**Proceedings of the 28th International Conference on Head-Driven Phrase Structure Grammar**

Online (Frankfurt/Main)

Stefan Müller, Nurit Melnik (Editors)

2021

Frankfurt/Main: University Library

# Contents

## Editor’s note

The 28th International Conference on Head-Driven Phrase Structure Grammar (2021) took place as an online conference and was organized by Frank Richter (Goethe-Universität, Frankfurt am Main).

The conference featured 2 invited talks and 12 papers selected by the program committee (Anne Abeillé, Emily M. Bender, Felix Bildhauer, Hans Boas, Olivier Bonami, Francis Bond, Gosse Bouma, Rui Chaves, Berthold Crysmann, Daniel Flickinger, Fabiola Henri, Thomas Hoffmann, Anke Holler, Gianina Iordachioaia, Paul Kay, Jong-Bok Kim, Jean-Pierre Koenig, David Lahm, Nurit Melnik (chair), Laura Michaelis, Philip Miller, Stefan Müller, Tsuneko Nakazawa, Petya Osenova, Rainer Osswald, Gerald Penn, Frank Richter, Manfred Sailer, Stephen Wechsler, Shuichi Yatabe, Eun-Jung Yoo, Olga Zamaraeva). There was a workshop on negation with one invited speaker and six regular papers.

We want to thank the program committees for putting these nice programs together.

As in the past years the contributions to the conference proceedings are based on the five page abstract that was reviewed by the respective program committee, but there is no additional reviewing of the longer contribution to the proceedings. To ensure easy access and fast publication we have chosen an electronic format. As of this year, the proceedings will be published by the University Library of Goethe-Universität, Frankfurt am Main. Previous volumes that were published by CSLI Publications have been migrated to the new location. We want to thank CSLI Publications for the good collaboration in all these years.

The proceedings include all the papers of the conference and workshop except the ones by Gabrielle Aguila-Multner & Berthold Crysmann, Zahra Mirrazi & Hedde Zeijlstra.

Part I

# Contributions to the Main Conference

# The Welsh of Jesus and Job: Verb-second in Middle Welsh

Robert D. Borsley
University of Essex and Bangor University

Proceedings of the 28th International Conference on
Head-Driven Phrase Structure Grammar

Online (Frankfurt/Main)

Stefan Müller, Nurit Melnik (Editors)

2021

Frankfurt/Main: University Library

pages 6–25

Keywords: Middle Welsh, verb-second, topic, focus, agreement

Borsley, Robert D. 2021. The Welsh of Jesus and Job: Verb-second in Middle Welsh. In Stefan Müller & Nurit Melnik (eds.), *Proceedings of the 28th International Conference on Head-Driven Phrase Structure Grammar, Online (Frankfurt/Main)*, 6–25. Frankfurt/Main: University Library. DOI: 10.21248/hpsg.2021.1.

**Abstract**

Middle Welsh is a VSO language with the verb before the subject in all kinds of finite clause. However, positive declarative main clauses normally show verb-second order with a constituent of some kind before the finite verb. There are questions about the nature of this restriction. There are also questions about subject-initial sentences, which show surprising agreement properties, whether the subject is a topic or a focused constituent. All these questions can be given plausible answers within HPSG.


## 1. Introduction

Welsh has always been a VSO language with the verb before the subject in all kinds of finite clause. However, in Middle Welsh, positive declarative main clauses normally show verb-second order with a constituent of some kind before the finite verb. Thus, the Welsh Bible, which reflects late Middle Welsh usage, has (1), where Modern Welsh would have (2). (All Middle Welsh examples are taken from Willis 1998 or Meelen 2016, and the primary text is given in brackets.)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| (1) | Yr | Ysbryd | Glân | a | ddaw | arnat | ti. |
| | the | Ghost | Holy | PRT | come.FUT.3SG | on.2SG | you |

‘The Holy Ghost will come upon you.’ (New Testament Luke 1:34–35)

| | | | | | | |
|---|---|---|---|---|---|---|
| (2) | Daw | ’r | Ysbryd | Glân | arnat. | |
| | come.FUT.3SG | the | Ghost | Holy | on.2SG | |

‘The Holy Ghost will come upon you’

Examples like (1), in which the initial constituent is interpreted as a topic, are known in traditional Welsh grammar as abnormal sentences (*brawddeg annormal* in Welsh), and they are a feature of Welsh Bible translations, dating from the late Middle Welsh period. As Meelen (2016: 1) notes, quoting Evans (1990), the result was that

> [t]o many people in Wales it was utterly embarrassing to hear “Jesus and Job speaking ‘bad Welsh’”.

---


* Earlier versions of this material were presented at the 24th Welsh Linguistics Seminar, at Gregynog Hall, mid-Wales in July 2017, at a symposium on New Approaches to Brittonic Historical Linguistics at the Dublin Institute for Advanced Studies in August 2017, and at a seminar at the Humboldt University in Berlin in December 2017. I am grateful to the audiences on all these occasions for their comments and discussion. Of course, I alone am responsible for what appears here.

A question obviously arises about the constraint responsible for this verb-second order, I will argue that it is the consequence of a negative constraint, excluding a finite verb from initial position in a class of clauses.

There are also questions about the properties of subject-initial sentences, both abnormal sentences, where the subject is a topic, and so-called mixed sentences (*brawddeg gymysg* in Welsh), where the subject is focused. I will argue that both are the realization of phrase types which are not head–filler phrases but share certain properties with such phrases. Given an appropriate type hierarchy, it is not difficult to capture the similarities and differences in this area.

The paper is organised as follows: In section 2, I set out the main facts that need to be considered. Then, in section 3, I outline an analysis of mixed sentences, and in section 4, I provide an analysis of abnormal sentences. In section 5, I consider how the verb-second requirement should be handled. Finally, in section 6, I conclude the paper.

## 2. Basic data

In this section, I will highlight the important properties of abnormal and mixed sentences and also say something about verb-initial clauses. This will lead to a statement of the questions that are addressed in the rest of the paper.

Abnormal sentences, in which the verb is preceded by a topic, may have a subject, a complement, or an adjunct in initial position, as the following illustrate:

(3) A [’r guyrda] a doethant y gyt.
and the nobles PRT come.PAST.3PL together
‘And the nobles came together.’ (PKM 90.27)

(4) a [’r llall] a adawd yghyfeir y vorwyn.
and the other PRT leave.PAST.3SG for the maiden
‘and the rest he left for the maiden.’ (Per 10.28)

(5) Ac [yn diannot] y doeth tan o ’r nef.
and PRED immediate PRT come.PAST.3SG fire from the heaven.
‘And without delay came fire from the sky.’ (Dewi 0086.218)

In each case, the initial constituent is followed by a particle. Roughly, this is *a* if the initial constituent is an argument and *y* if it’s an adjunct. At one time, a number of researchers (e.g. MacCana 1973, 1991 and Fife and King 1991) proposed that abnormal sentences were just a literary phenomenon. However, Willis (1998: 1.3.3) and Meelen (2016) argue that they are an ordinary feature of the language. They show that they are not confined to literary texts. They also note that a similar verb-second requirement survives in Modern Breton (as discussed e.g. in Borsley and Kathol 2000). Thus, these sentences are abnormal from the standpoint of Modern Welsh, but not in any other sense.

In (3), the verb agrees with the preceding subject, which is a topic. This is unexpected given that agreement in Middle Welsh, as in Modern Welsh, generally only occurs with pronouns. Normally, the default third person form of the verb appears with a non-pronominal NP, as in the following:[1]

(6) Yna y doeth kennadeu.
Then PRT come.PAST.3SG messengers
'Then messengers came.' (PKM 79 27)

Thus, sentences like (3) are doubly abnormal.

Contrasting with the abnormal sentences just considered are mixed sentences such as (7), in which the initial constituent is focused.

(7) Mi a 'e heirch.
I PRT 3SGF seek.PRES.3SG
'It is I who asks for her.' (WM 479.24)

Here, there is no agreement even though the initial NP, which is understood as a subject, is a pronoun. The default third person form of the verb appears. This also is unexpected.

We have seen that positive declaratives show verb-second order. Sentences which are not positive or not declarative are normally verb-initial. In negative main clauses the verb is usually only preceded by the negative particle *ny*.

(8) Ny welei ef y twrwf rac tywyllet y nos.
NEG see.PAST.3SG he the commotion as darkness the night
'He could not see the commotion as the night was so black.' (PKM 22.23)

A negated verb may be preceded by a topic, as in (9), but this is not required.

(9) A hynny ny thygywys idaw
And that NEG avail.PAST.3SG to.3SGM
'And that didn't work for him.' (PKM 11. 2)

In interrogative clauses, the verb is only preceded by the interrogative particle *a*.

[1] For detailed discussion of the facts of Modern Welsh, see Borsley (2009).

(10) A wydyat llad a chledyf?
QU-PRT know.PRES.2SG kill.INF with sword
'Do you know how to kill with a sword?' (Peredur 0003.335)

There is some evidence that preverbal particles form a complex verbal constituent with the immediately following verb in Modern Welsh (Harlow 1983, Willis 1998: 70–71, Borsley and Jones 2005: 57). Assuming Middle Welsh is the same, negative and interrogative examples like (8) and (10) have a finite verbal constituent in clause initial position.

Imperatives such as the following have the imperative verb in initial position with nothing preceding:

(11) Dos titheu ar Arthur y diwyn dy wallt.
go.IPV.2SG you to Arthur to cut.INF 2SG hair
'Go to Arthur to cut your hair.' (CO 58)

But it could be that imperative verbs are not finite. So it is not clear how important such examples are.

There is one important class of verb-initial positive declaratives. This is examples where the verb is a form of the copula, such as the following:[2]

(12) Mae uyg kallon yn tirioni vrthyt.
be.PRES.3SG 1SG heart PROG grow-fond.INF with.2SG
'My heart inclines toward you.' (CO 0004.196)

Some other apparent examples of verb-initial positive declaratives will be discussed in section 5, but it will be argued that they are only apparent examples.

The facts set out above raise three main questions:

- What is the nature of the Middle Welsh verb-second requirement?
- Why do verbs agree with any preceding subject which is a topic in an abnormal sentence?
- Why do verbs not agree with any preceding subject which is focused in a mixed sentence?

The nature of the verb-second requirement cannot be addressed without a clear understanding of both abnormal and mixed sentences. Therefore, we need to consider these first and then turn to the nature of verb-second.

[2] Parallel examples are acceptable in Modern Breton (Borsley and Kathol 2000: 666).

## 3. Mixed (or cleft) sentences

I will first consider mixed sentences because they are fairly straightforward. They survive in Modern Welsh, in which they are often called cleft sentences, and essentially the same analysis seems appropriate for Middle Welsh as for Modern Welsh.

In Borsley (2015, 2020), I argue that the basic properties of Modern Welsh clefts can be accounted for on the assumption that the initial constituent is not a filler but one term of a hidden identity predication, and the same approach can be applied to Middle Welsh. An English example such as (13) shows that the focused constituent and the gap in a cleft may have different properties.

(13) It's me that likes beer.

Hence, there is no reason within this approach for the gap within the second constituent to have the same properties as the initial constituent. and no reason to expect agreement in (7). In Middle Welsh, as in Modern Welsh, the hidden identity predication can be negated by an initial negative particle, as shown in (14).

(14) Nyt y dyn a doeth.
NEG the man PRT come.PAST.3SG
'It was not the man who came.' (Meelen 2016: 200)

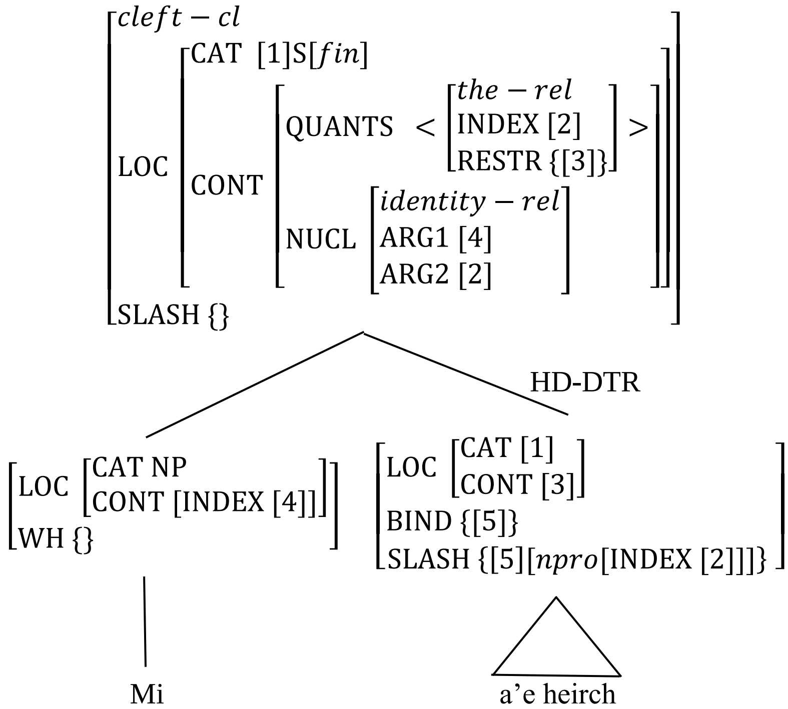
Meelen (2016: 119) points out that early Middle Welsh clefts had a form of the copula preceding the focused constituent, as in (15).

(15) Ys mi a 'e heirch.
be.PRES.1SG me PRT 3SGF seek.PRES.3SG
'It is I who seeks her' (WM 479.29)

It seems, then, that the identity interpretation originally stemmed from a lexical element but subsequently became a property of the construction.

Within this approach, the mixed/cleft sentence in (7) can be assigned the structure in (16). The BIND feature here is rather like feature of the same name in Bouma *et al*. (2001) and picks out one member of the SLASH set of a daughter (typically the only member) for some kind of special treatment. Apart from this, the structure has two important properties. Firstly, the CONTENT value of the mother makes it clear that the second daughter is interpreted as a definite description and identified with the first daughter. Thus, the two daughters are interpreted as the two terms of an identity predication. Secondly, the single member of the BIND and SLASH sets is non-pronominal. This ensures that the gap is non-pronominal and hence does not trigger agreement.

(16)

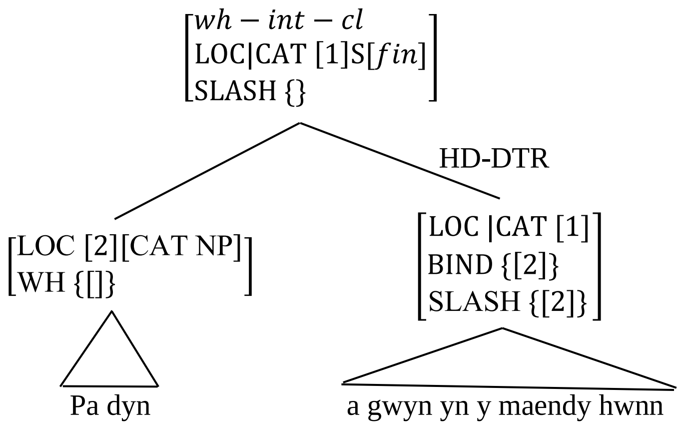



Although the initial constituent of a cleft is not a filler, clefts share properties with head–filler phrases, e.g. *wh*-interrogatives such as (17).

(17) Pa dyn a gwyn yn y maendy hwnn?
which man PRT lament.PRES.3SG in the prison this
‘Which man laments in this prison?’ (CO 914)

Ignoring semantics, this will have a structure of the following form, in which the *wh*-phrase is a filler:

(18)



Both types of clause have two daughters, a phrase and a clause with a non-empty SLASH value. This can be captured by treating them as two subtypes of a type *binary-slashed-head-phrase*.

(19) *binary-slashed-head-phrase*

*head-filler-phrase*      *cleft-clause*

For *binary-slashed-head-phrase*, we can propose the following constraint:

(20) *binary-slashed-head-phrase* $\Rightarrow$

$$\begin{bmatrix} \text{SS}\ [\text{SLASH}\ [1]] \\ \text{HD}-\text{DTR}\ [2] \\ \text{DTRS} < [\,] > \oplus < [2] \begin{bmatrix} \textit{clause} \\ \text{SS}\ \begin{bmatrix} \text{BIND}\ \{[3]\} \\ \text{SLASH}\ \{[3]\} \cup [1] \end{bmatrix} \end{bmatrix} > \end{bmatrix}$$

This ensures that a binary–slashed–head phrase has two daughters, and that the second is a head which is a clause with one SLASH set member which is not part of the SLASH set of the mother.[3] This will be simplified later. For head–filler phrases, we can propose the constraint in (21).

(21) *hd-fill-ph* $\Rightarrow$ $[\text{DTRS}\ < [\text{SS}[\text{LOC}[1]]], [\text{SS}[\text{BIND}\ \{[1]\}]] >]$

This requires the first daughter to be a filler with a LOCAL value identical to the single member of the BIND set of the second daughter. For clefts, we can propose the constraint in (22).

---

[3] Without BIND, problems could arise where a SLASH set has more than one member. The member of the SLASH set of the head which is not a member of the SLASH set of the mother would not necessarily be the one that receives a special treatment in some other way. This is a flaw in the analysis outlined in Borsley (2020) for Modern Welsh clefts.

(22) *cleft-clause* $\Rightarrow$

$$\left[\begin{array}{l}
\mathrm{SS|LOC}\left[\mathrm{CONT}\left[\begin{array}{l}
\mathrm{QUANTS}\ <\left[\begin{array}{l} the-rel \\ \mathrm{INDEX}\ [1] \\ \mathrm{RESTR}\ \{[2]\}\end{array}\right]>\oplus\ \mathrm{L} \\
\mathrm{NUCL}\left[\begin{array}{l} identity-rel \\ \mathrm{ARG1}\ [3] \\ \mathrm{ARG2}\ [1]\end{array}\right]
\end{array}\right]\right] \\
\mathrm{DTRS}\ <\left[\mathrm{SS|LOC|CONT}\ [\mathrm{INDEX}\ [3]]\right], \\
\qquad\left[\mathrm{SS}\left[\begin{array}{l}\mathrm{LOC}\left[\begin{array}{l}\mathrm{CAT|HEAD|VFORM}\ fin \\ \mathrm{CONT}\ [2]\end{array}\right] \\ \mathrm{BIND}\ \{[\mathrm{CONT}\ npro[\mathrm{INDEX}\ [1]]]\}\end{array}\right]\right]>
\end{array}\right]$$

This ensures that a cleft clause has two daughters which are interpreted as the two terms of an identity predication. It also ensures that the second daughter has a non-pronominal NP in its BIND set, and hence that any gap is non-pronominal and so does not trigger agreement.

Thus, it is not too hard to provide an account of mixed/cleft sentences which captures both their distinctive properties and the properties they share with head–filler phrases such as *wh*-interrogatives.

## 4. Abnormal sentences

As we have noted, the main challenge with abnormal sentences is to ensure that the verb shows agreement with a preceding subject even if it is non-pronominal. I will propose that this is because they, like mixed sentences, are not head–filler phrases when the initial constituent is nominal (although this constituent might be called a ‘quasi-filler’).

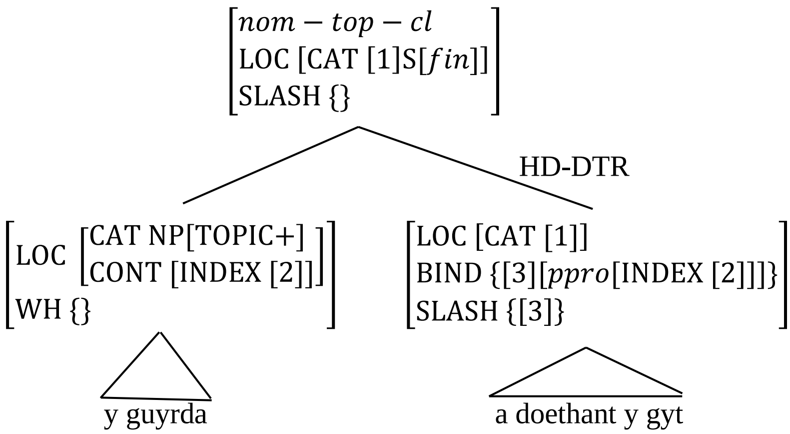
Since agreement in Middle Welsh normally only occurs with pronouns, some special constraint must be responsible for agreement between a verb and a preceding subject in an abnormal sentence. There are two possible approaches: either (a) the verb agrees directly with the preceding subject, or (b) it agrees with a subject gap and that agrees with the visible subject. Meelen (2016: 6.4) takes the former approach. However, as we have seen, the initial constituent in an abnormal sentence can have various roles: subject, object or adjunct. It is not obvious how a verb could be made to agree with a preceding topic just in case it is interpreted as its subject.[4] This suggests that the verb agrees with a subject gap. One way to ensure this is to require the SLASH

[4] See Borsley 2018 for further discussion.

value in a nominal topic clause to be pronominal. This will mean that the gap in such a clause is pronominal, and if it is in subject position, it will trigger agreement like any other pronominal subject.

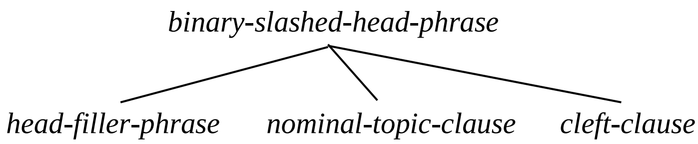
We can do this by assuming that these clauses are not head–filler phrases but the realization of another subtype of *binary-slashed-head-phrase*, which we can call *nominal-topic-clause*, in which a topic NP is coindexed with a pronominal BIND value. On this approach, (3) will have this structure:

(23)




The type hierarchy can be extended as follows:

(24)




For nominal topic clauses, we can propose the constraint in (25):

(25) *nominal-topic-clause* $\Rightarrow$

$$\begin{bmatrix} \text{DTRS} < [\text{SS}[\text{LOC NP}[\text{TOPIC}+, \text{INDEX} [1]]]], \\ \qquad\qquad [\text{SS}[\text{BIND} \{[\text{CONT } ppro[\text{INDEX} [1]]]\}]] > \end{bmatrix}$$

This says that the first daughter of a nominal topic clause is a nominal topic and that the second daughter has a BIND set whose single member is a coindexed pronominal.[5] The coindexing entails that the two elements have the same person, number, and gender. If the first daughter is non-pronominal, they

---

[5] Borsley (2015: 1004) proposes that all nominal SLASH set members are non-pronominal in Modern Welsh. The analysis of abnormal sentences outlined here means that this position is not available in Middle Welsh.

will differ in one respect. If the first daughter is pronominal, they will be identical in every respect and the first daughter will resemble a filler (hence the term 'quasi-filler'). In either case, a gap will be pronominal, and if it is in subject position, there will be agreement.

Here, then, we have an account of abnormal sentences which captures the fact that the verb agrees with a preceding subject even if it is non-pronominal. It also captures the similarities between a nominal topic clause and both mixed sentences and head–filler phrases by treating them as subtypes of the type *binary-slashed-head-phrase*. What about non-nominal topic clauses such as (5)? As far as I can see, there is no reason why they should not be analysed a type of head–filler phrase. It is just nominal topic clauses that require a special treatment.

## 5. The nature of verb-second

Having outlined analyses of both mixed and abnormal sentences, we can consider how the Middle Welsh verb-second requirement should be analysed. There are two logically possible types of constraint. One could have a positive constraint requiring certain clauses to have a certain property or one could have a negative constraint requiring certain clauses not to have a certain property. After considering constraints of the first kind, I will argue for a constraint of the second kind.

We have argued in the preceding sections that neither mixed sentences nor nominal topic clauses are head–filler phrases. Clearly, then, the verb-second requirement could not be a requirement that positive declarative main clauses must be a head–filler phrase. However, these clauses, like head–filler phrases, involve an unbounded dependency, and on fairly standard HPSG assumptions, this means that the highest verb has a non-empty SLASH value. Hence, one might propose that a finite verb other than the copula heading a positive declarative main clause must have a non-empty SLASH value. Abnormal sentences and mixed/cleft sentences will conform to this constraint, but verb-initial positive declarative main clauses will not.

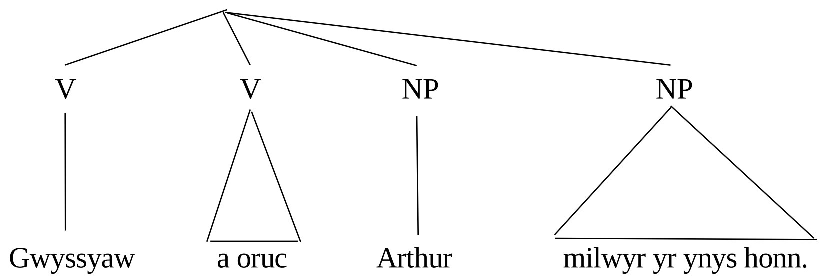
This approach seems quite promising, but two sorts of example pose problems. Firstly, there are examples with an initial non-finite verb separated from its complement, such as the following from Willis (1998: 52):

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| (26) | Gwyssyaw | a | oruc | Arthur | milwyr | yr | ynys | honn ... |
| | summon.INF | PRT | do.PAST.3SG | Arthur | soldiers | the | island | this |

'Arthur summoned the soldiers of this island...' (CO 922-3)

As with similar examples in Modern Breton (Borsley & Kathol 2000), there is no reason to think that these involve an unbounded dependency. Rather, it is plausible to analyse them as argument composition structures, in which a finite auxiliary verb takes as its complements a non-finite verb and whatever complements the latter requires, giving a structure of the following form:

(27)



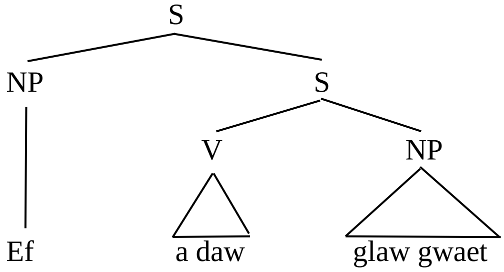

If this is right, the finite verb will not have a non-empty SLASH value.

Secondly, there are examples with an expletive pronoun in initial position, such as (28):

(28) Ef a daw glaw gwaet …
it PRT come.FUT.3SG rain blood
'There will come a rain of blood …' (BB 125.5)

Willis (1998:128) reports that initial expletives are rare in early texts and restricted to unaccusative contexts, but common in later texts and not restricted in this way. The obvious structure is something like the following:

(29)




Again, there is no reason to think that there is an unbounded dependency here, and so no reason to think that the finite verb has a non-empty SLASH value. This suggests that a different approach is required.

As an alternative, one might propose that a finite verb other than the copula in a positive declarative main clause must be preceded by a phrase of some kind, including an expletive, or a non-finite verb. On the face of it, this would allow mixed sentences, abnormal sentences, and sentences with an expletive or a non-finite verb in initial position, while excluding examples with a finite verb in initial position. However, there is no easy way to formalise this restriction. It would be easy enough if all these elements were sisters of the finite verb, but probably only an initial finite verb is.[6]

A rather different alternative involves a negative constraint. Instead of stipulating that certain clauses must have a certain property, one can stipulate that they must not have a certain property. In the present case, the property is having a finite verb other than the copula in clause-initial position. There are some complications here, but it is not too difficult to develop an account along these lines.

An analysis obviously requires a way to distinguish standard verbs from the copula. Following Bonami *et al*. (2016) and Borsley (2019), I assume a feature LID whose value is unique to each distinct lexeme, the words that realize it, and the phrases that they head, and l assume that *standard-verb* is a supertype of the LID values of all standard verbs while the copula is [LID *copula*]. If we assume also that main clauses are [ROOT +] and positive clauses [POL(ARITY) *pos*(*itive*)] and that the order of elements in the DTRS list of a clause corresponds to the observed order, we might propose the following constraint for Middle Welsh:

(30) $$\begin{bmatrix} declarative-clause \\ \text{SS|LOC|CAT} \begin{bmatrix} \text{HEAD} \begin{bmatrix} \text{VFORM } fin \\ \text{ROOT} + \\ \text{POL } pos \end{bmatrix} \end{bmatrix} \\ \text{DTRS} < [1], \ldots > \end{bmatrix} \Rightarrow$$

[1] ≠ [SS|LOC|CAT|HEAD [LID *standard-verb*, VFORM *fin*]]

This says that the first daughter of a finite positive declarative main clause may not be a finite standard verb. It rules out a finite standard verb in initial position in such clauses but allows such a verb in other types of clause and allows other clause-initial constituents.

This approach looks promising, but there is a problem. As analyzed above, both abnormal sentences and mixed/cleft sentences will involve a structure of the following form:

[6] The situation might be different if one assumed order domains since within such an approach, the various elements that can precede the finite verb may be in the same order domain as the verb. An analysis of this kind is proposed for Modern Breton in Borsley and Kathol (2000). However it seems preferable to avoid an appeal to order domains if possible.

(31)

$$\underset{\begin{bmatrix}\text{ROOT} + \\ \text{SLASH}\ \{\}\end{bmatrix}}{\text{S}} \rightarrow \text{XP}\quad \underset{\begin{bmatrix}\text{ROOT} + \\ \text{SLASH}\ \{[]\}\end{bmatrix}}{\text{S}}$$

Expletive-initial examples like (28) will involve a similar structure in which both Ss are [SLASH {}]. In these clauses, the lower S is a head and hence, on standard assumptions, is [ROOT+] like the higher S. But clearly the lower S can and normally will have a finite verb as its first daughter.[7] One response to this problem would be to stipulate that the head in such clauses is always [ROOT –]. But this is only possible in a version of HPSG assuming a default Head Feature Principle, so it seems better to look for a different solution.

An alternative solution is suggested by Bonami *et al*. (2016), who propose that Modern Welsh has not a two-way distinction between main and subordinate clauses, but a three-way distinction between simple main, simple complement, and unbounded dependency clauses, encoded as the value of a feature STATUS. For Middle Welsh, we can propose that the third type is not unbounded dependency clauses, but extended clauses in which at least normally a basic clause combines with a preceding sister of some kind. This will include both unbounded dependency clauses and clauses with an initial expletive. It will give (32) instead of (31).

(32)

$$\underset{\begin{bmatrix}\text{STATUS}\ \mathit{extended} \\ \text{SLASH}\ \{\}\end{bmatrix}}{\text{S}} \rightarrow \text{XP}\quad \underset{\begin{bmatrix}\text{STATUS}\ \mathit{extended} \\ \text{SLASH}\ \{[]\}\end{bmatrix}}{\text{S}}$$

Assuming that simple non-extended main clauses are [STATUS *main*], we can reformulate (30) as follows:

[7] The first daughter of the lower S will not always be a finite verb. It can also be what Willis (1998: 3.3.2) calls an interposed adverb, such as *yna* 'then' in (i).

| | | | | |
|---|---|---|---|---|
| (i) A | Lawnslot | yna | a | dywawt ... |
| And | Lancelot | then | PRT | said |

'And Lancelot then said ...' (YSG 121)

$$(33)\quad \begin{bmatrix} \mathit{declarative-clause} & \\ \mathrm{SS|LOC|CAT} \begin{bmatrix} \mathrm{HEAD} \begin{bmatrix} \mathrm{VFORM}\ \mathit{fin} \\ \mathrm{STATUS}\ \mathit{main} \\ \mathrm{POL}\ \mathit{pos} \end{bmatrix} \end{bmatrix} & \\ \mathrm{DTRS} < [1], \ldots > & \end{bmatrix} \Rightarrow$$

[1] ≠ [SS|LOC|CAT|HEAD [LID *standard-verb*, VFORM *fin*]]

This says that the first daughter of a simple finite positive declarative main clause may not be a finite standard verb. It will rule out a finite standard verb in initial position in simple finite positive declarative main clauses, but have no effect on the lower S in (32) because it is not [STATUS *main*]. It will allow a finite standard verb in initial position in negative declaratives, interrogatives, and imperatives. It will also allow a non-finite standard verb in initial position in positive declarative main clauses. This is relevant not only to examples like (26) but also to examples with an initial non-finite verb which is the only verb in the sentence, such as the following:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| (34) | Dyuot | Caswallawn | am | eu | penn | a | llad | y |
| | come.INF | Caswallawn | about | 3PL | head | and | kill.INF | the |
| | chwegwyr. | | | | | | | |
| | six.men | | | | | | | |

'Caswallon fell upon them and killed the six men.' (CO 4)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| (35) | A | chaffael | mab | ohonu | trwy | weti | y | wlad. |
| | and | get.INF | son | from.3PL | through | pray.INF | the | country |

'And through the country's prayers they got a son.' (CO 4)

| | | | | | |
|---|---|---|---|---|---|
| (36) | Canu | englyn | idaw | ynteu | yna. |
| | sing.INF | englyn | to.3SGM | him | then |

'He sang an englyn then' (PKM 90.9)

There are two sorts of example here. In (34) the subject immediately follows the verb while in (35) and in (36) it takes the form of a PP following the object, headed by *o* 'from' in (35) and by *i* 'to' in (36). The interpretation is always past tense. (See Meelen 2016: 4.3.6 for discussion of such examples.) This analysis will also, of course, allow a topic (as in (1) and (3)–(5)), a focused constituent (as in (7)), or an expletive pronoun (as in (28)) in initial position.

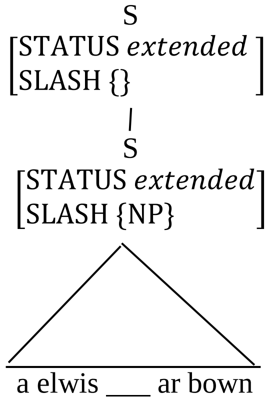
There are some further acceptable verb-initial clauses which might seem problematic for this approach, e.g. the bracketed second conjunct in (37).

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| (37) | … ac | yna | y | kyuodes | sabot | ac | [a | elwis | ar |
| | and | there | PRT | arise.PAST.3SG | Sabot | and | PRT | call.PAST.3SG | on |
| | bown] | | | | | | | | |
| | Bown | | | | | | | | |

'And then Sabot arose and called on Bown …' (YBH 2825-8)

However, Willis (1998: 4.2) argues that such clauses involve an unexpressed topic and an unbounded dependency of some kind. One way to handle such examples would be to assume that they have a phonologically empty topic. This would make them just like examples with an overt topic. However, there is an alternative approach which doesn't require a phonologically empty element. Following Müller's (2014: 101) analysis of similar German 'topic-drop' sentences, one can analyse these examples as involving a unary branching structure in which an S[SLASH {}] has a single daughter, which is an S[SLASH {NP}], as in (38).

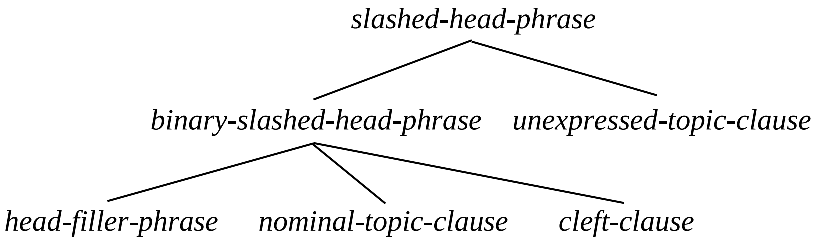
(38)




Since this structure is [STATUS *extended*], it will be unaffected by the constraint in (33). (Note that this means that the lower S in an extended clause isn't always preceded by a sister of some kind.)

This structure can be assigned to a type *unexpressed-topic-clause*. Apart from having just a single daughter (which is a head), this will be quite similar to the type *binary-slashed-head-phrase* introduced above. The similarities can be captured by treating them as two subtypes of a type *slashed-head-phrase*, giving the extended type hierarchy in (39).

(39)




The main properties associated with *binary-slashed-head-phrase* in (20) above can now be assigned to *slashed-head-phrase*, as follows:

(40) *slashed-head-phrase* ⇒

$$\begin{bmatrix} \mathrm{SS} \begin{bmatrix}\mathrm{LOC|CAT|HEAD[STATUS}\ \mathit{extended}] \\ \mathrm{SLASH}\ [1]\end{bmatrix} \\ \mathrm{HD-DTR}\ [2] \\ \mathrm{DTRS\ L} \oplus < [2] \begin{bmatrix} \mathit{clause} \\ \mathrm{SS} \begin{bmatrix}\mathrm{BIND}\ \{[3]\} \\ \mathrm{SLASH}\ \{[3]\} \cup [1]\end{bmatrix}\end{bmatrix} > \end{bmatrix}$$

This ensures that a slashed–head phrase is [STATUS *extended*] and has a head daughter which is a clause with one SLASH set member which is not part of the SLASH set of the mother. It allows but does not require other pre-head daughters. Both *binary-slashed-head-phrase* and *unexpressed-topic-clause* will be subject to quite simple constraints, as follows:

(41) *binary-slashed-head-phrase* ⇒ [DTRS <[*phrase*]> ⊕ <[]>]

(42) *unexpressed-topic-clause* ⇒ [DTRS <[]>]

The former ensures that a binary–slashed–head phrase has two daughters (the second of which is a head as a result of the constraint on *slashed-head-phrase*). The latter ensures that an unexpressed–topic clause has a single daughter (which is a head as a result of the constraint on *slashed-head-phrase*). A full constraint on *unexpressed-topic-clause* will also need to ensure the appropriate semantics with an unexpressed topic, but I will not try to decide how this should be done. Thus, if Willis (1998) is right about the second clause in examples like (37), they are unproblematic for the account of Middle Welsh verb-second outlined above. They just require a slight elaboration of the type system.

Here, then, we have an approach to Middle Welsh verb-second in which a negative constraint rules out a finite standard verb (any verb other than the copula) in initial position in a simple finite positive declarative main clause. It allows a finite standard verb in initial position in negative declaratives, interrogatives, and imperatives, and in the lower S in an extended clause. It also allows a topic, a focused constituent, a non-finite verb, and an expletive pronoun in initial position.

## 6. Concluding remarks

In this paper, I have been concerned with the fact that Middle Welsh has a verb-second restriction with a constituent of some kind before the finite verb in positive declarative main clauses. There are questions about the nature of this restriction. There are also questions about subject-initial clauses, both abnormal sentences, where the subject is a topic, and mixed or cleft sentences, where it is a focused constituent. I have argued that neither mixed/cleft sentences nor abnormal sentences with a nominal topic are head–filler phrases. However, they share certain properties with head–filler phrases, which can be captured by treating them as subtypes of a single type. Building on these proposals, I have argued that the verb-second restriction is a consequence not of a positive constraint requiring certain clauses to have a certain property but a negative constraint requiring them not to have a certain property, namely an initial finite standard verb. I have also argued that certain unexpressed topic clauses can be analysed in terms of a unary branching structure. This involves a further phrase type which is not a head–filler phrase but shares properties with such phrases.

**Primary texts**

BB = *Brut y Brenhinedd: Cotton Cleopatra Version*, ed. John Jay Parry (Cambridge, Mass.: Mediaeval Academy of America 1937)

CO = *Culhwch ac Olwen: An Edition of the Oldest Arthurian Tale*, ed. Rachel Bromwich and D. Simon Evans (Cardiff: University of Wales Press 1992)

Dewi = *Buched Dewi* 'The Life of St David'

Per = Peredur *Historia Peredur vab Efrawc*, ed. Glenys Witchard Goetinck (Caerdydd: Gwasg Prifysgol Cymru, 1976)

PKM = *Pedeir Keinc y Mabinogi*, ed. Ifor Williams (Caerdydd: Gwasg Prifysgol Cymru, 1930)

WM =*Llyfr Gwyn Rhydderch*, ed. J. Gwenogvryn Evans with introduction by R. M. Jones, (Caerdydd: Gwasg Prifysgol Cymru, 1973)

YBH = *Ystoria Bown de Hamtwn*, ed. Morgan Watkins (Caerdydd: Gwasg Prifysgol Cymru, 1958)

YSG = *Ystoryaeu Seint Greal*, ed. Thomas Jones (Caerdydd: Gwasg Prifysgol Cymru, 1992)

## REFERENCES


Bonami, O., R. D. Borsley & M. O. Tallerman (2016), On pseudo-non-finite clauses in Welsh, D. Arnold, M. Butt, B. Crysmann, T. Holloway-King & S. Müller (eds.), *Proceedings of the Joint 2016 Conference on Head-driven Phrase Structure Grammar and Lexical Functional Grammar*, 104–124, Stanford, CA: CSLI Publications.

Borsley, R. D. (2009), On the superficiality of Welsh agreement, *Natural Language and Linguistic Theory* 27, 225–265.

Borsley, R. D. (2015), Apparent filler–gap mismatches in Welsh, *Linguistics* 53, 995–1029.

Borsley, R. D. (2018), Review of Meelen (2016), *Journal of Celtic Linguistics* 19, 266–274.

Borsley, R. D. (2019), The complexities of the Welsh copula, S. Müller (ed.), *Proceedings of the 26th International Conference on Head-driven Phrase Structure Grammar*, 5–25, Stanford, CA: CSLI Publications.

Borsley, R. D. (2020), On a family of Welsh constructions, S. Müller (ed.), *Proceedings of the 27th International Conference on Head-driven Phrase Structure Grammar*, 26–46, Stanford, CA: CSLI Publications.

Borsley, R. D. & B. M. Jones (2005), *Welsh Negation and Grammatical Theory*, Cardiff: University of Wales Press.

Borsley, R. D. & A. Kathol (2000), Breton as a V2 language, *Linguistics* 38, 665–710.

Bouma, G., R. Malouf & I. A. Sag (2001), Satisfying constraints on extraction and adjunction, *Natural Language & Linguistic Theory* 19, 1–65.

Harlow, S. (1983), Celtic relatives, *York Papers in Linguistics* 10, 77–121.

Evans, D. (1990), Insular Celtic and the emergence of the Welsh language, in A. Bammesberger & A. Wollmann (eds.), *Britain 400–600: Language and History*, 150–177, Heidelberg: Carl Winter.

Fife, J., & G. King (1991), Focus and the Welsh ‘abnormal sentence’: A crosslinguistic perspective, in J. Fife & E. Poppe (eds.), *Studies in Brythonic Word Order* (Vol. 83, 81–153), Amsterdam: John Benjamins Publishing.

MacCana, P. (1973), Celtic word order and the Welsh abnormal sentence, *Ériu*, 90–120.

MacCana, P. (1991), Further notes on constituent order in Welsh, in J. Fife & E. Poppe (eds.), *Studies in Brythonic Word Order* (Vol. 83, p. 45–80), Amsterdam: John Benjamins Publishing.

Meelen, M. (2016), *Why Jesus and Job Spoke Bad Welsh: The Origin and Distribution of V2 Orders in Middle Welsh*, Utrecht: LOT.

Müller, S. (2014), Elliptical constructions, multiple frontings, and surface-based syntax, in P. Monachesi, G. Jäger, G. Penn & S. Wintner (eds.), *Proceedings of Formal Grammar 2004*, Nancy, 91–109. Stanford, CA: CSLI Publications.

Willis, D. W. E. (1998), *Syntactic Change in Welsh: A Study of the Loss of Verb-second*, Oxford: Oxford University Press.

# Verbs of deception, point of view and polarity

Jack Hoeksema
University of Groningen

Proceedings of the 28th International Conference on
Head-Driven Phrase Structure Grammar

Online (Frankfurt/Main)

Stefan Müller, Nurit Melnik (Editors)

2021

Frankfurt/Main: University Library

pages 26–46

Keywords: Contrafactivity, verbs of deception, point of view, negation, futurate present

Hoeksema, Jack. 2021. Verbs of deception, point of view and polarity. In Stefan Müller & Nurit Melnik (eds.), *Proceedings of the 28th International Conference on Head-Driven Phrase Structure Grammar, Online (Frankfurt/Main)*, 26–46. Frankfurt/Main: University Library. DOI: 10.21248/hpsg.2021.2.

## 1. Introduction

Making somebody wise would seem to be a laudable thing to do. However, in Dutch and German the combination *make wise*, rendered in these languages as *wijsmaken* and *weismachen* respectively, is used to express an act of deception. German *jemandem etwas weismachen* means to fool somebody into believing something false. Clearly, the compound verb has a noncompositional interpretation, which is derived from an older interpretation *to inform somebody about something,* possibly as a result of pragmatic entrenchment of an ironic use. Some typical examples are given in (1) for German and (2) for Dutch:

(1) German

a. Sie können mir doch nicht weismachen, dass es stimmt.
you can me PRT not wise-make that it OK
"You can't fool me into thinking that it is correct"

b. Wir sollten uns doch nichts weismachen!
we should REFL PRT nothing wise-make
"We shouldn't delude ourselves"

(2) Dutch

a. Maak jezelf niet wijs dat de kans heel klein is
Make yourself not wise that the chance very small is
"Don't fool yourself into believing that chances are very slim"

b. Hem werd wijsgemaakt dat ze een Duitse was
him was wise-made that she a German was
"He was led to believe (falsely) that she was German"

The two verbs have the unusual property of being *contrafactive*, that is to say, they presuppose the falsity of their complement. Consider the following Dutch examples:

(3) a. Ze maakte me wijs dat ze rijk was.
she made me wise that she rich was
"She fooled me into believing that she was rich"

b. Maakte zij je wijs dat ze rijk was?
made she you wise that she rich was?
"Did she fool you into thinking that she was rich?"

c. Ze heeft me niet wijsgemaakt dat ze rijk was
she has me not wise-made that she rich was
"She has not fooled me into believing that she was not rich"

The assertion in a, the question in b and the negative assertion in c all presuppose the falsehood of the complement clause. Similar observations apply to the German counterparts of these sentences. Holton (2017) claims that there are no such verbs, at least not simplex verbs, and draws from this the far-reaching conclusion that propositional attitude verbs relate to facts, not propositions. A proposition can be false, a fact cannot. Now *wijsmaken* and *weismachen* are not simple verbs, but given their noncompositional interpretation, they could be viewed as semantically atomic, and hence as counterexamples to Holton's claim. Holton (2017: 247) notes that verbs such as *lie*, which might also be seen as contrafactive, do not take propositional complements. In his words: "one does not lie *that p*". This claim does not appear to hold for all speakers of English, since there is sufficient evidence from corpora that the verb *lie* may be used in combination with *that*-clauses. Here is just one illustrative example from the COCA corpus (see www.english-corpora.org/coca/), but there are plenty more, and, moreover, do not appear to be slips of the pen or substandard usage:

(4) A federal judge recently sanctioned the Manhattan lawyer for lying that his client was based in the UK instead of Brooklyn

*Wijsmaken* and *weismachen* are propositional attitude verbs that combine with finite complements (as well as nominal complements, most commonly pronouns denoting propositions, but occasionally full phrases such as *alternative Fakten* 'alternative facts,' a recent coinage for fibs and falsehoods). In Dutch, the most common complement is a *dat*-clause (equivalent to a *that*-clause in English) in indicative mood, in German either a *dass*-clause or a finite V2-clause, often in subjunctive ("Konjunktiv") mood. All of this is unsurprising for verbs of communication in these languages.

Let us for a moment compare this to English verbs of deception. Apart from *deceive*, thesaurus.com lists among others the following verbs, all of which express various shades and aspects of deception. They are not perfect synonyms, but overlap semantically. Note that hardly any of them combine with finite clauses.

(5) English verbs of deception: Bamboozle, betray, cheat, circumvent, defraud, delude, dupe, fool, hoodwink, swindle, take for a ride

You can take someone for a ride by telling them something false, for instance by claiming that you admire them (while secretly despising them). You can state this in German as follows:

(6) Sie hat ihm weisgemacht, dass sie ihn bewundert.
she has him wise-made that she him admires
"She has taken him for a ride by claiming that she admires him"

Note that the English translation separates two elements which are combined in the German original: a verb (or verbal idiom) to describe the deceptive nature of the interaction between the two protagonists in general terms, and a verb of saying introducing the finite clause. This reminds one of Talmy's theory of motion verbs (Talmy 1991), where he argues that English may conflate manner of motion and directed motion in a single verb, whereas Romance uses verbs to express motion and separate modifiers to indicate the manner. Here we have conflation in German and Dutch of two things: the act of communication and the fact that this act constitutes deception, which English mostly keeps separate, although some googling yields occasional examples of the verb *fool* followed by a finite complement, such as *I am trying to fool her that I am sleeping*. Perhaps this warrants some typological research in the spirit of Talmy. I should add here that verbs such as *wijsmaken* and *weismachen* are somewhat exceptional in Dutch and German as well, and that other verbs of deception, such as German *betrügen* 'to deceive, betray' do not have clausal complements.

## 2. Licensing of negative polarity items

A verb that presupposes the falsity of its complement would seem to be an ideal candidate for licensing negative polarity items. The literature identifies so-called emotive factive verbs and adjectives as triggers (cf. Linebarger 1987, Kadmon & Landman 1993, von Fintel 1999, Giannakidou 2006, Chierchia 2019, Duffley & Larrivée 2019). The general idea is that emotive factives carry a negative implicature which might be used to explain the possibility of polarity items. Compare the examples in (7):

(7) a. I regret I said anything untoward. [⇒I wish I hadn't]
b. I am amazed he did anything at all [⇒I expected him not to do anything]
c. I am indignant that he offered them anything at all [⇒ I consider it not acceptable that he did]

However, *wijsmaken* and its German counterpart *weismachen* do not appear to offer this option. In (8 a-b) I give some examples with the polarity items *ook maar iets* (Dutch) and *auch nur etwas* (German), which mean 'even anything' or, in more idiomatic English, 'anything at all'.

(8) a. *Je maakt me wijs dat hij ook maar iets gezien had
you make me wise that he anything_at_all seen had
"You fool me into believing he had seen anything at all"
b. *Hans versuchte mir weiszumachen
Hans tried me make-believe
dass er auch nur etwas gesehen hatte
that he anything_at_all seen had
"Hans tried to fool me into believing he had seen anything at all"

Note that verbs meaning *deny*, which do not presuppose but assert the falsity of their complements, are fine with these items:

(9) a. Jan ontkende dat hij ook maar iets gezien had
Jan denied that he anything_at_all seen had
'Jan denied having seen anything at all'
b. Hans leugnete das er auch nur etwas gesehen hatte
Hans denied that he anything_at_all seen had
'Hans denied having seen anything at all'

We can make sense of this by considering the notion of Strawson entailment, first introduced by von Fintel (1999):

(10) Strawson Downward and Upward Entailingness
A function f of type $<\sigma,\tau>$ is Strawson-DE iff for all x, y of type $\sigma$ such that $x \Rightarrow y$ (generalized entailment: x is more specific than y) and f(x) is defined (i.e. its presuppositions are met): $f(y) \Rightarrow f(x)$.

A function f of type $<\sigma,\tau>$ is Strawson-UE iff for all x, y of type $\sigma$ such that $x \Rightarrow y$ (generalized entailment: x is more specific than y) and f(x) is defined (i.e. its presuppositions are met): $f(x) \Rightarrow f(y)$.

Von Fintel (1999) has argued extensively that Strawson downward entailingness is the relevant property for polarity licensing. The following inference shows that *wijsmaken* is Strawson Upward Entailing, hence not a licensor of polarity items in its complement. The conclusion is valid if the presuppositions of the premise and the conclusion are met.

(11) Piet maakte Marie wijs dat het hard regende (Piet told Marie falsely that it was raining hard)
It was not raining hard ( presupposition of prior premise)
It was not raining (presupposition of conclusion)
∴ Piet maakte Marie wijs dat het regende (P. told M. falsely it was raining)

When matrix negation is added to the examples in (8), the polarity items become acceptable, see (12). Refer to (8) for glosses and translations.

(12) a. Je maakt me niet wijs dat hij ook maar iets gezien had
b. Hans versuchte mir nicht weiszumachen dass er auch nur etwas gesehen hatte.

This is not entirely unexpected, given that matrix negation may sometimes license polarity items across factive predicates (Homer 2011, Hoeksema 2017), as illustrated below with the factive verb *realize*:

(13) The family did not realize that anyone had broken into their home.

## 3. Pragmatic enrichment

### 3.1. Introduction

*Wijsmaken* and *weismachen* typically have [+human] indirect objects which serve as the victims of the fabrication. However, in the following idiomatic exclamations, animal participants show up (the b-example is Flemish Dutch, the a-example is standard Dutch):

(14) a. Maak dat de kat wijs!
make that the cat wise
'Try and convince the cat of that = that is bullshit'
b. Maak dat de ganzen wijs!
make that the geese wise
'Tell it to the geese = I don't believe a word of it'

These expressions are somewhat similar to the colloquial English expression *Talk to the hand ('cause the ears ain't listening).* The latter conveys a strong disinterest on the part of the speaker in what the other has to say, whereas the Dutch cases convey disbelief. By using the expression *wijsmaken*, the speaker indicates that he or she regards the proposition, referred to by the anaphoric demonstrative *dat*, as false. The exclamations are not intended as ordering the hearer to go ahead and deceive some animals, cats, or geese, or whatever, but as expressions of disbelief. Something similar is going on in sentences such as the following (Dutch and German, respectively)

(15) a. Je maakt mij niet wijs dat Fred komt.
you make me not wise that Fred comes
'You won't fool me into believing Fred is coming'
b. Sie machen mir nicht weis, es ist Ihnen ernst
you make me not wise it is you earnest
'You won't get me to believe that you are serious'

These sentences are not really meant as predictions of the nonoccurrence of some event of deception. Rather, the speakers state disbelief. The speakers do not believe that Fred is coming (example 15a) or that you are being serious (15b). This comes about through an implicature of the relevance type. How can the speakers be confident that they are not going to be duped into believing some proposition p? Because they believe that p is false.

Somewhat more involved is the following example:

(16) Bah! macht das weis , wem Ihr wollt, nur keinem
bah, make that wise, whom you want, only no
amerikanischen Arbeiter!
American worker
'Bah, tell that (bullshit) to anyone you want, just not to an American worker!'

This example can be read in two ways: (1) feel free to deceive whoever you like, but not an American worker (a straightforward literal reading), or (2) go ahead and deceive whoever you want, but you won't fool an American worker: they know better.

I propose that these examples are instances of pragmatic enrichment, aimed at expressing disbelief on the part of the indirect object of *wijsmaken/ weismachen*. This enrichment requires a number of things to be true:

(17) a. *wijsmaken/weismachen* appears in a future oriented context (mostly a simple present with future/habitual reading)
b. under negation
c. the referent of the indirect object must be available for establishing the point of view

In the following subsections, I address each of these points and adduce corpus data to underscore them. The Dutch corpus data are from the Lassy Large newspaper corpus, accessed through the online platform PaQu (Odijk et al. 2017). A search for all occurrences of the lemma *wijsmaken* yielded 834 sentences, and after removing double occurrences, the remaining 771 sentences were entered into a database, in which information about absence or presence of negation, modal context, subject, object and indirect object were added manually. The German corpus data are 500 sentences containing an occurrence of the lemma *weismachen*, taken from the deTenTen18 corpus, available at the SketchEngine platform (www.sketchengine.eu/).

### 3.2. Future orientation

Let me first say something about requirement (a), the presence of a future orientation. Compare the Dutch examples in (18)

(18) a. Je hebt me niets wijsgemaakt.
you have me nothing wise-made
'You told me nothing untrue (I believe you)'
b. Je maakt me niets wijs.
you make me nothing wise
'You are not fooling me (I don't believe you)'

Example (18a) is in the present perfect and states that no act of deception has taken place. Example (18b) is a future present: it states that no act of deception will take place, with the tacit understanding that this is because of a firm disbelief on the part of the speaker. Futurate uses of the simple past are no problem for pragmatic enrichment, cf. the Dutch examples in (19-20):

(19) Je maakt mij niet wijs dat het gremlins waren
you make me not wise that it gremlins were
'You're not going to fool me that those were gremlins'

(20) Je maakte mij niet wijs dat gremlins bestonden
you made me not wise that gremlins existed
'You could not make me believe that gremlins existed'

Both examples are statements of disbelief. In the case of (20), disbelief on the part of the speaker is located in the past. It might be that the speaker believes in gremlins now, and is talking about a time when s/he did not.

Unlike the simple past, the present perfect does not have a futurate use, and is predicted to be impossible with the pragmatically enriched version of *wijsmaken/weismachen*. For the basic, non-enriched use of these verbs, however, there is no ban on using them with the perfect tense:

(21) Hij heeft ons wijsgemaakt dat we gewonnen hadden.
he has us wise-made that we won had
'He duped us into believing that we had won'

The future orientation of pragmatically enriched *wijsmaken* may come about in a number of ways: by futurate readings of simple present and simple past, or by the future auxiliaries *zullen* 'shall, will', and *gaan* 'go, be going to'. In Dutch, the vast majority of cases involve the future present. Nonetheless, as a fraction of the entire distribution of *wijsmaken*, the future present uses are still relatively infrequent. In German, this is even more striking, as a comparison of the German and Dutch data in Table 1 shows. The category 'Other', which together with the category Future present covers all occurrences without an auxiliary, is much larger in Dutch than it is in German. German predominantly uses *weismachen* in nonfinite form, either a bare infinitive with a modal verb, a zu-infinitive with verbs of trying, or a participle with *haben* 'have' or *werden*, the passive auxiliary. Simple present and simple past forms with no auxiliary are rare, compared to Dutch.

Note that I have simplified the actual situation somewhat by ignoring multiple auxiliaries. In a case like *hat uns weismachen wollen* ("has wanted to fool us into believing"), I only listed the syntactically closest auxiliary, in this case *wollen*. The verb *have* belongs to *wollen*, not to *weismachen.* The predominance of *wollen* in the German data is remarkable. It is even possible to find cases of double *wollen* in our data set:

(22) Du willst mir doch tatsächlich nicht weismachen wollen,
you want me PRT really not wise-make want
dass Hunde weidende Pferde mit Hunden verwechseln
that dogs grazing horses with dogs confuse
und diese deshalb jagen?
and them therefore hunt
'Surely you don't want to have me believe that dogs confuse grazing horses with dogs, and therefore hunt them?'

| | German | | | Dutch | |
|---|---|---|---|---|---|
| **context** | # | % | | # | % |
| brauchen 'need' | - | - | hoeven | 9 | 1.2 |
| futurate | 3 | 0.6 | futurate | 65 | 8.4 |
| haben 'have' | 25 | 5.0 | hebben | 112 | 14.5 |
| imperative | 4 | 0.8 | imperative | 19 | 2.5 |
| können 'can' | 31 | 6.2 | kunnen | 40 | 5.2 |
| lassen 'let' | 10 | 2.0 | laten | 48 | 6.2 |
| mögen 'want' | 11 | 2.2 | moeten 'must' | 55 | 7.1 |
| sollen 'should' | 7 | 1.4 | zullen 'will' | 6 | 0.8 |
| versuchen 'try' | 45 | 9.0 | proberen/trachten | 53 | 6.5 |
| werden (passive) | 35 | 7.0 | worden/zijn | 14 | 1.8 |
| wollen 'want' | 289 | 57.8 | willen | 21 | 2.7 |
| other | 40 | 8.0 | other | 314 | 40.7 |
| Total | 500 | 100 | | 771 | 100 |

Table 1: Tense and modality in combinations with *weismachen/wijsmaken*

The following tables show strong interaction effects of the type of auxiliary and the presence of negation:

| auxiliary | | # | negated | % negated |
|---|---|---|---|---|
| wollen | want | 289 | 33 | 11.4 |
| versuchen | try | 45 | 1 | 2.2 |
| werden | passive be | 35 | 1 | 2.9 |
| können | can | 31 | 18 | 58.1 |
| haben | perfective have | 25 | 4 | 16 |
| lassen | let | 10 | 5 | 50 |
| imperative | | 4 | 2 | 50 |
| futurate | | 3 | 3 | 100 |
| none (imperfect) | 40 | - | - | 0 |

Table 2 German *weismachen*: negation in 10 contexts

| auxiliary | | # | negated | % negated |
|---|---|---|---|---|
| hebben | perfective have | 112 | 5 | 4.5 |
| moeten | must/should | 55 | 47 | 85.5 |
| proberen/trachten | try | 53 | 1 | 1.9 |
| laten | let | 48 | 33 | 68.8 |
| kunnen | can | 40 | 19 | 47.5 |
| worden/zijn | passive be | 14 | - | - |
| mogen | may | 9 | 6 | 66.7 |
| hoeven | need | 9 | 9 | 100 |
| zullen | will | 6 | 4 | 66.7 |
| gaan | futurate go | 5 | 4 | 80 |
| imperative | | 17 | 6 | 35.3 |
| futurate | | 65 | 65 | 100 |
| none (imperfect) | | 312 | - | - |

Table 3: Dutch *wijsmaken*: negation in 13 contexts

### 3.3. Negation and other contexts

A requirement that negation be present suggest that *wijsmaken* and *weismachen* have developed a polarity-sensitive use. Pragmatic enrichment leading to polarity sensitivity is not unheard of, and I will give some examples of this below. For the moment, let us assume that this is indeed the case. Then the question arises, what, if anything, might bring the enriched use about, besides negation. After all, most polarity items are licensed by more than just negation: they appear in questions, conditional clauses, comparatives, relative clauses modifying universally quantified noun phrases, the scope of restrictive adverbs such as *only*, the scope of weakly negative quantifiers and adverbs of quantification such as *few, little, less than N, at most N, seldom, rarely,* etc. (cf. Ladusaw 1979). It is also well-known that polarity items are not uniform in their distributional characteristics. There are items which require negation and nothing else, items which are fine in any of the above contexts, and a lot of different cases in between (cf. Zwarts 1986, van der Wouden 1997, Hoeksema 2012, Richter & Rado 2014, Schaebbicke et al. 2021).

Enriched *wijsmaken* appears in my data set with typical n-words, as well as *moeilijk* 'with difficulty, hardly', a polarity trigger in modal contexts (van der Wouden 1995) and *weinig* 'little, few'. The German data also have an occurrence with *kaum* 'hardly'.

Questions are a bit tricky. It seems that pragmatic enrichment is possible in questions, but these typically involve an additional auxiliary such as *willen* 'want' or *proberen* 'try', compare the following Dutch examples:

(23) a. Wil je me wijsmaken dat dat mag?
want you me wise-make that that may
'Do you want me to believe that that is allowed?'

b. Probeer je me wijs te maken dat je kunt zwemmen?
try you me wise-to-make that you can swim
'Are you trying to fool me into believing that you can swim?'

c. #Maak je me wijs dat je kunt zwemmen?
make you mewise that you can swim
'Are you fooling me into believing that you can swim?'

Sentence (23c) is pragmatically odd, much like its English translation, whereas (23a,b) are fine as rhetorical questions. The main point here is that the referent of the indirect object in these questions, the speaker, is indirectly characterized as strongly believing that the embedded proposition is false. In the same manner, some *wh*-questions may be employed:

(23) d. Wie wil je wijsmaken dat je kunt zwemmen?
who want you wise-make that you can swim
'Who do you want to fool into believing that you can swim?'

The question in (23d) could be an inquiry about a future act of deception, or it could be rhetorical, in which case the speaker wants to convey that he or she does not believe the addressee can swim.

Occurrences of *wijsmaken* and *weismachen* in comparative clauses with the counterparts of *than* and *as* are common but seem to lack the particular pragmatic interpretation we are after here. Consider for instance:

(24) Er worden minder misdaden gepleegd dan
there get fewer crimes committed than
de regering de mensen wijsmaakt
the government the people wise-makes
'Fewer crimes are committed than the government wants the people to believe'

Crucially, there is no implicature here that the referents of the indirect object (*de mensen* 'the people') do not believe the misleading information from the government. Presumably the speaker does not, based on his or her choice of words, but the people may or may not believe the information they receive.

German has less negation than Dutch in sentences with *weismachen/wijsmaken*. In part, this is to attributed to a distribution difference that has not been mentioned so far: German *weismachen* often appears in parenthetical and comparative sentences with *wie* or *als* such as *wie die Regierung uns versucht weiszumachen, schneller als die Wissenschafter uns weismachen wollten,* and within such clauses, negation is usually ruled out (Potts 2002). That the German data set has more of such occurrences could be due to corpus differences. The German corpus we used was a web corpus, and turned out to be full of angry comments directed at misinformation from the government, big business, the church, the media, mainstream scientists, liberals, atheists, Satan and other suspect sources. Fake news is a big topic on the German internet. The Dutch corpus, on the other hand, was a newspaper corpus, and Dutch newspapers, by and large, are not chockablock with conspiracy theories.

### 3.4. Point of view

The pragmatically enriched reading of *wijsmaken/weismachen* carries an implicature to the effect that the referent of the indirect object is confident that the embedded proposition is false, and therefore will not be swayed by the attempt at deception. Normally, this only makes sense if the speaker has access to the internal mental state of that referent. This could be based on prior knowledge of the beliefs of that person, assuming these are immutable, or because the speaker is an omniscient narrator, as in a novel, and so has direct access to the thoughts and feelings of his characters. In free indirect discourse one could have something like the following, from *De vergelding* (a Dutch novel by Carry van Bruggen, 1923). Because of its length, I did not gloss it, but the crucial part is in italics.

(25) Hij had willen weggaan, maar nu deed hij het niet. Verkoos niet uitgelachen te worden door dien lammen Verkerk.... met zijn kwasi-onverschilligheid. *Niemand maakte hem wijs* dat de vent zich niet geweldig voelde om zijn knappen kop. Knappe kop.... jawel....
'He had wanted to leave, but now he did not. Chose not to be laughed at by that lame Verkerk...with his so-called indifference. Nobody was going to make him believe that the guy did not feel great because of his handsome face. Handsome face..yeah right.'

One interesting property of the subject of *wijsmaken* I have referred to elsewhere, in connection with other predicates (Hoeksema 2018: 371) as *subject indiscriminacy*:

(26) *Subject indiscriminacy of a predicate P*
For P, the identity of the subject is irrelevant. Whenever P is predicated of an individual within the relevant local context, it applies to all other individuals in that context.

A case where this property applies is the English expression *can hear a pin drop.* This verbal idiom is a positive polarity item, used to signify a high measure of silence. In a corpus study, 60 out of 65 occurrences had the subject *you*, in its generic use, although other subjects are entirely possible: *the audience could hear a pin drop, one could hear a pin drop, the spectators could hear a pin drop, the council members could hear a pin drop* etc. If all these options are available, why use the generic and not very informative pronoun *you* 60 out of 65 times? The answer is that the predicate is about silence, not so much about the people perceiving that silence. The silence should be perceived by any and all people witnessing the scene, which is why it sounds very odd to say that some of us could hear a pin drop, unless of course we are talking about an actual pin dropping, something which very well may be heard only by some people.

In the case of enriched *wijsmaken*, I want to maintain that the identity of the subject is likewise largely irrelevant. If I am convinced of something, and am sure that you won't be able to change my mind about it, it does not matter who you are. We see this reflected in the corpus data. Negated cases in the present future appear 64 times, and you can see a predominance of second-person and generic pronouns. Generic pronouns are to be expected, given our earlier findings with *can hear a pin drop*. The second-person pronouns are appropriate in a dialogue setting, where you address the hearer in this way. But we see that random other subjects may appear as well, as we already saw in example (25), which is not from the corpus, by the way.

| | | | |
|---|---|---|---|
| future present | Adriaanse | name | 1 |
| | Copca | name | 1 |
| | de nuchtere Afrikaan | the level-head African | 1 |
| | de veertiger | the 40 year old | 1 |
| | ge | you (Flemish) | 1 |
| | ik | I | 1 |
| | je | you | 43 |
| | niemand | nobody | 4 |
| | u | you (polite) | 5 |
| | verkopers | sellers | 1 |
| | ze | they (generic) | 5 |
| | Total | | 64 |

Table 4: Subjects *wijsmaken* in negative future present tense contexts

Strong predictors of the presence of negation are pairings of subject and indirect object. Two types of combinations stand out: second person subjects in combination with first person indirect objects, and generic subjects with first person indirect objects. The polite forms of the second person subjects are unambiguous, the weak form *je* on the other hand is ambiguous between second person use and generic use. I did attempt to tease these apart, since we are at ceiling level for *je* anyway. In the case of the weak third person subject pronoun *ze* 'they', there is ambiguity between referential use and generic use. Here it was possible to reliably classify 14 out of 15 cases as generic. The specialized generic pronoun *men* is on its way out in Dutch, hence the single occurrence with a first person indirect object.

| SUBJ-IO | | # | negated | % negated |
|---|---|---|---|---|
| je mij | you (weak), me (strong) | 33 | 33 | 100% |
| je me | you (weak), me (weak) | 6 | 6 | 100% |
| u mij | you (polite), me (strong) | 1 | 1 | 100% |
| u me | you (polite), me (weak) | 5 | 5 | 100% |
| ze mij | they (generic), me (strong) | 14 | 12 | 85.7% |
| men mij | one (generic), me (strong) | 1 | 1 | 100% |

Table 5: Subject-indirect object combinations in Dutch

| SUBJ-IO | | # | negated | % negated |
|---|---|---|---|---|
| du mir | you me | 21 | 19 | 90.5% |
| ihr mir | you (pl) me | 2 | 2 | 100% |
| Sie mir | you (polite) me | 9 | 9 | 100% |
| man mir | one (generic) me | 5 | 2 | 40% |

Table 6: Subject-indirect object combinations in German

Also interesting to note is the strong likelihood that the indirect object is first person singular, when the subject is a negative quantifier: for Dutch *niemand* all 13 occurrences in the data have either *me* or *mij* as the indirect object, and for German *keiner* 10 out of 10 occurrences are with *mir*, and for *niemand* it is 5 out of 7.

**4. Analysis**

The basis of the analysis is the postulation of an implicature which arises under rather specific circumstances. Let me write it quasi-formally as in (27), where the possibility symbol is indexed with the subject j, to indicate the person for whom the possible worlds are epistemic alternatives.

(27) $\neg\Diamond_j$ Weismachen(x,y,p) $\leadsto$ Confident(y, $\neg$p)

The possibility operator, I assume, not only applies to cases where there is an overt modal verb. Let us consider the case of the present futurate. I will assume this is a universal claim about epistemically accessible future worlds. A statement of the form *x makes y not wise that p* can be rendered as a claim that in no accessible future world x will deceive y regarding p:

(28) $\Box_j \neg$Weismachen(x,y,p)

which happens to be equivalent to the formula to the left of the implicature arrow in (27). So we derive that present futurate occurrences of *weismachen* may give rise to the implicature as well.

Let us assume that the index j is deictically controlled by the speaker of the utterance, unless the point of view of the speaker is handed over to a third party, in cases of free indirect speech. This third party will be the referent of the indirect object. In that case, the following equation holds:

(29) $j = y$

Note also that the implicature, the stuff to the right of the squiggly arrow in (27), is a statement about the beliefs of y, and agent x is not even mentioned in it. This is how we account for the subject indeterminacy of *weismachen*.

We also have an account of the interaction with auxiliary verbs. The verb *können* 'can' and its Dutch counterpart *kunnen* have higher than expected occurrences of negation. Higher than expected, that is, if no notion of modality were to play a role. The Dutch verbs *zullen* and *gaan* can be analyzed similarly as the present futurate. What remains to be explained is why they are relatively infrequent, compared to the present futurate.

The Dutch verb *moeten* 'must' also has a high percentage of negative occurrences. I believe these cases are different in nature. We could treat them as in (28), since *moeten* is a positive polarity item and hence has scope over negation. However, the examples appear to be mainly deontic, not epistemic, and in a deontic context one would hope to see a preponderance of negative occurrences for verbs of deception. *Thou shalt not deceive* sounds like better advice than *You must deceive*. Also worth pointing out is the large number of reflexive pronouns (25 out of a total of 55 sentences with *moeten*) in the indirect object slot, as in e.g.

(30) Ik moet mezelf elke dag wijsmaken dat ik aantrekkelijk ben
I must myself each day wise-make that I attractive am
'I have to fool myself every day that I am attractive'

The status of reflexive pronoun might be interesting to study further.

Finally a word about the German cases with *wollen*. Here we do not expect pragmatic enrichment and to a large degree we don't. However, a few remarks are in order. First of all, the negated cases often have an occurrence of the particle *doch* (8 out of 14 cases):

(31) Du willst mir doch damit nicht weismachen , dass
you want me PRT with-that not wise-make, that
dass ein Kater von 9 Kg normal ist?
that a tomcat of 9 kilo normal is
'You won't fool me that a 9 kilo tomcat is normal with that'

In questions, occurrences of *weismachen* co-occur rather often with expressions such as *wirklich (really), im Ernste (seriously), allen Ernstes (in all seriousness), echt (really),* and *etwa* (by any chance). In all of these cases, the speaker signals incredulity or uncertainly. This creates the context for pragmatic enrichment. Incredulity is based on the assumption, perhaps premature, of impossibility, and in such a context the implicature in (27) arises. The speaker seems to want to assert emphatically that a 9 kilo cat is not normal. In other cases, no similar implicature is generated, as in the following example from our German corpus:

(32) Mittlerweile habe ich eine sehr nette Hebamme, die mir nicht weismachen will, wie toll Schmerzen und Wehen sind und bei der ich meine eigene Meinung äußern darf.
'I now have a very nice midwife, one who does not want to have me believe that pain and contractions are wonderful, and who listens to my own opinions.'

Here the unpleasantness of being in labor is presupposed, assumed to be common ground, not at issue.

## 5. Discussion and conclusions

Pragmatic enrichment and polarity sensitivity are often in lockstep. This is certainly the case with scalar items, such as minimizers, which depend on scalar implicatures (Fauconnier 1975, Chierchia 2004). Other cases that come to mind are reflexives in copular sentences. These should be anomalous, since they are either contradictions or tautologies, depending on the presence or absence of negation, but they are fine with pragmatically enriched readings:

(33) a. John is not himself today. [either a contradiction or pragmatically enriched as: not his usual self]
b. At the farm, John can be himself. [tautology or pragmatically enriched as: be his true self]

Somewhat more similar to the topic of this talk is the following case of pragmatic enrichment in Dutch:

(34) a. Je hoort mij niet zeggen dat hij onschuldig is
you hear me not say that he innocent is
'You won't hear me say he is innocent'
b. Ik hoor je niet zeggen dat hij onschuldig is.
I hear you not say that he innocent is
'I am not hearing you say that he is innocent'

In (34a), the most straightforward interpretation is one in which *horen zeggen* is a futurate reading of the simple present, and there is some form of pragmatic enrichment going on. The speaker cannot promise she or he won't pronounce the "him" innocent, presumably because they are convinced of the opposite. So the implicature is: He is not innocent. On the other hand, (34b) is most plausibly translated as a describing the present, stating that the speaker is not hearing a pronouncement of innocence at the moment. The enriched meaning in (34a) requires negation, the compositional interpretation in (34b) does not. As with *wijsmaken*, the property of subject indiscriminacy holds. A corpus search (using the same Lassy newspaper corpus as for our data on *wijsmaken*) yielded the following subject-indirect object pairs for all cases where an implicature-reading was deemed possible:

| SUBJ – IO | translation | # |
|---|---|---|
| je mij | you me | 88 |
| je me | you me [weak] | 33 |
| u mij | you [polite] me | 19 |
| u me | you, me [weak] | 1 |
| u ons | you [polite], us | 3 |
| je ons | you us | 2 |
| je *proper name* | you *proper name* | 5 |
| men me | one me | 1 |

Table 7: subject-object combinations of negated *horen zeggen* 'hear say'

In conclusion: the Dutch verb of deception *wijsmaken* and to a lesser extent also its German counterpart *weismachen* have developed a use in negative future-oriented sentences in which they generate an implicature of disbelief on the part of the person denoted by the indirect object. This entails a shift from the basic meaning as a verb of communication to a verb of cognition. Most commonly, the person whose disbelief is reported is the speaker, but when the indirect object is third-person, the point of view of a third-person entity is conveyed. In frameworks such as HPSG and construction grammar, such complex interactions of lexical meaning, argument structure, tense and negation with pragmatics are not just expected, but form part of the raison d'être of the constructionalist enterprise.

**References**

Chierchia, Gennaro. 2004. Scalar implicatures, polarity phenomena, and the syntax/pragmatics interface. In: Adriana Belletti (ed.) *Structures and Beyond. The Cartography of Syntactic Structure,* vol. 3, 39-103. Oxford University Press, Oxford.

Chierchia, Gennaro. 2019. Factivity Meets Polarity: On Two Differences Between Italian Versus English Factives. In: Daniel Altshuler & Jessica Rett (eds.) *The Semantics of Plurals, Focus, Degrees, and Times*, 111-134. Springer, Cham.

Duffley, Patrick & Pierre Larrivée. 2019. The use of *any* with factive predicates. *Linguistics*, *57*(1), 195-219.

Fauconnier, Gilles. 1975. Pragmatic scales and logical structure. *Linguistic inquiry* 6(3), 353-375.

von Fintel, Kai. 1999. NPI licensing, Strawson entailment, and context dependency. *Journal of semantics* 16(2), 97-148.

Giannakidou, Anastasia. 2006. Only, emotive factive verbs, and the dual nature of polarity dependency. *Language* 82(3), 575-603.

Hoeksema, Jack. 2012. On the natural history of negative polarity items. *Linguistic Analysis* 38(1/2), 3-33.

Hoeksema, Jack. 2017. Neg-raising and long-distance licensing of negative polarity items. In: Debra Ziegeler & Bao Zhiming, eds., *Negation and contact: With special focus on Singapore English*, 33-61. Amsterdam: John Benjamins.

Hoeksema, Jack. 2018. Positive polarity predicates. *Linguistics 56*(2), 361-400.

Holton, Richard. 2017. "I—Facts, Factives, and Contrafactives." *Aristotelian Society Supplementary Volume,* 91(1), 245-266.Homer, Vincent. 2011. *Polarity and Modality*. Doctoral dissertation, UCLA.

Kadmon, Nirit & Fred Landman. 1993. Any. *Linguistics and philosophy* 16(4), 353-422.

Ladusaw, William A. 1979. *Polarity Sensitivity as Inherent Scope Relations.* Dissertation, University of Texas at Austin.

Linebarger, Marcia C. 1987. Negative polarity and grammatical representation. *Linguistics and philosophy* 10(3), 325-387.

Odijk, Jan, Gertjan van Noord, Peter Kleiweg & Erik Tjong Kim Sang. 2017. The Parse and Query (PaQu) Application. In: Jan Odijk & Arjan van Hessen (eds.) *CLARIN in the Low Countries,* 281–297. London: Ubiquity Press. Press.

Potts, Christopher. 2002. The syntax and semantics of as-parentheticals. *Natural Language & Linguistic Theory* 20(3), 623-689.

Richter, Frank & Janina Radó. 2014. Negative Polarity in German: Some Experimental Results. *Journal of Semantics* 31(1), 43-65.

Schaebbicke, Katharina, Heiko Seeliger & Sophie Repp (2021). The Diverse Landscape of Negative Polarity Items: On the Use of German NPIs as Experimental Diagnostics. *Journal of Psycholinguistic Research*, 1-26.

Talmy, Leonard. 1991. Path to realization: A typology of event conflation. *Annual Meeting of the Berkeley Linguistics Society* 17(1), 480-519.

van der Wouden, Ton. 1995. *Moeilijk* is (not) difficult. *Linguistics in the Netherlands* 12, 203-214.

van der Wouden, Ton. 1997. *Negative contexts: Collocation, polarity and multiple negation*. London: Routledge.

Zwarts, Frans. 1986. *Categoriale Grammatica en Algebraïsche Semantiek*. Dissertation, University of Groningen.

# The grammatical representation of expletive negation

Yanwei Jin
University at Buffalo

Jean-Pierre Koenig
University at Buffalo

Proceedings of the 28th International Conference on
Head-Driven Phrase Structure Grammar

Online (Frankfurt/Main)

Stefan Müller, Nurit Melnik (Editors)

2021

Frankfurt/Main: University Library

pages 47–67

Keywords: Expletive negation, Lexical Resource Semantics, Semantic Underspecification, non-at-issue content, reverse selection

Jin, Yanwei & Jean-Pierre Koenig. 2021. The grammatical representation of expletive negation. In Stefan Müller & Nurit Melnik (eds.), *Proceedings of the 28th International Conference on Head-Driven Phrase Structure Grammar, Online (Frankfurt/Main)*, 47–67. Frankfurt/Main: University Library. DOI: 10.21248/hpsg.2021.3.

**Abstract**

Expletive negation refers to constructions where a negator in the complement of certain lexical items does not change the polarity of the complement proposition. Jin & Koenig (2021) show that expletive negation occurs rather widely in languages of the world and in very similar environments. They propose a language production model of why such apparently illogical uses of negation arise in language after language. But their study does not address the grammatical status and representation of expletive negation. In this paper, we argue that expletive negation is part of the lexical knowledge speakers have of their language and that the negator in expletive negation constructions contributes a negation to a non-at-issue content associated with expletive negation triggers. We provide a Lexical Resource Semantics analysis of how triggers combine in a non-standard manner with the standard semantic content of their complements: the negation (and in some cases an additional modal operator) of the content of their complement is part of the trigger's non-at-issue content while the scope of the negation is an argument of the trigger's MAIN content. Finally, we suggest that the expletive use of the French negator *ne* includes a lexical constraint that requires it to modify a verb that reverse selects for an expletive negation trigger.

Sentence (1) illustrates expletive negation, a construction where a negator, *no*, appears in the complement of a verb, but does not seem to correspond to a negation semantically. The speaker's fear in the Catalan example in (1) is that a new director will be elected, not that a new director will *not* be elected. The negator appears redundant or pleonastic, terms that have also been used to describe the use of *no* in (1). We use the term *negator* to refer to the form and reserve the term *negation* for the semantic content of the negator, *argument proposition* to refer to the semantic content of the clause or VP where the expletive negator occurs; we use the expression *expletive negation trigger* or *trigger* for the lexeme or collocation that selects for the argument proposition, *temo* in (1).

(1) Em temo que no escullin nou director.
me.CL am.afraid that NEG elect.SBJV.3PL new director
'I'm afraid that a new director would be elected.' (Espinal, 2000, 54)

The occurrence of expletive negation has been noticed for a long time by Romance grammarians, particularly French grammarians. One of the earliest—if not the earliest—grammarian to mention expletive negation is d'Olivet in the mid 18th century:

> "J'avoue que cette particule prohibitive paroît rédondante en notre Langue."
> *I confess that this prohibitive particle appears redundant in our language.*
> (d'Olivet, 1767, 304)

But, although expletive negation has been noticed for a long time in Romance languages and is most often mentioned in that context, it is by no means confined to Romance languages. Jin & Koenig (2021) and Jin (2021) show that expletive negation occurs rather widely. In Jin's 1,142 language sample it occurred in 128 languages, on all continents, and in 63 genera. Moreover, as both Jin & Koenig and Jin show, expletive negation is grossly underreported in reference grammars. Out of the 45 languages for which both research papers and reference grammars were consulted, expletive negation was mentioned in research papers but not grammars in 27 languages, suggesting that expletive negation most likely occurs in many more languages in Jin's sample: expletive negation is a relatively widespread phenomenon and certainly not an oddity of Romance languages.

Not only does expletive negation occurs in all areas of the world, the contexts where it occurs are similar: the same operators and predicates recur as triggers in language after language: expletive negation occurs in the argument propositions of semantically similar triggers like BEFORE or FEAR, for example (we use small caps for semantic predicates). Jin & Koenig (2021) show that expletive negation occurs in basically the same environments in the five languages they carefully looked at, Januubi Arabic, English, French, Mandarin, and Zarma-Sorai. The similarity of expletive negation triggers suggests a common conceptual or semantic cause to its occurrence. And this is indeed what Jin & Koenig argue. Simplifying somewhat, they suggest that expletive negation triggers entail a proposition that contains a negation (or strongly contextually imply such a proposition) and that it is this inference (what we label *the negative inference*) that causes the occurrence of a negation. Thus, the predicate denoted by *temo* in (1), FEAR, entails that the speaker wants the event described by the argument proposition not to occur (that a new director would be elected). In somewhat informal terms, there are two distinct propositions associated with (1), **fear'(sp, rain')** and **want'(sp, ¬ rain')**, the former entailing the latter. (2) is a more general informal representation of the inference pattern typical of expletive negation triggers, according to Jin & Koenig. (3) summarizes the terminology we are using throughout this paper.

(2) **fear'(x, p)** $\vDash_C$ **want'(x, ¬p)**

(3) a. **fear'(x, p)**: at-issue semantic content
  b. **p**: positive (argument) proposition
  c. **¬p**: negative proposition
  d. **want'(x, ¬p)**: non-at-issue negative inference

To explain why expletive negation occurs in similar contexts and in so many languages despite the fact that it is often deemed a performance error in some languages (see Horn 2010), Jin & Koenig (2019, 2021) propose a language production model of the emergence of expletive negation based on Dell (1986). Because triggers entail (in some cases strongly contextually imply) a proposition that contains the dual of the trigger's argument proposition, the negation that is part of this entailment is strongly activated. This strong activation explains that speakers sometimes express a negation: the negation is part of the negative inference, although it is not part of the argument proposition. For example, because **fear'(a, p)** entails **want'(a, ¬p)**, **¬p** becomes activated and sometimes ¬ is lexicalized as a negator (*no* in (1)). As mentioned, we call the entailment (sometimes, strong contextual implication) that includes the dual of the lexical item's argument proposition the *negative inference*. Jin & Koenig's account thus models the production of expletive negation as the result of a semantic interference between the intended message and an inference (most often an entailment) of the message. This model predicts a general propensity for expletive negation to occur across languages in speech production. Jin & Koenig suggest that differences in how frequently expletive negation occurs in spontaneous speech is a matter of entrenchment variation (Langacker, 1987): languages and triggers may vary as to how routinized the production of expletive negation is.

Jin & Koenig's model leaves open how expletive negation is represented in native speakers' grammars. It could remain a performance phenomenon—no matter how frequent it is—or it could be part of native speakers' competence in some languages, but not others, or for some triggers, but not others. Their model is agnostic on this point. In this paper, we argue that expletive negation should be included in native speakers' grammatical competence and that the negative inference is a non-at-issue content that is part of an alternate lexical entries of expletive negation triggers (see Potts 2005 for the notion of non-at-issue semantic content). We then use Lexical Resource Semantics (Richter & Sailer, 2004) and semantic underspecification to model how this entry interacts with the compositional meaning of the complement of the triggers to ensure the right at-issue and non-at-issue content for the clause headed by the trigger.

We present two arguments to support our claim that the occurrence of expletive negation is part of speakers' representation of triggers, i.e. is part of the grammar of their language. The first is that speakers' propensity to interpret a negator expletively is language and trigger dependent. So, for some triggers and some languages, a negator is very likely to be interpreted expletively, but for other triggers and other languages an expletive interpretation is unlikely. In Jin & Koenig's terms, degree of entrenchment is a language and trigger specific property. A negator's propensity to be interpreted expletively when occurring in the argument proposition is thus part of speakers' knowledge of their language. The second argument we present in favor of the grammatical representation of expletive negation is that whenever an expletive negation occurs in a language that has several negators, the choice of negator is licensed by the negative inference, not the at-issue content. For speakers to choose the appropriate negator, they must therefore represent the negative inference and analyze the negator as an instance of expletive negation. We now detail both arguments.

To establish that expletive negation is not just a performance phenomenon and is part of speakers' representations of triggers, we ran four similar experiments in English, French, Mandarin, and Spanish. An example stimulus set for our English experiment is provided in (4). For reasons of space we do not discuss in detail each experiment and refer the interested reader to Jin (2021) for details about the English, French, and Mandarin experiments and Jin & Koenig 2020 for the English experiment. Stimuli across the three languages were kept maximally similar (after translation from English to French, Mandarin, and Spanish), with a few necessary adjustments to make sure the stimuli contained culture-specific proper names or to take into consideration slight idiosyncratic differences in particular expletive negation triggers. Participants in each experiment saw a small text followed by a target sentence (in red in (4) for clarity's sake) headed either by an expletive negation trigger or not. Participants had to judge whether the target sentence was consistent with the preceding text. Logical accuracy and decision latencies were recorded. So, participants who saw stimulus (4a) would have to decide whether *So I started not eating meat* is consistent with the preceding three sentences (in this case, the expected answer was *No*).

To ensure an equal expected number of *Yes* and *No* answers, the expected answer was half of the time that the target sentence was inconsistent with the preceding context and half of time consistent with the preceding context, except for the French experiment. In that experiment, expletive negation trigger stimuli were divided in two halves, one half containing *ne* (a dedicated marker of expletive negation, Muller 1991) and the other half containing *ne …pas*, which can but is not very frequently used expletively (Larrivée, 1996). As the number of expletive negation triggers is limited, the addition of a negator form condition in the French experiment (*ne* vs. *ne …pas*) required us to drop the consistency manipulation: all stimuli were logically inconsistent with the preceding context, if the negator (*ne* or *ne …pas*) was interpreted as logical negation.

(4) a. **Non-EN-trigger + logically inconsistent negation**
I used to be a strict vegetarian. Last year, I was diagnosed with iron-deficiency anemia, a disease caused by not eating enough meat. My doctor strongly recommended that I eat meat. So I started not eating meat.

b. **EN-trigger + logically inconsistent negation**
After learning that being vegan can prevent the exploitation of animals and promote a greener life on our planet, I decided to become vegan. So I quit not eating meat.

c. **Non-EN-trigger + logically consistent negation**
After learning that being vegan can prevent the exploitation of animals and promote a greener life on our planet, I decided to become vegan. So I started not eating meat.

d. **EN-trigger + logically consistent negation**
I used to be a strict vegetarian. Last year, I was diagnosed with iron-deficiency anemia, a disease caused by not eating enough meat. My doctor strongly recommended that I eat meat. So I quit not eating meat.

Our experiments followed the semantic interference logic of Glucksberg et al. (1982) according to which people take longer to make a semantic judgement (and might make more errors) when stimuli support two distinct answers. Consider the two stimuli in (4b) and (4d). If the negator *not* in the target sentence of (4b) is interpreted as logical negation, the sentence is inconsistent with what precedes. But if *not* is interpreted expletively, the same continuation is consistent with what precedes. Thus, depending on how the negator is interpreted (logically or expletively), the appropriate answer is different. The converse is true for (4d). The existence of two distinct potential answers in the case of expletive negation triggers (*Yes* and *No* for both (4b) and (4d) depending on the interpretation of the negator) does not extend, of course, to non-expletive negation triggers such as *started* in (4a) and (4c) where only one interpretation of the negator is possible, and therefore only one answer is appropriate (*No* for (4a) and *Yes* for (4c)). If both possible interpretations of a negator in the scope of an expletive negation trigger are activated in the mind of participants, the two competing answers should lead to a slow down (an increase in decision latencies) and an increase in "errors". We use scare quotes around the word "error", as saying *Yes* in (4b) is only an "error" if we assume a logical interpretation of the negator. The point is that an expletive negation interpretation of the negator should lead to an answer that is the dual of what should be the answer if the negator was interpreted logically and this what we measure in our "error" numbers.

To sum up, we predicted that if a negator is interpreted expletively after an expletive negation trigger, participants should make more logical errors and take longer to decide if the target is consistent with the context, as the ambiguity of the negator (it may express expletive or logical negation) should make it harder for participants to decide whether the target sentence coheres with the preceding context. Table 1 summarizes the results of the experiments for all four languages whereas Table 2 compares the results for French expletive negation trigger stimuli (and corresponding non-expletive negation trigger stimuli) that contained *ne* and *ne …pas*, respectively.

| | English | | French | | Mandarin | | Spanish | |
|---|---|---|---|---|---|---|---|---|
| | −EN | +EN | −EN | +EN | −EN | +EN | −EN | +EN |
| % of logical errors | 7.35% | 22.5% | 9.35% | 55.6% | 9.7% | 58.3% | 9.5% | 27.7% |
| Decision latency | 3930 | 5673 | 3944 | 6143 | 5163 | 5949 | 4334 | 7155 |

Table 1: Percentages of logical errors and decision latencies for expletive negation and non-expletive negation triggers in English, French, Mandarin, and Spanish.

| | *ne* | | *ne …pas* | |
|---|---|---|---|---|
| | −EN | +EN | −EN | +EN |
| % of logical errors | 9.49% | 82.04% | 9.2% | 29.05% |
| Decision latency | 4128 | 5163 | 3761 | 7124 |

Table 2: Percentages of logical errors and decision latencies for expletive negation and non-expletive negation triggers in French when the negator after an expletive negation trigger is *ne* vs. when it is *ne…pas*.

Overall, we found, as predicted, that participants in all four languages made significantly more logical errors and took significantly longer (marginally longer in Mandarin) to decide whether the target sentence was consistent with the preceding context when the target sentence's matrix clause contained an expletive negation trigger than when it did not. We also found an interaction between the ± expletive negation trigger condition and language: French, Mandarin, and Spanish speakers made significantly more logical errors than English speakers when the matrix verb, adposition, or adverb was an expletive negation trigger, but not when it was not an expletive negation trigger, which is expected given the different status of expletive negation in the respective languages' reference grammars. We also found an interaction between language and negator form in French. French expletive negation trigger stimuli which included *ne* as negator lead to significantly more logical errors, compared to the corresponding English, Mandarin, and Spanish stimuli. French expletive negation trigger stimuli which included *ne…pas* as negator did not lead to significantly more logical errors than the corresponding English or Spanish stimuli but lead to significantly less logical errors than the corresponding Mandarin stimuli.

Different triggers led to more errors than others: English expletive negation trigger *prevent* led to 40.2% errors across all our participants, whereas English *forget* leads to only 24.5% errors. More importantly for our purposes, which expletive negation triggers led to more or less errors (what we call *expletive negation propensity*) was a language specific property, as shown by the fact that there was no rank order correlation between the orders of triggers by percentage of errors for any pair of languages in the four languages we conducted experiments on (for all pairs of languages, the Kendall rank correlation had $p > .05$). (5)-(9) list the partial order of triggers (all triggers to the right of the scale covered by … did not significantly differ from each other in number of errors participants made; see Jin 2021 for the list of expletive negation triggers used in the English, French, and Mandarin experiments).

(5) English: without > prevent > give up, since > too > deny > beware, forget > fear > stop, before > doubt, …

(6) Mandarin: avoid > doubt > beware, question, stop > give up, prevent > deny > refuse > before, fear …

(7) French *ne …pas*: doubt, too, beware, hide > forbid, forget, deny > give up > stop

(8) French *ne*: without > impossible > almost > before …

(9) Spanish: without > beware > impossible > prevent > before …

Finally, there was a near-high correlation ($r = .66$) between the percentage of logical errors after individual expletive negation triggers and the percentage of expletive negations produced after the corresponding triggers in two Google-based corpus studies in both English and Mandarin (see Jin & Koenig 2021 and Jin 2021 for details about the search patterns and analyses of hits for both the English and Mandarin corpus studies).[1]

[1] A reviewer expressed concerns about our use of Google searches on grounds of replicability, citing Kilgarriff (2007). While there are indeed aspects of Google searches that are not optimal, we detail in the work cited why we chose these corpora. More importantly, the issue of replicability is, we believe, a red herring. Replicability in experimental sciences does not mean other researchers could run the same experiment on the same sample. For experimental psycholinguistics it would mean the same participants, which is both impossible due to anonymity required by regulations and the fact that participants' behavior would be affected by a second run through an experiment. In a biological context (e.g., cell

The results of our experiments and corpus studies suggest that speakers of individual languages store with each expletive negation trigger how likely it is to actually trigger expletive negation: the relative propensity of individual lexemes to trigger an expletive interpretation of a negator is what explains differences in number of errors and response latencies in Tables 1 and 2. Furthermore, the absence of correlation between the ordering of triggers by expletive negation propensity across languages (see the partial lists in (5)-(9)) confirms that expletive negation propensity is a language specific and lexeme specific property that is part of what speakers must know about individual lexemes. We thus suggest that native speakers store with each expletive negation trigger its expletive negation propensity very much like Ford et al. (1982) and Trueswell & Kim (1998) argue that speakers store with each verb its relative preference for one subcategorization frame or another.

The preceding experiments suggest that whether a lexeme is an expletive negation trigger or not as well as its expletive negation propensity is a lexical property that is part of native speakers' grammars. But they do not speak to whether or not the negator contributes a semantic negation or is simply a formative without semantic content. In other words, they do not help us decide whether a negative inference along the lines of (3d) is part of the semantic representation of sentences such as (1). We now turn to the need to include in the lexical description of individual triggers not only their propensity to co-occur with an expletive negation *form*, but also the *semantic* contribution of the expletive negation. Critical evidence supporting this further claim comes from the form of expletive negators in languages that have more than one negator. We discuss Mandarin here, but similar data from Januubi Arabic and Zarma-Sonrai can be found in Jin & Koenig (2021) and Jin (2021). Mandarin has at least three negators, *bù*, *méi*, and *bié* (Li & Thompson, 1981). Simplifying somewhat, *bù* is a neutral negation typically used when the described event is still not completed even later than reference time, whereas *méi* is the negation used when the described event is not completed at reference time. *Bié*, on the other hand, is used in imperatives and negative wishes. What is of particular interest for our purposes is that constraints on the choice of negator do not pertain to the expression of the at-issue content, but to that of the negative inference: properties of the negative inference is what governs the choice of negator. Thus, *bié* is used after predicates expressing **fear'**, as shown in (10) because the negative inference pertains to negative wishes. If the negative inference was not part of the representation of *shēngpà* 'fear', the choice of *bié* would be left unexplained: it is the negative inference that consist of a negative wish that licenses the use of *bié*.[2]

biology), this view of replication is even more impractical, as cells have died prior to the publication of experiments. What replicability means is that other researchers could run the same experiment/corpus study on another random or pseudo-random sample and our corpus studies are indeed replicable in that sense. The same search patterns we used can be applied to another sample of English or Mandarin.

[2]The data from Chinese also supports the claim that it is the negative inference informally represented in (3d) that licenses the expletive negation, as *bié* is only appropriate in the context of imperatives and negative wishes.

(10) xǔduō rén zài wèile xuéyè hé shìyè nǔlì-zhe, shēngpà zìjǐ
many people PROG for study and career work.hard-PROG fear self
**bié** bèi shìjiè táotài-diào.
IMP.NEG PASS world eliminate-COMPL
'Many people are working hard in their studies and careers for fear that they might be out of step with the world.'

Similarly, the form of the negator for *qián* 'before' differs depending on whether the negation is expletive or logical, as predicted by the rules for choice of negator. Consider (11) and (12). The negation in (11) is expletive, so the sentence means that the export had not started at reference time (this is the negative inference) and the negator must therefore be *méi*. The negation in (12), on the other hand, is logical, so the sentence means that the end of the exports will take place later than reference time and the negation must be *bù*. The Chinese data in (10)-(12) supports the claim that expletive negation must be part of the representation of individual triggers, as the meaning that is relevant for the selection of negator (e.g., *bié* in (10)) depends on the specific negative inference triggered by the matrix verb. *Shēngpà* 'fear'—not *qián* 'before'—entails a negative inference that is a negative wish that provides the appropriate context for the use of *bié*. Conversely, only for the complement clause of *qián* 'before'—not that of *shēngpà* 'fear'—does the issue of when the described event does not hold makes sense.

(11) (Context: Since we started exporting our products to the US last year, our profits have quadrupled)

qíshí, hái **méi** chūkǒu qián wǒmen jiù néng yùjiàn zhège
in.fact still PRF.NEG export before we already can predict this
jiéguǒ le.
result PFV

'In fact, we could already predict this result before we exported.' (Not exporting is true at reference time = past of argument proposition of *before*)

(12) (Context: Since we stopped exporting our products to the US because of the trade war, our profits have plummeted greatly)

qíshí, **bù** chūkǒu qián wǒmen jiù néng yùjiàn zhège jiéguǒ
in.fact IPFV.NEG export before we already can predict this result
le.
PFV

'In fact, we could already predict this result before we stopped exporting.' (Not exporting is what will happen in future of reference time)

The data we just presented (and similar data from other languages) argues in favor of the view that negative inferences must be part of the semantic representation of sentences containing expletive negations. Taken together with the results of our four experiments, it supports the hypothesis that expletive negation is part of the knowledge speakers have of individual triggers and contributes a negation to the semantic representation of clauses headed by triggers. In the rest of this paper, we show how semantic underspecification (in particular, Lexical Resource Semantics Richter & Sailer 2004; henceforth LRS) and structured meaning approaches (von Stechow 1991 and, more relevantly Potts 2005) make it relatively easy to state the constraints on the lexical description of triggers so that the negation contributed by expletive negations is not part of the argument proposition, but of the negative inference.

There are many possible ways of implementing the basic ideas we discuss below within LRS and, at this point, it is both unclear which one would fit best within the spirit of LRS and whether there is empirical data to choose between these implementations. We therefore outline the leading ideas and one possible implementation and simply allude to other options. Our analysis relies on several assumptions we explicate below. First, we treat the negative inference as a non-at-issue content, following Potts (2005) (see Hasegawa & Koenig 2011 and Sailer & Am-David 2016 for some previous work in Lexical Resource Semantics that tackles non-at-issue content). Such an assumption is required to avoid incoherence: the speaker of (1) cannot both fear that a new director will be elected and that a new director will not be elected. By separating at-issue content, what the speaker fears, and non-at-issue content (what (s)he wishes were not the case), we eschew ascribing incoherence to the speaker.

The second assumption we make is that semantic composition within the argument proposition proceeds as expected. So, the meaning of the complement clause *que no escullin nou director* 'that they would not elect a new director' in (1) is the same as it would be were it the complement of a non-expletive negation trigger. Our main motivation for this second assumption is that since the semantic oddity of expletive negation lies in the trigger itself, we can minimize changes to standard semantic composition by restricting those changes to the trigger and respect assumptions of locality and context-freeness of semantic composition within the trigger's complement: semantic composition within the complement does not have to "know" the complement's meaning serves as an argument of an expletive negation trigger.

Our third assumption is that expletive negation triggers come in two forms, one where they behave as expletive negation triggers and the second where they do not. This assumption is motivated by the fact that expletive negation is never required in the languages we focus on in this paper (although it is in some environments and in some languages as Jin 2021 discusses). So, we need to allow for so-called expletive negation triggers not to trigger expletive negation in some case and take argument propositions that contain a *logical* negation. In other words, a negation in the complement of a trigger is no necessarily expletive. Given the lexicalist stance of HPSG, this means that there are two variants of the lexeme for *temo* 'I fear' in Catalan, one that takes an expletive negation and the other that does not. Our lexical treatment of the alternation between expletive and non-expletive uses of triggers is corroborated by the lexical nature of the frequency with which expletive negation is produced in our English and Mandarin corpus studies or the frequency of expletive negation interpretation of negators occurring in the complement of triggers in our four experiments. Different verbs have different preferences for expletive negation uses and these preferences are both language and lexeme specific. The upshot of our two lexeme variants assumption is that we need to distinguish *the class of expletive negation triggers*, i.e. the set of verbs that license the occurrence of an expletive negation in their complement, and *expletive negation uses of these triggers* in sentences where an expletive negation actually occurs.

To model the alternation between expletive negation and non-expletive negation uses of triggers as well as the difference between non-triggers and triggers (only the latter can have expletive negation uses and are subject to the special semantic composition rule we detail below), we propose that expletive negation triggers have a non-atomic lexical identifier (LID) value, as shown in (13), where the sort *en-trigger* is a property of expletive negation triggers and the EN feature specifies whether a particular occurrence of a trigger includes an expletive negation or not. In other words, $\begin{bmatrix}\text{EN} & \text{-}\end{bmatrix}$ means that the complement of a trigger does not include an expletive negation whereas $\begin{bmatrix}\text{EN} & +\end{bmatrix}$ does. Triggers in all languages we discuss in this paper are unspecified for the EN feature.

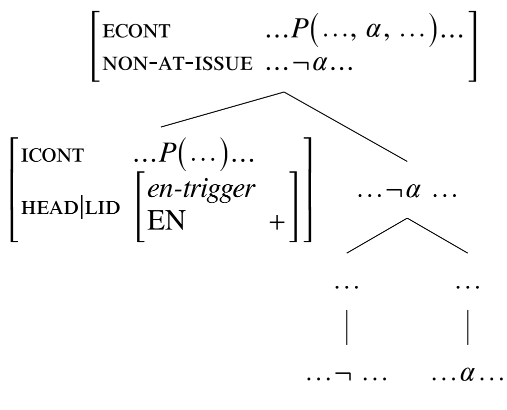
(13) $\begin{bmatrix}\textit{en-trigger} & \\ \text{EN} & \textit{boolean}\end{bmatrix}$

As mentioned, we assume that semantic composition proceeds as usual within the argument proposition and that there is a special composition rule for the combination of a trigger and its complement. The leading idea of this special composition rule is given in (14), where $\neg\alpha$ is (the relevant part of) the external semantic content of the complement.

(14) When composing … $\neg\alpha$ … with a trigger, $\alpha$ is the argument proposition of the trigger's MAIN content and $\neg\alpha$ is part of a non-at-issue proposition.

The effect of this special composition rule is provided in (15), where *P* stands for the predicate or operator denoted by the trigger. Intuitively speaking, the entry for triggers that are used expletively takes apart the content of their complement, with the negation becoming part of a non-at-issue content and the scope of the negation being the argument of the predicate denoted by the trigger (the value of MAIN).

(15)



The sort for expletive negation tiggers *qua* triggers is provided in (16).

(16)
$$\begin{bmatrix} \textit{EN-trigger-lxm} & \\ \text{HEAD}|\text{LID} & \begin{bmatrix} \textit{en-trigger} & \\ \text{EN} & + \end{bmatrix} \\ \text{SYNSEM}|\text{LOCAL}|\text{CAT}|\text{ARG-ST} & \left\langle \dots, \begin{bmatrix} \text{ECONT} & \neg\alpha \end{bmatrix}, \dots \right\rangle \\ \text{CONT}|\text{MAIN} & P \\ \text{SEM} & \begin{bmatrix} \text{ICONT} & \beta \\ \text{NI-CONT} & \langle \dots, \gamma, \dots \rangle \end{bmatrix} \end{bmatrix}$$
$$P(\dots, \alpha, \dots) \triangleleft \beta, \neg\alpha \triangleleft \gamma$$

The + value of the EN feature means that the lexeme is used expletively. The entry says that the external content of one of the syntactic arguments of the lexeme much be of the form $\neg\alpha$. The constraints below the AVM ensure that only $\alpha$ (not the negation) is the argument of the predicate $P$ denoted by the lexeme and that $\neg\alpha$ is part of the non-at-issue content $\gamma$. The entry in (16) ensures that although the negation is part of the external content of the complement, it is not part of the at-issue semantic content of the sentence headed by the trigger, but is part of its non-at-issue content.

Note that the lexeme description in (16) violates the feature geometry argued for in Sailer (2004) who splits the content of an expression—which is part of the value of the SYNSEM attribute—and its semantics, the value of an additional SEM attribute—which is not part of the value of SYNSEM, as shown in (17) (we follow more recent terminology, see Iordăchioaia & Richter 2015, and use the feature name SEM rather than LOGICAL-FORM that Sailer used).

(17)
$$\begin{bmatrix} \text{SYNSEM} & \begin{bmatrix} \text{LOCAL} & \begin{bmatrix} \text{CONTENT} & \textit{content} \end{bmatrix} \end{bmatrix} \\ \text{SEM} & \begin{bmatrix} \textit{lrs} & \\ \text{EXT-CONT} & \textit{me} \\ \text{INT-CONT} & \textit{me} \\ \text{PARTS} & \textit{list}(\text{ME}) \end{bmatrix} \end{bmatrix}$$

The feature geometry represented in (17) does not make the external content of the complement "visible" to the trigger lexeme, as it is not part of the SYNSEM of that complement. While the lexical treatment of the special composition rule associated with expletive negation triggers seems warranted, it is not the only possibility. An alternative approach to the revised feature geometry we assume in (16) would be to add a clause to the Semantics Principle of LRS that would target phrases headed by an expletive negation trigger. While we do not know of major obstacles to this alternative approach to composing the meaning of triggers with that of their complements, the lexical treatment we provide is somewhat simpler, as there are several different kinds of negative inferences for different classes of triggers, as we show below, and any additional clause of the Semantics Principle would have to distinguish between these various lexical subclasses, i.e. to replicate that lexical classification.

Jin & Koenig (2021) show that different negative inferences are associated with different classes of triggers. From a semantic composition perspective, we need to distinguish at least three broad classes of negative inferences. For one class of triggers, the negative inference is simply $\neg\alpha$ in (16). For another class of triggers $\neg\alpha$ is a proper subpart of the negative inference and the part that is distinct from $\neg\alpha$ is part of the meaning of the complement. Finally, for yet another class of triggers $\neg\alpha$ is a proper subpart of the negative inference, but the part that is distinct from $\neg\alpha$ is not part of the meaning of the complement; it is contributed by the trigger itself. We consider each case below.

For many triggers the negative inference *is* the negative proposition $\neg p$. For those triggers, the non-at-issue content is simply the negation of the trigger's argument proposition. *Before* in English and other languages is such a trigger. (18) represents the relevant information of the + and − EN variants of *before*. Critically, these two variants differ on the value of the attribute EN, which encodes whether *before* occurs in an expletive negation context or not and whether the argument of **before'** is part of a negated non-at-issue content ($\neg\alpha$) or not. (We ignore representation of reference time for ease of exposition.)

(18) $$\begin{bmatrix} \textit{before1} & \\ \textsc{head}|\textsc{lid} & \begin{bmatrix}\textit{en-trigger} & \\ \text{EN} & - \end{bmatrix} \\ \textsc{sem} & \begin{bmatrix}\textsc{icont} & \ldots\textsf{before'}(\alpha)\ldots\end{bmatrix}\end{bmatrix} \begin{bmatrix} \textit{before2} & \\ \textsc{head}|\textsc{lid} & \begin{bmatrix}\textit{en-trigger} & \\ \text{EN} & + \end{bmatrix} \\ \textsc{sem} & \begin{bmatrix}\textsc{icont} & \ldots\textsf{before'}(\boxed{1}\alpha)\ldots \\ \textsc{ni-cont} & \langle \ldots, \neg\boxed{1}, \ldots \rangle \end{bmatrix}\end{bmatrix}$$

For other triggers the negative inference properly includes the negative proposition. If we informally represent the negative inference as $Op(\ldots \neg p \ldots)$, two options are possible. For one subclass to which *fear* and its corresponding lexical items in other languages belong (lit 'not-want'), *Op* remains unexpressed (even if it matters for the choice of negator, as we saw in the case of Mandarin). Thus, the main predicate of the trigger's complement is a proper part of the positive proposition, but **want'** is not. The + and − EN variants of *fear* are provided in (19).

(19) $$\begin{bmatrix} \textit{fear1} & \\ \textsc{head}|\textsc{lid} & \begin{bmatrix}\textit{en-trigger} & \\ \text{EN} & - \end{bmatrix} \\ \textsc{sem} & \begin{bmatrix}\textsc{icont} & \ldots\textsf{fear'}(\textsf{a},\alpha)\ldots\end{bmatrix}\end{bmatrix} \begin{bmatrix} \textit{fear2} & \\ \textsc{head}|\textsc{lid} & \begin{bmatrix}\textit{en-trigger} & \\ \text{EN} & + \end{bmatrix} \\ \textsc{sem} & \begin{bmatrix}\textsc{icont} & \ldots\textsf{fear'}(\boxed{2},\boxed{1}\alpha)\ldots \\ \textsc{ni-cont} & \langle \ldots,\textsf{want'}(\boxed{2},\neg\boxed{1}), \ldots \rangle \\ \textsc{parts} & \langle \ldots\neg, \boxed{1}, \neg\boxed{1},\textsf{want'},\ldots \rangle \end{bmatrix}\end{bmatrix}$$

Finally, for some triggers, the part of the negative inference that is not the negative proposition (*Op*) *is* expressed within the complement. Consider sentence (20). Jin & Koenig (2021) analyze the negative inference for this verb and other verbs in the same semantic class as conveying that the argument proposition $\alpha$ violates the attitude holder's behavioral standards: $\alpha$ is not the case in all possible worlds consistent with the attitude holder's behavioral standards (*bs*) (it shouldn't have happened) (we assume an analysis of attitude verbs along the lines of Heim 1992).

(20) I always thought he was the one for me and at this point of time I really regret that I shouldn't have gone for him.
(Retrieved from: `https://www.quora.com/What-is-the-craziest-thing-youve-done-for-love-and-do-you-re`

gret-it-even-if-it-didnt-work-out, accessed 20 October 2019)

Interestingly, in all five languages we looked in detail at (Arabic, English, French, Mandarin, and Zarma-Sonrai, although the situation is more complex in the case of French), verbs that denote **regret'** or similar predicates can only co-occur with an expletive negation when their complement includes a modal verb or adverb that expresses the strong deontic modality which Jin & Koenig (2019, 2021) suggest are part of the negative inference. In (20), for example, the deontic operator denoted by *shouldn't* is not part of what the speaker regrets, as the overall context for (20) makes clear: what the speaker regrets is having gone for her boyfriend of four years. Thus, in this example, the part of the negative inference that is not part of $\neg\alpha$, namely the deontic operator ($\Box_{bs}$) is expressed within the complement clause, in fact it is the main predicate of the EN trigger's complement. This means that the deontic operator included in the complement's external content, just like the negation, does not contribute to the at-issue content of the clause headed by the trigger. It only contributes to the non-at-issue negative inference associated with the trigger.

The expletive negation variant of *regret* is provided in (21). The verb's complement includes both the negation and the modality operator as per our assumption that semantic composition within the complement proceeds ordinarily. The external content of *I shouldn't have gone for him* in (20) includes both the negation and the modal necessity operator and takes the form $\Box_{bs}\neg\boxed{1}$ in (21). But, the modal operator and the negation both become part of the non-at-issue content of *regret* and only the negation's argument ($\boxed{1}$) is included in the internal content of the verb.

(21)
$$\begin{bmatrix} \textit{regret2} & \\ \text{HEAD}|\text{LID} & \begin{bmatrix} \textit{en-trigger} & \\ \text{EN} & + \end{bmatrix} \\ \text{SEM} & \begin{bmatrix} \text{ICONT} & \ldots\text{regret'}(\text{a}, \boxed{1})\ldots \\ \text{NI-CONT} & \langle \ldots, \Box_{bs}\neg\boxed{1}, \ldots \rangle \end{bmatrix} \\ \text{ARG-ST} & \langle \text{NP}, \left[\text{SEM} \left[\text{ECONT} \ \Box_{bs}\neg\boxed{1}\right]\right] \rangle \end{bmatrix}$$

Jin (2021) mentions that examples of expletive negation uses of *complain* in English behave like *regret* in including the deontic operator (as well as the expletive negation) in the complement clauses. Interestingly, the complement clause of *pà* 'fear' in Mandarin can include another negator than *bié*, namely *bú-yào* (lit. 'not-want'), as shown in (22). We analyze such examples like we did *regret*: the predicate **want'** is part of the external content of the complement clause, but is constrained to become part of the trigger's non-at-issue content similarly to what happens with the entry for *regret* in (21).

(22) wǒ dàoshì bú-yàojǐn, pà nǐ bú-yào bèi wǒ liánlèi.
I though NEG-it.matters fear you NEG-want PASS I get.involved
'It doesn't matter to me. I'm just afraid that I might get you involved (in my thing).'

(From an online novel; retrieved from: `http://www.zhuzhudao.org/book/55976/24090305.html`)

The previous discussion has outlined how semantic composition works for three major classes of triggers identified by Jin & Koenig, those where the negative inference is the negation of the trigger's argument proposition, those where the negative inference includes additional material contributed by the trigger that remains unexpressed (some kind of operator incorporation—to extend the use of the notion of lexical semantic incorporation discussed in Jackendoff 1990), and finally those where the negative inference also includes additional material contributed by the trigger but that additional material is expressed within the complement. Critical to our analysis of all three cases is the assumption that the external content of the trigger's complement is picked apart and some of it becomes part of the trigger's at-issue internal content and some part of the trigger's non-at-issue content. This is what the semantic composition rule specific to expletive negation-trigger included in the sort in (16) ensures.

We now turn to a rather unique case, that of French *ne* and show how our analysis easily extends to that unusual case. Although French is typically cited when discussing expletive negation, it is unique. First, French uses two negators expletively. One is the modern French negation *(ne)* ...*pas* (we put parenthesis around *ne* as it is not required, in fact rarely if ever present in colloquial spoken French, see Abeillé & Godard 2021, Chapter 10): *(ne)* ...*pas* can be used expletively as argued for by Larrivée (1996) and confirmed by our experiment. The other is the old French negator *ne*. What is unique and, to our knowledge, unattested outside of French is that *ne* when it appears on its own in the complement of triggers is dedicated to marking expletive negation (see Muller 1991 for some other uses of *ne* in modern French outside of the scope of expletive negation triggers). The fact that French has a negator mostly dedicated to marking expletive negation explains that expletive negation has been noticed and discussed by French grammarians since the middle of the 18th century.

(23) J'ai peur qu'il ne pleuve.
I have fear that it NEG rain.SBJV
'I fear that it will rain.'

Other than the fact that *ne* is a dedicated marker of expletive negation when occurring on its own within the complement of expletive negation triggers, French *ne* behaves just like negators in other languages we looked at both in terms of the triggers that license its occurrence or the modal expressions sometimes required for its occurrence (see Jin & Koenig 2021 and its Appendix for details). We therefore propose to locate the idiosyncrasy of French *ne* in the lexical properties of the negator itself. To capture the fact that this use of *ne* must co-occur with an expletive negation trigger (and the negation it contributes must thus be part of a non-at-issue content associated with the trigger), we employ the REV-SEL feature which has been used (sometimes under different names) whenever an expression is restricted to occur as dependent of a particular class of signs (see Bonami 2015 for its use to model periphrasis and

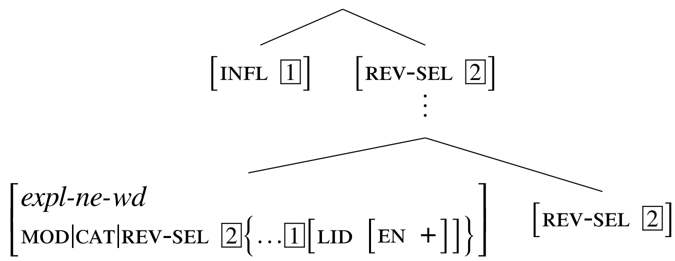
Aguila-Multner & Crysmann 2020 for its use to model causatives in French). In other words, we propose that *ne* is lexically specified as modifying a verb that reverse selects for an expletive negation trigger (an expression whose LID contains the information $[\text{EN}\ +]$). Since REV-SEL is a head feature, modifying a verb that reverse selects for an expletive negation trigger means that the complement clause itself reverse selects for an expletive negation trigger.[3]

The simplified entry in (24) provides the relevant part of the lexical entry for expletive *ne*. We assume this use of *ne* is a specific lexeme (hence its *expl-ne* LID). Critically, it is lexically specified to modify a verb that reverse selects a trigger that occurs in an expletive negative context (i.e., that is $[\text{EN}\ +]$). As the REV-SELECT feature is a head feature, the clause headed by the verb expletive *ne* modifies itself reverse selects for a $[\text{EN}\ +]$ trigger. The Reverse Selection Principle proposed in Bonami (2015, 107) and provided in (25) ensures that the complement co-occurs with a word that includes $[\text{LID}\ [\text{EN}\ +]]$ in its inflectional feature set. An informal representation of how the lexical specification of a REV-SEL feature in the entry for expletive *ne* in (24) ensures it occurs as part of the complement of a trigger that is used expletively is provided in (26).

(24)
$$\begin{bmatrix} \textit{expl-ne-wd} & \\ \text{CAT} & \begin{bmatrix} \text{HEAD} & [\text{LID}\ \textit{expl-ne}] \\ \text{MOD} & \left[\ldots|\text{REV-SELECT}\ \left\{\ldots, \left[\text{LID}\ \begin{bmatrix}\textit{en-trigger}\\ \text{EN} +\end{bmatrix}\right], \ldots\right\}\right] \end{bmatrix} \\ \text{CONTENT} & [\text{MAIN}\ \neg] \end{bmatrix}$$

(25) "*Reverse Selection Principle*:
If a word *w* carries a reverse selection requirement *s* in its REV-SEL, then *s* must be token-identical to the INFL value of a word $w'$ selecting for a projection of *w*." (Bonami, 2015, 107)

(26)




Nothing else needs to be said about French expletive *ne*, since aside from its restricted context of occurrence (and its consequent overwhelming expletive inter-

[3]Berthold Crysmann (p.c.) points out that many scholars assume *ne* to be an affix. Under such an analysis, the presence of the REV-SELECT feature on the complement clause's main verb would be the result of a lexical rule that introduces the negative meaning together with the relevant morphosyntactic features on the complement clause's verbal head. Nothing substantial depends on the choice of a morphological or syntactic analysis of French expletive *ne*.

pretation by participants in our experiments), expletive uses of French *ne* are just like expletive uses of English *not*.

Jin & Koenig (2021) have shown that expletive negation occurs rather widely in languages of the world and in very similar environments. They propose that a negative inference from, typically, the lexical meaning of a verb, preposition, or adposition/adverb acts as the licensor of expletive negation. In this paper, we examined whether and how negative inferences—and, more generally, expletive negation—is represented in the grammar of natural languages. We first provided two pieces of evidence that expletive negation is part of the lexical representation of triggers in individual languages and that it is treated as a true negator, not some semantically vacuous formative. The results of four experiments in English, French, Mandarin, and Spanish showed that native speakers of these languages differ in how likely they are to interpret expletively a negator in the complement of a trigger and that different triggers lead to different likelihood of being interpreted expletively. Both facts suggest that speakers of individual languages associate with each trigger something like the frequency of an expletive interpretation of negators occurring in the complement, just as they associate with verbs the relative frequency of individual syntactic frames. The data on the choice of negators in languages like Mandarin also shows that expletive negation must be treated as a negation, as properties of the negative inference (which contains a negation operator) motivate the form of the expletive negation.

In the second part of this paper, we have outlined an analysis of expletive negation within HPSG using Lexical Resource Semantics. We proposed an expletive negation trigger specific composition rule whereby only the argument of the negation included in the external content of the trigger's complement becomes the argument of the trigger's MAIN content and the negation becomes part of the non-at-issue negative inference associated with each trigger. We discussed three classes of triggers that differ in both the nature of the negative inference and whether material that is only part of the negative inference (aside from the negation) appears in the complement or not. Finally, we provided an analysis of French expletive *ne* whereby it reverse selects (through modification of the complement's main verb) for an expletive negation trigger, thus explaining its dedicated use to mark expletive negation when occurring on its own in the complement of triggers.

Stepping back from the particulars of our analysis, we offer a couple of concluding remarks. First, it is worth pointing out that the semantic rule we propose for composing the meaning of triggers and the meaning of their complements depends on the descriptive stance of Lexical Resource Semantics—i.e., the idea that semantic constraints are descriptions of formulas rather than formulas (an idea shared by most if not all approaches to semantic underspecification). A descriptive stance is critical here because our analysis requires "shipping" the negation that is part of the complement's content to the non-at-issue content of the trigger and having the rest of the (external) content of the complement become the argument of the predicate denoted by the trigger: the entry for triggers must therefore be able to make reference to parts of formulas. The same is true for the part of the negative inference which is included in the complement but is not part of the at-issue content, such as *shouldn't* in (20).

Second, despite its success in modeling expletive negation, our analysis leaves several questions unanswered that the data we have at our disposal do not allow us to answer. We only mention one in closing for reasons of space. Manfred Sailer (p.c.) asked why we do not include the negative inference in the external content of expletive negation triggers (and the clause they head) along the lines of the analysis of definite descriptions proposed in Sailer & Am-David (2016). If we were to follow Sailer & Am-David's proposal, the external content of clauses headed by expletive negation triggers would be of the form informally represented in (27) where **Neg_inf** stands for the negative inference and **At_issue** is the at-issue content of triggers (and the clause they head).

(27) **Neg_inf** $\wedge$ **At_issue**

We know of no issue with such an approach as long as **Neg_inf** does not interact with scopal operators within the at-issue content, which seems straightforward to achieve given the principles for retrieval of non-at-issue content proposed in Sailer & Am-David. Such an extension of the analysis we propose would have the added benefit to make it easier to maintain the relation between semantic parts and external content according to which "every element of the utterance's PARTS list is a subexpression of the EXCONT value" (Richter & Kallmeyer, 2009, 47). We did not include a constraint within entries for expletive negation triggers that the external content of trigger is of the form in (27), as whether this is the way to go depends on how to model non-at-issue content within LRS. To cite but one of the issues that would have to be resolved and that we do not wish to take a stand on, Sailer & Am-David conjoin conventional implicatures with at-issue content rather than assume with Potts (1975) (and Karttunen & Peters 1979) that conventional implicatures are part of another dimension of meaning. Additionally, the exact status of negative inferences—aside from their being non-at-issue—is unclear to us. In most cases, negative inferences are entailments due to the meaning of triggers and thus do not behave like traditional conventional implicatures. More importantly, since **At_issue** in (27) entails in most cases **Neg_inf**, we are not sure what the point of the conjunction would be, aside from maintaining the current understanding of the External Content Principle. Until questions we just raise are answered, we think it better to not commit to how–if at all—the at-issue and non-at-issue content of expletive triggers combine.

# References

Abeillé, Anne & Daniéle Godard. 2021. *Grande grammaire du Français*. Paris: Actes Sud.

Aguila-Multner, Gabriel & Berthold Crysmann. 2020. An inside-out approach to French causatives. In Stefan Müllerller & Anke Holler (eds.), *Proceedings of the 27th international conference on Head-driven phrase structure grammar*, 5–25. Stanford, CA: CSLI Publications.

Bonami, Olivier. 2015. Periphrasis as collocation. *Morphology* 25(1). 63–110.

Dell, Gary. 1986. A spreading-activation theory of retrieval in sentence production. *Psychological Review* 93(3). 283–321.

d'Olivet, L'Abbé. 1767. *Remarques sur la grammaire françoise*. Paris: Frères Barbou.

Espinal, Maria Teresa. 2000. Expletive negation, negative concord and feature checking. *Catalan Working Papers in Linguistics* 8. 47–69.

Ford, Marilyn, Joan Bresnan & Ronald Kaplan. 1982. A competence-based theory of syntactic closure. In Joan Bresnan (ed.), *The mental representation of grammatical relations*, 727–796. Cambridge, MA: MIT Press.

Glucksberg, Sam, Patricia Gildea & Howard B. Bookin. 1982. On understanding nonliteral speech: Can people ignore metaphors? *Journal of Verbal Learning and Verbal Behavior* 21(1). 85–98.

Hasegawa, Akio & Jean-Pierre Koenig. 2011. Focus particles, secondary meanings, and lexical resource semantics: The case of japanese *shika*. In Stefan Müller (ed.), *Proceedings of the hpsg 2011 conference*, 81–101. Stanford, CA: CSLI Publications.

Heim, Irene. 1992. Presupposition projection and the semantics of attitude verbs. *Journal of Semantics* 9. 183–221.

Horn, Lawrence. 2010. Multiple negation in English and other languages. In Lawrence Horn (ed.), *The expression of negation*, 111–148. Berlin: De Gruyter Mouton.

Iordăchioaia, Gianina & Frank Richter. 2015. Negative concord with polyadic quantifiers: The case of Romanian. *Natural Language and Linguistic Theory* 33(2). 607–658.

Jackendoff, Ray. 1990. *Semantic structures* (Current Studies in Linguistics 18). Cambridge, MA: MIT Press.

Jin, Yanwei. 2021. *Negation on your mind: A cross-linguistic and psycholinguistic study of expletive negation*. Buffalo, NY: University at Buffalo dissertation.

Jin, Yanwei & Jean-Pierre Koenig. 2019. Expletive negation in English, French, and Mandarin: A semantic and language production model. In Christopher Piñón (ed.), *Empirical issues in syntax and semantics 12*, 157–186. Paris: CNRS.

Jin, Yanwei & Jean-Pierre Koenig. 2020. English speakers produce and understand expletive negation. In Stephanie Denison, Michael Mack, Yang Xu & Blair C. Armstrong (eds.), *Proceedings for the 42nd annual meeting of the Cognitive Science Society*, 2870–2876. Toronto, ON: Cognitive Science Society.

Jin, Yanwei & Jean-Pierre Koenig. 2021. A cross-linguistic study of expletive negation. *Linguistic Typology* 25(1). 39–78.

Karttunen, Lauri & Stanley Peters. 1979. Conventional implicature. In Choon-Kyu Oh & David A. Dinneen (eds.), *Syntax and semantics 11: Presupposition*, 1–56. New York: Academic Press.

Kilgarriff, Adam. 2007. Googleology is bad science. *Computational Linguistics* 33(1). 147–151.

Langacker, Ronald. 1987. *Foundations of cognitive grammar*, vol. 1. Stanford, CA: Stanford University Press.

Larrivée, Pierre. 1996. *Pas* explétif. *Revue Romane* 31. 19–28.

Li, Charles N. & Sandra A. Thompson. 1981. *Mandarin Chinese: A functional reference grammar*. Berkeley, CA: University of California Press.

Muller, Claude. 1991. *La négation en français*. Geneva: Librairie Droz.

Potts, Christopher. 2005. *The logic of conventional implicatures* Oxford Studies in Theoretical Linguistics. Oxford: Oxford University Press.

Potts, Timothy. 1975. Model theory and linguistics. In Edward Keenan (ed.), *Formal semantics of natural languages*, 241–249. Cambridge: Cambridge University Press.

Richter, Frank & Laura Kallmeyer. 2009. Feature logic-based semantic composition: A comparison between lrs and ltag. In Anders Søgaard & Petter Haugereid (eds.), *Typed feature structure grammars*, 37–92. Frankfurt: Peter Lang.

Richter, Frank & Manfred Sailer. 2004. Basic concepts of Lexical Resource Semantics. In *ESSLLI 2003 course material*, vol. 5 Collegium Logicum, Kurt Gödel Society Wien.

Sailer, Manfred. 2004. Local semantics in Head-driven Phrase Structure Grammar. In Olivier Bonami & Patricia Cabredo Hofherr (eds.), *Empirical issues in syntax and semantics 5*, 197–214. Paris: CNRS.

Sailer, Manfred & Assif Am-David. 2016. Definite meaning and definite marking. In Doug Arnold, Miriam Butt, Berthold Crysmann, Tracy Holloway King & Stefan Müller (eds.), *Proceedings of the joint 2016 conference on head-driven phrase structure grammar and lexical functional grammar*, 641–661. Stanford, CA: CSLI Publications.

von Stechow, Arnim. 1991. Focusing and backgrounding operators. In Werner Abraham (ed.), *Discourse particles: Descriptive and theoretical investigations on the logical, syntactic and pragmatic properties of discourse particles in german* Pragmatics & Beyond New Series, 37–83. Amsterdam: John Benjamins Publishing Company.

Trueswell, John & Albert Kim. 1998. How to prune a garden path by nipping it in the bud: Fast priming of verb argument structure. *Journal of Memory and Language* 39. 102–123.

# Copy raising as a lexical rule

Paul Kay
University of California, Berkeley and Stanford University

Proceedings of the 28th International Conference on
Head-Driven Phrase Structure Grammar

Online (Frankfurt/Main)

Stefan Müller, Nurit Melnik (Editors)

2021

Frankfurt/Main: University Library

pages 68–82

Keywords: copy raising, lexical rule, SBCG, weather it, SELECT feature

Kay, Paul. 2021. Copy raising as a lexical rule. In Stefan Müller & Nurit Melnik (eds.), *Proceedings of the 28th International Conference on Head-Driven Phrase Structure Grammar, Online (Frankfurt/Main)*, 68–82. Frankfurt/Main: University Library. DOI: 10.21248/hpsg.2021.4.

**Abstract**

The paper argues that there is compelling evidence for analyzing copy raising in English as a lexical rule that converts a subtype of perception verb with a stimulus subject (a so-called "flip-perception verb") into a semantically bleached verb of mild evidentiary force, roughly equivalent to *seem* in some uses, which identifies the index of its external argument with the index of the pronominally expressed external argument of its complement.

## 1. Introduction

Copy raising in English is best viewed as a lexical rule that converts a subtype of perception verb with a stimulus subject (a so-called "flip perception verb") into a semantically bleached verb of mild evidentiary force, roughly equivalent semantically to *seem* in some uses. The derived verb does not subcategorize for a source of perception. It provides for a generic interpretation of the unexpressed witness of the evidence, and it identifies the index of its external argument with the index of the pronominal external argument of its clausal complement. Sign-Based Construction Grammar (SBGC) provides a formal framework for expressing this analysis.

Following Kim 2014, Landau 2011, and Potsdam & Runner 2001, among others, we observe that certain English perception verbs have two distinct senses: (i) a perception sense, in which the verb's external argument denotes an entity that plays a semantic role which might be called the 'perceptual stimulus' in a report of an experience in the perceptual mode denoted by the verb, and (ii) a different sense (or a homophonous verb) that does not assign a semantic role to its external argument and which figures in sentences like (1-4).[1]

(1) ... it's not difficult to work out why *Trump looked like he was going to win in January*: the stock market was booming, unemployment was low, crime low, there were no new wars…it's not a mystery.

(2) i have gone ahead and paid your parts because *the host of the giveaway looks like he disappeared* …

---

[1] The verbs with these two senses are not necessarily limited to those senses. For example, *seem* and *appear* may have additional senses associated with their raising and *it-extraposition* valences and *sound* has a hearsay sense distinct from both its perception and copy raising senses (i).

(i) This 74-year-old pasta sauce recipe sounds incredibly delicious.

(3) *... the bill seemed like it would easily pass…*

(4) I'm so excited to get my copy of Sara's book … *this one sounds like it's going to win an immediate place in my heart*.

In (1) Trump's visual appearance is patently not at issue. Similarly in (2), as regards the visual appearance of the giveaway host. In (3) any perceptual properties the bill might have had are almost certainly not related to its likelihood of passing. In (4) the information prompting the speaker's enthusiasm for a new cookbook is almost certainly not auditory. (All positive, numbered examples in this paper were attested on the web in July 2021, unless otherwise indicated.)

Sentences of this kind contain a subordinate clause complement, introduced by *like, as if,* or *as though,* the subject of which is a pronoun whose index is identified with the index of the matrix verb's external argument. The latter bundle of facts has given rise to the name Copy Raising (CR).[2] A key fact about CR sentences is that they have a paraphrase with an expletive subject and only one mention of the nominal expression in question. For example, a sentence such as (5a) *Marion looks like she will be elected* has two distinct rough paraphrases (5b) 'It appears likely that Marion will be elected' (CR) and (5c) 'Marion's visual appearance suggests that she will be elected' (perception report). (Perhaps Marion is looking at the latest polls and smiling.)

(5) a. Marion looks like she will be elected. (invented example.)
b. 'It appears likely that Marion will be elected' (CR)
c. 'Marion's visual appearance suggests that she will be elected' (perception report)

With regard to CR, the only structures that need special attention beyond the rest of the grammar are those in which (i) the subject pronoun of the *like*-phrase shares the index of the matrix subject and (ii) the meaning is that of the paraphrase just described. A sentence such as (6a) *Pat looks like Marion is angry at him* or even (6b) *Pat looks like Marion is angry* are widely understood to employ only the perception sense of the verb and be thus irrelevant to the analysis of CR, although there are certainly dissenters from this view (e.g., Asudeh and Toivonen 2012 and related papers, Lappin 1983, 1984,

[2] The phenomenon was originally discussed for English by Andy Rogers (1971, 1973, 1974a, 1974b), who gave the transformation he proposed to model the phenomenon the name "Richard", perhaps to convey with a somewhat whimsical flourish how different this pattern seemed from raising or any other familiar grammatical pattern of English.

Heycock 1994, and Kim 2014). I will not discuss those dissents here; I find persuasive the arguments of Potsdam & Runner (2001), who conclude their examination of the relevant facts, "… true Copy Raising exists only where the pronominal copy is in subject position."

(6) a. Pat looks like Marion is angry at him. (Invented example)
b. Pat looks like Marion is angry. (Invented example)

An essential observation relevant to the CR phenomenon is that an expression of the form *like/as if/as though* + S[fin] is an ordinary kind of subordinate clause, not limited to copy raising locutions. Such clauses can appear as complements to verbs like *act, behave* and *acquit* (*oneself*) as in examples (7-9)

(7) … everyone high or low acquitted himself *(as if the fortune of the field depended on his own individual prowess.)

(8) Although it continued to float in midair, it acted *(like someone had cemented it to the ground).

(9) Americium, which is a pseudolanthanide, behaves *(as though it were roughly atomic No. 60.)

These clauses can also serve as complements to perception verbs, as in examples (10) through (12).

(10) Doug Collins looked *(like someone had just slapped him). (Kevin Sullivan & Mary Jordan, *Trump on Trial: The Investigation, Impeachment, Acquittal, and Aftermath*)

(11) The words sounded *(as if they were floating like flowers on water). (Virginia Woolf, *To the Lighthouse*)

(12) As for Ramsey…he had told me all along that his head was in danger, and he seemed *(as though the order was out for its removal).

Clauses of this form can also serve as adverbial modifiers of both transitive and intransitive verbal expressions.

(13) The man called her *as though he was calling a little cat*.

(14) This girl swims *like it was something she was meant to do*.

(15) She looked at him *like he had lost it completely*.

Kim (2014, among others) considers examples like (10-12) to be a kind of CR. The full range of examples like (7-15) suggests, on the other hand, that doing so complicates the full picture unnecessarily. There is no necessity to suppose that a sentence like (10), for example, has a grammatical form different from that of, say, (16).

(16) She looked like someone had died.

Let's call such clauses *as-if* clauses; as-if clauses possess the following properties: *like, as if,* and *as though* SELECT a finite clause via the SELECT feature proposed by Allegranza (1989) and Van Eynde (2006), which groups determiners and modifiers together as *functors*. The finite S selectee is the head of the as-if clause and consequently its external argument (XARG) is visible externally. As-if clauses are accorded a dedicated MARKING value, *asif,* and apply an appropriate *frame* to the INDEX of the head finite clause. (The term *frame* is the SBCG name for an MRS elementary predication. See Copestake *et al*. 2005.) Huddleston& Pullum (2002: 1151) argue for the lexical unity of *as if*, and *as though*, which is also usual in the CR literature, and recognize the syntactic reality of as-if clauses. They assume that *like, as if,* and *as though* are prepositions and their relation to their clausal accompaniments that of complementation rather than modification. Unsurprisingly, given the relevant publication dates, they do not appear to have considered the possibility of a functor-type analysis.

## 2. Expletives

Before presenting an analysis of CR, it is desirable to look briefly at how expletives behave in CR contexts, since expletives and related forms have furnished key data for many analyses of CR. For example, Sag (2012) presents the examples in (17) and (18). His implied analysis of CR consists in proposing an illustrative lexeme type, as exemplified by CR *look* in (19).

(17) There looks like $\left\{\begin{array}{l}\text{there's going to be a storm}\\ \text{*it's going to rain}\\ \text{*Kim's going to win}\end{array}\right\}$ (Sag 2012: 150, (110a))

The point intended is that the CR version of *look* requires identity between the matrix subject and that of the phrase following *like*.

(18) ?Kim looks like $\left\{\begin{array}{l}\text{there's going to be a storm}\\ \text{it's going to rain}\\ \text{Pat's going to win}\end{array}\right\}$ (Sag 2012: 151, (110b))

Sag states that "the acceptability [of the examples in (18)] is slightly degraded." The alleged degradation, and the attendant question mark, need not be considered grammatically relevant, as these examples appear to exemplify fully grammatical sentences that seem odd when presented in isolation only because the contexts in which they might be felicitously uttered do not spring to mind unbidden. Imagine in the first two sentences of (18) that Kim is a farmer who has hurriedly thrown on his rain gear and is dashing out the door. The examples in (18) are unremarkable in that each must be a perception report and not CR. Sag's SBCG lexical analysis of CR is illustrated in (19).

(19) $$\begin{bmatrix} \text{FORM} & \langle \textit{look} \rangle \\ \text{ARG-ST} & \left\langle \text{NP}_i, \begin{matrix}\text{PRT}\\ [\textit{like}]\end{matrix}, \begin{bmatrix}\text{S} & \\ \text{XARG} & \langle \text{NP}_i[\textit{pron}]\rangle\end{bmatrix} \right\rangle \end{bmatrix}$$ (Sag 2012:151, (111)

This analysis is not persuasive.[3] The particle *like* serves only to make the XARG of the complement visible to the matrix XARG in the ARG-ST. It is otherwise unmotivated, performing no further function either in a CR environment or elsewhere in the grammar. On the other hand, we have seen that as-if clauses such as *like there's going to be a storm* in (17) and *like Pat's going to win* in (18) function as constituents in non-CR examples like (7) – (15) with the same apparent semantic effects as in (17) and (18). Ideally, the as-if clause type should be recognized as such in an analysis of CR clauses.

As an initial step in investigating the role of expletives in CR, we note that English so-called 'weather *it'* is not properly considered expletive. In a mostly forgotten paper of nearly a half-century ago, Dwight Bolinger (1973) makes a compelling case that 'weather *it'* is not only not restricted to weather and time (*It's freezing; it's nearly 4:00 a.m*.) but rather denotes ambience generally. Some of Bolinger's initial examples imagine a phone conversation between two forest rangers in different stations.

(20) a. 'How's it down there?' – 'It's fairly calm'
b. 'How's it up there?' – 'It's practically ripping the trees out.'

Apparently, in (20) *it* includes the local wind conditions in its reference, but in a different location for each interlocutor. Bolinger continues:

(21) a. 'Isn't it nice out this afternoon?' – 'You must be crazy. It's so hot that it's giving me a headache.
b. 'It's cold enough to freeze the balls on a brass monkey.'

---

[3] We will see, however, that the analysis of CR presented below is similar to that implied by (19) in being strictly lexical and in making strategic use of the XARG feature.

“Presumably in the last two sentences the *it* that refers to the weather is the same *it* that gives the headache and freezes the balls on the brass monkey” (Bolinger 1973: 262). Ambient *it*, as Bolinger shows, is protean. The examples in (22) are also from Bolinger (1973).

(22) a. It’s scary in the dark.
  b. It’s inspiring here at MIT.
  c. I’m climbing down. It’s too exposed up here.
  d. It’s her graduation next week.
  e. I like it in California.
  f. The noise makes it hard to study.
  g. It’s all finished between us.

One might disagree with Bolinger that the examples in (23), exemplify the same *it* as those in (20-22) but in any case, these tokens of *it* are also clearly not expletive. “I would maintain that the same *it* turns up in the following:”

(23) a. *Stop it*! (what you are obviously doing).
  b. Don't do it! (what you are obviously about to do).
  c. Come off it! (what you are obviously insisting on)” Bolinger (1973: 263).

We proceed on the hypothesis that the *it* subject of weather sentences is not expletive. This hypothesis is consistent with the tradition in HPSG that postulates three types of index for English: expletive *it,* expletive *there,* and referential. Ambient *it* is a subtype of *referential-index*.

That “weather” *it* denotes ambiance entails that a weather predicate, unlike a CR verb, imposes a semantic role on its external argument. This in turn entails that a sentence like (24a) is three ways ambiguous. The lower *it* must be ambient because *rain* requires ambient *it* of its subject. The matrix *it* can be either ambient or expletive; if it is ambient the sentence can be CR, but it can also be a perception report with the two ambient *it* tokens referring differently: the matrix *it* to the current ambience and the lower *it* to an imagined future ambience, somewhat as we saw in (20) regarding contrasting wind conditions. If the matrix *it* is expletive, (24a) is not a CR sentence; *seems* is the familiar raising verb in its alternate, *it*-extraposition, valence, and the sentence is interpreted like a sentence such (24e). Example (24b) is bad because *rain* requires ambient *it*. Example (24c) is bad for the same reason; that reason also explains why CR is not possible, despite identity of the matrix subject’s index and the complement’s subject’s index. Example (24d) is bad because it lacks the identity of indices required by CR and neither perception *seem* nor *it*-extraposition *seem* allows a *there* subject. Sentence (24e) is a perception report, with perception *seem* and ambient *it* subject. Example

(24f) is boringly bad because there is no bound pronoun as required for CR, and both perception *seem* and *it*-extraposition *seem* reject *there* subjects. Finally, (24g), which contrasts minimally with (24c), exemplifies CR, with matching expletives *there; be a storm* is not a weather predicate, which would require an ambience-referring *it*, as subject.

(24)
a. It seems like it's going to rain soon.
b. *It seems like there is going to rain soon.
c. *There seems like there is going to rain soon.
d. *There seems like it is going to rain soon.
e. It seems like rain is coming soon.
f. *There seems like rain is coming soon.
g. There seems like there is going to be a storm soon.

**3. Analysis of Copy Raising**

Noting that the external argument of a CR verb does not denote a source of perception, we can observe that there are four English perception verbs that undergo the copy raising lexical rule. These are the four most general perception verbs: *seem, appear, look, and sound*. These and only these verbs can yield a hearsay reading in a sentence of the form illustrated in (25) (invented). Examples a-d have a common reading, roughly, 'Apparently, Nero didn't really burn Rome'; examples e and f do not have such a reading.

(25)
a. It seems like Nero didn't really burn Rome.
b. It appears as if Nero didn't really burn Rome.
c. It looks as though Nero didn't really burn Rome.
d. It sounds like Nero didn't really burn Rome.
e. # It smells like/as if/as though Nero didn't really burn Rome.
f. # It tastes like/as if/as though Nero didn't really burn Rome.

Assuming a multiple-inheritance hierarchy of *frames* (Davis & Koenig 2000) we posit a perception frame *percep-fr, whose* immediate subtypes include *gen(eral)percep-fr, smell-percep-fr,* and *taste-percep-fr*. The immediate subtypes of *gen-percep-fr* are *seem-percep-fr, appear-percep-fr, look-percep-fr,* and *sound-percep-fr*, as represented in the type hierarchy fragment (26).

(26)

*percep-fr*

*gen-percep-fr* *smell-percep-fr* *taste-percep-fr* *...?*

*seem-percep-fr* *appear-percep-fr* *look-percep-fr* *sound-percep-fr*

So far, nothing has been formally proposed regarding CR *per se*; as-if clauses are vanilla English grammar. SBCG expresses lexical rules as unary-branching, derivational constructions. The Copy Raising Construction pumps a general perception verb lexeme to a verb lexeme with a meaning that might be characterized as imparting a weak evidentiary force, perhaps similar to the meaning of *seem* in a sentence like (27), and whose output (MTR) lexeme identifies the index of its NP XARG with the index of the pronominally specified XARG of the *as-if* finite clausal complement, as shown in (28).

(27) … the bill seems like a positive step for our state.

(28) MTR [ARG-ST <NP$_i$, S[MRKG *as-if*, SYN|XARG NP[*pron*]$_i$]>]

This analysis, despite departing from that of Sag (2012), shares with it both a strictly lexical approach and critical dependence upon the XARG feature: although the selectee finite clause in an as-if clause has empty VAL(ENCE), its XARG remains available to be coindexed with the matrix subject. The key points of this approach are (i) the empirical observation that all the verbs that participate in CR have a perception-verb double (although the converse does not hold, since only the four general perception verbs have a CR double), (ii) that expressions such as *like he was going to win* in (1) occur freely in several non-CR contexts, as illustrated in examples (7) – (15), (iii) the fact that the *it* subjects of weather sentences are best conceived as referential, (iv) the Allegranza-Van Eynde innovation of the Head-Functor Construction, based on the SELECT feature, which in the present context enables the subject of the as-if complement clause of an erstwhile perception verb to be visible in the latter's ARG-ST, and (v) that aspect of the architecture of SBCG (and of related forms of HPSG) that makes it possible for a *realized* external argument to nonetheless be visible in the ARG-ST of a governing predicator.

For illustration we consider the aspirational CR sentence (29). First, we take up the ordinary listeme *like,* which appears in examples (1-4), (10), (14), (15) and (29), recalling that examples (7-15) are not CR. (Since scope constraints play no direct role in the present analysis, we adopt a kind of MRS Lite notation, in which constraints on relative scope, such as *qeq* constraints, are unexpressed, in effect ignoring the distinction between LTOP and GTOP.)

(29) Trump looks like he disappeared.

(30) Listeme *like*

$$\begin{bmatrix} \text{FORM} & \langle \textit{like} \rangle \\ \text{SYN} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \textit{adverb} & \\ \text{XARG} & \textit{none} \\ \text{SELECT} & \begin{bmatrix} \textit{verb} & \\ \text{SYN} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{VFORM} & \textit{fin} \\ \text{XARG} & \text{NP} \\ \text{INV} & - \end{bmatrix} \\ \text{VAL} & \langle\ \rangle \end{bmatrix} \\ \text{SEM} & \begin{bmatrix} \text{LTOP} & l \\ \text{INDEX} & e \end{bmatrix} \end{bmatrix} \end{bmatrix} \\ \text{VAL} & \langle\ \rangle \\ \text{MRKG} & \textit{asif} \end{bmatrix} \\ \text{SEM} & \begin{bmatrix} \text{FRAMES} & \langle \textit{as-if}(e',l) \rangle \\ \text{INDEX} & e' \end{bmatrix} \end{bmatrix}$$

The functor *like* is an adverb that SELECTs a finite clause ([VFORM *fin*], [INV –]); the selected clause specifies a nominal external argument and an empty valence list. The semantics of *like* applies the *as-if-frame* to the LTOP of its selectee clause. Also, *like* is marked *asif*. As a functor, it will transmit [MARKING *asif*] to its MOTHER in a *head-functor-construct*.

The only addition we make to the grammar of English to account for the CR facts is the lexical rule in (31), which takes as input a general perception verb lexeme, that is, one whose FRAMES value is compatible with <*gen-percep-fr*>, and yields a CR verb lexeme as output.[4] A CR verb (as specified by the mother in (31)) subcategorizes for an NP subject *Z* and an as-if clause complement. Semantically, it specifies a *seeming-frame* with three arguments: the Davidsonian event variable *e,* a human experiencer argument *j*, and the semantic information, labeled *l* of the *as-if* complement, which is the state of affairs that *seems* to *j* to be the case. Also – and essential to the CR phenomenon – the CR verb, identifies the index of its external argument *Z* with the index of the pronominal external argument of the *as-if* complement.

---

[4] Comment on notation: For constraint descriptions (AVMs) [A], [B], the paired tags ‘*X* ! [A]’ and ‘*X* : [B]’ indicate that [A] and [B] are identical in all respects in which they are not shown to differ. This abbreviatory notation is commonly used in SBCG in the statement of lexical rules, though not limited to that use. (See Sag 2012: 125, including footnote, for further discussion.) AVMs in boxes represent model objects (feature structures, as against descriptions of feature structures, such as types and constructions).

(31) Copy Raising Construction (↑*derivational-cxt*) [a lexical rule]
*copy-raising-v-cxt* ⇒

$$
\left[\begin{array}{ll}
\text{MTR} & X\,! \left[\begin{array}{ll}
\text{SYN} & \left[\begin{array}{ll}
\text{CAT} & \left[\text{XARG } Z{:}\text{NP}_i\right] \\
\text{VAL} & \left\langle Z, \left[\begin{array}{ll}
\text{SYN} & \left[\begin{array}{ll}
\text{CAT} & \left[\begin{array}{ll}\text{VFORM} & \textit{fin}\\ \text{XARG} & \text{NP}[\textit{pron}]_i\end{array}\right]\\
\text{VAL} & \langle\,\rangle\\
\text{MRKG} & \textit{asif}
\end{array}\right]\\
\text{SEM} & \left[\text{LTOP } l\right]
\end{array}\right]\right\rangle
\end{array}\right]\\
\text{SEM} & \left[\begin{array}{ll}\text{FRAMES} & \langle \textit{seeming-fr}(e), \textit{human-fr}(j), l\rangle\\ \text{INDEX} & e\end{array}\right]
\end{array}\right]\\
\text{DTRS} & \left\langle X{:}\left[\begin{array}{l}\textit{verb}\\ \text{SEM}\ \left[\text{FRAMES}\ \langle \textit{gen-perception-fr}(e)\rangle\right]\end{array}\right]\right\rangle
\end{array}\right]
$$

By way of illustration, Figure 1 shows the derivation tree for the aspirational sentence (29) *Trump looks like he disappeared*.

We take sentence (29) to have the approximate gloss 'It seems as if Trump disappeared'. Starting at the bottom of the tree, consider the right, head-daughter sign. In the SEMANTICS value, the FRAMES value specifies the *disappear-frame* applied to the event variable *e*, which is the INDEX of the sign, and the individual variable *i*. The FRAMES list also contains the *past-fame* applied to *e*. According to the tag $\boxed{1}$ the head daughter is the value of the SELECT feature of the left, functor daughter, *like*, in a *head-functor-construct*. The functor daughter's FRAMES feature applies the *as-if-frame* to the local INDEX *e'* and to the *disappear* and *past* predications jointly labelled $l_1$, the value of the LTOP of the head daughter. The *as-if-frame* is assumed to be interpreted by an epistemic operator. The *like* sign also introduces the MARKING value *asif*, which is passed up to the MOTHER sign, *like he disappeared*, in a *head-functor-construct*. The mother of that construct, *like he disappeared,* gathers up the frames of its two daughters and inherits the rest of its information from the head daughter.

To build the VP *looks like he disappeared* with the Predicational Head-Complement Construction, we note that we have employed the Copy Raising lexical rule (31) to build the CR form of *look* from general perception *look*. Inflected CR *looks* introduces in its FRAMES list the *present-frame* predicated

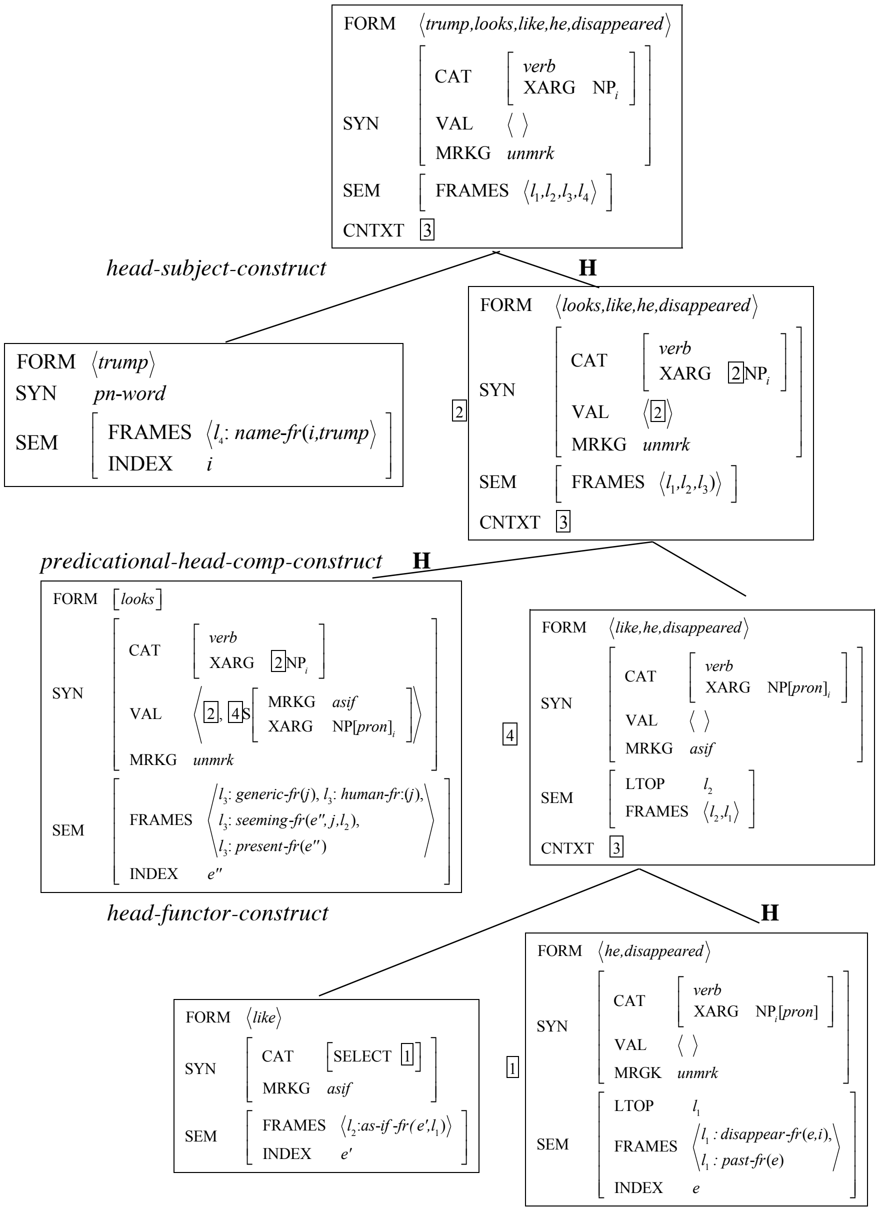



Figure 1. Derivation Tree for *Trump looks like he disappeared*

of the local index *e''*. In this example the semantic equivalent of so-called arbitrary PRO is introduced as the experiencer of the *seeming* predication by application of the *generic-fr* to the bound variable *j*, restricted by the *human-frame*. The *seeming-frame* specifies two arguments in addition to the event variable *e''*: *j* and the *asif-fr* predication $l_2$. The *seeming* predication thus specifies that the as-if predication $l_2$ is the state of affairs that seems to the generic human *j* to be the case. *Looks* also specifies in its VALENCE list the CR-characteristic coindexation of its NP XARG and the XARG of its *asif-clause* complement. The latter valent, bearing the tag $\boxed{4}$, is discharged in the *predicational-head-complement construct* by the right sister of *looks*. We have already discussed this sign as the mother of the *like-he-disappeared* construct. As a head, the *looks* constituent bears the MARKING value *unmarked*, which it passes up to its mother, *looks like he disappeared,* in the *predicational-head-complement-construct*.

Finally, The Head-Subject Construction (AKA Subject-Predicate Construction) realizes the remaining valent $\boxed{2}$ as the subject *Trump*. The mother constituent of the *head-subject-construct, Trump looks like he disappeared,* gathers up the four frames of its daughters, inherits the marking value *unmarked* from the head VP, and expresses with an empty VALENCE list the fact that the NP *trump*, whose index *i* is identified with that of the pronoun *he*, has satisfied the last remaining valent.

**Conclusion**

The lexical rule analysis of CR presented here has benefited particularly from three empirical observations and two formal aspects of SBCG and related versions of HPSG. The empirical observations are not necessarily new, but they have not to my knowledge been marshalled in this combination before. They are that (i) to each verb participating in CR there corresponds a homophonous general perception verb, (ii) the pronoun *it* that serves as the subject of weather verbs is referential, and (iii) the word string initiated by *like, as if,* or *as though* in a CR sentence forms a single constituent, a type of subordinate clause (christened here "as-if" clause) that occurs as both complement and modifier elsewhere in the grammar. The formal aspects of SBCG/HPSG that are strategically employed in the present analysis are as follows: (i) The SELECT feature makes it possible for the finite clause requirement of the CR-marking expression (*like, as if,* or *as though*) to be a selectee rather than a complement of that expression. This circumstance identifies the XARG of the finite selectee with the XARG of the as-if clause, and so renders it potentially visible in the ARG-ST of the CR verb. (ii) Since the XARG feature, unlike the ARG-ST feature, percolates up the line of heads, the XARG of the as-if complement can be addressed in the ARG-ST of the CR verb and specified as a pronoun that shares its index with that of the matrix XARG. When the three empirical observations are considered, the SBCG/HPSG formalism enables an account of the CR facts with a lexical rule that inputs a general perception verb and outputs a verb that identifies the index of its external argument with the index of the external argument of its as-if complement and whose semantics specifies a mildly evidentiary *seeming* meaning of which the experiencer argument may be covert and interpreted generically.

This paper has considered copy raising only for English. Future research will have to determine whether this approach is helpful in understanding copy raising in other languages.

**Acknowledgments**

The story of CR presented here has arisen from many conversations on this subject with Laura Michaelis. I owe Rui Chaves an unpayable debt for his generous counsel on formalizing the analysis. I thank Jong-Bok Kim and Eric Potsdam for helpful email correspondence. I would also like to express my appreciation to the organizing committee of the 2021 HPSG International Conference for inviting me, as well as to the conference participants, several of whom, especially Adam Przepiórkowski, provided helpful suggestions. Remaining flaws are, of course, mine.

## References

Allegranza, V. 1998. Determiners as functors: NP structure in Italian. *Romance in HPSG*, Vol. 75 of CSLI Lecture Notes ed. by Sergio Balari and Luca Dini. Stanford: CSLI, 55-107.

Asudeh, A. & Toivonen, I. 2012. Copy raising and perception. *Natural Language & Linguistic Theory* 30, no. 2, 321-380.

Copestake, A., Flickinger, D., Pollard, C., & Sag, I. A. 2005. Minimal recursion semantics: An introduction. *Research on language and computation, 3*(2), 281-332.

Davis, A. R., & Koenig, J. P. 2000. Linking as constraints on word classes in a hierarchical lexicon. *Languag,e 76*(1), 56-91.

Heycock, C. 1994. *Layers of Predication*. New York: Garland Publishing Co.

Landau, I. 2011. Predication vs. aboutness in copy raising. *Natural Language & Linguistic Theory*, *29*(3), 779-813.

Huddleston, R., and Pullum, G.K. 2002. *The Cambridge grammar of the English language*. Cambridge University Press. Cambridge.

Kim, J. B. (2014). English copy raising constructions: Argument realization and characterization condition. *Linguistics*, *52*(1), 167-203.

Lappin, S. 1983. Theta-roles and NP movement. *The Proceedings of NELS 13,* ed. by Peter Sells and Charles Jones, 121-128. Amherst, MA: GLSA.

Lappin, S. 1984. Predication and raising. *The Proceedings of NELS 14, ed. by Charles Jones and Peter Sells, 236-252*. Amherst, MA. GLSA.

Potsdam, E., & Runner, J. 2001. Richard returns: Copy raising and its implications. *Proceedings of CLS*, *37*, 453-468.

Rogers, A. 1972. Another look at flip perception verbs. *Papers from the Eighth Regional Meeting of the Chicago Linguistic Society,* 303-315. Chicago: Chicago Linguistic Society

Rogers, A. 1974a. A transderivational constraint on Richard? *Papers from the Tenth Regional Meeting of the Chicago Linguistic Society* , 551-558. Chicago: Chicago Linguistic Society.

Rogers, A. 1974b. *Physical Perception Verbs in English: A Study in Lexical Relatedness*. UCLA Ph.D dissertation.

Sag, I. A. 2012. Sign-based construction grammar: An informal synopsis. In *Sign-Based Construction Grammar* ed. by Hans C. Boas and Ivan A. Sag. Stanford: CSLI. 69-202.

Ura, H. 1994. Varieties of raising and the feature-based bare phrase structure theory. *MIT Occasional Papers in Linguistics (7)*. Cambridge, MA: MIT Working Papers in Linguistics.

Van Eynde, F. (2006). NP-internal agreement and the structure of the noun phrase. *Journal of Linguistics*, *42*(1), 139-186.

# Verbal reduplication in Mandarin Chinese: An HPSG account

Yanru Lu
Humboldt-Universität zu Berlin

Stefan Müller
Humboldt-Universität zu Berlin

Proceedings of the 28th International Conference on
Head-Driven Phrase Structure Grammar

Online (Frankfurt/Main)

Stefan Müller, Nurit Melnik (Editors)

2021

Frankfurt/Main: University Library

pages 83–103

Keywords: Chinese, HPSG, reduplication

Lu, Yanru & Stefan Müller. 2021. Verbal reduplication in Mandarin Chinese: An HPSG account. In Stefan Müller & Nurit Melnik (eds.), *Proceedings of the 28th International Conference on Head-Driven Phrase Structure Grammar, Online (Frankfurt/Main)*, 83–103. Frankfurt/Main: University Library. DOI: 10.21248/hpsg.2021.5.

**Abstract**

The current study presents an HPSG analysis for verbal reduplication in Mandarin Chinese. After discussing reduplication's interaction with *Aktionsarten* and aspect markers, we argue that it is a morphological rather than a syntactic process. We put forward a lexical rule for verbal reduplication in Mandarin Chinese, and the different forms of reduplication are captured in an inheritance hierarchy. The interaction between verbal reduplication and aspect marking is handled by multiple inheritance. This analysis covers all forms of verbal reduplication in Mandarin Chinese and has none of the shortcomings of previous analyses.

# 1 Introduction

In Mandarin Chinese, verbs can be reduplicated to express a delimitative aspectual meaning (e.g. Chao 1968; Q. Chen 2001; Dai 1997; Li 1996; Li & Thompson 1981; Tsao 2001; Xiao & McEnery 2004; Yang 2003; Zhu 1998). This means that the event or state denoted by the verb happens in a short duration and/or at a low frequency (Xiao & McEnery 2004: 155), as illustrated in (1).[1] Thus, verbal reduplication in Mandarin Chinese is often translated as doing something "a little bit/for a little while".

(1) a. qing ni chang zhe dao cai.
please you taste this CLF dish
'Please taste this dish.'

b. qing ni *chang-chang* zhe dao cai.
please you taste-taste this CLF dish
'Please taste this dish a little bit.'

The current study tries to determine a suitable formal and unified analysis for the structure of verbal reduplication in Mandarin Chinese. It provides a novel HPSG analysis of this phenomenon and avoids the problems of previous approaches.

We will present in Section 2 the forms and syntactic distribution as well as the semantics of verbal reduplication in Mandarin Chinese. Importantly, we restrict the object of this study to the AA, A-*yi*-A, A-*le*-A, A-*le*-*yi*-A, ABAB and AB-*le*-AB forms (these templates will be illustrated below). We will also discuss in this section, with the help of corpus data, the question of whether the reduplication is a morphological or a syntactic process. In Section 3, we will discuss the advantages and drawbacks of previous approaches. Finally, in Section 4, we will present a new HPSG account for verbal reduplication in Mandarin Chinese.

The data in this paper was drawn from several sources. In addition to introspection, the Modern Chinese subcorpus of the corpus of the *Center for Chinese Linguistics of Peking University* (CCL) (Zhan et al. 2003; 2019) was consulted. Other examples from novels and plays written by native speakers were also considered.

[†]We want to thank Elizabeth Pankratz for comments on an earlier version of this paper.

[1]Reduplications in the example sentences will be set in italics.

## 2 The phenomenon

Verbal reduplication in Mandarin Chinese takes the forms listed in (2).

(2) a. for monosyllabic verbs: *shuo* 'say'

i. shuo-shuo — AA
say-say

ii. shuo-yi-shuo — A-*yi*-A
say-one-say

iii. shuo-le-shuo — A-*le*-A
say-PFV-say

iv. shuo-le-yi-shuo — A-*le*-*yi*-A
say-PFV-one-say

v. shuo-shuo-kan — AA-*kan*
say-say-look

vi. shuo-kan-kan — A-*kan*-*kan*[2]
say-look-look

b. for disyllabic verbs: *lai-wang* come-go 'come and go/communicate'

i. lai-wang-lai-wang — ABAB
come-go-come-go

ii. lai-wang-le-lai-wang — AB-*le*-AB
come-go-PFV-come-go

iii. lai-lai-wang-wang — AABB
come-come-go-go

c. for Verb-Object (V-O) compounds: *chang-ge* sing-song 'sing'

i. chang-chang-ge — AAB
sing-sing-song

ii. chang-yi-chang-ge — A-*yi*-AB
sing-one-sing-song

iii. chang-le-chang-ge — A-*le*-AB
sing-PFV-sing-song

Arcodia et al. (2014), Fan (1964), Melloni & Basciano (2018) and Xie (2020) compared the AA, ABAB and AABB forms of reduplication and found a number of differences for the AA and ABAB forms compared to the AABB form in terms of their semantics, productivity, syntactic distribution and origin. The current study will only focus on the AA, A-*yi*-A, A-*le*-A, A-*le*-*yi*-A, ABAB and AB-*le*-AB forms, though AA-*kan*, A-*kan*-*kan*, AAB, A-*yi*-AB, A-*le*-AB will also be mentioned occasionally to provide further arguments. In what follows, the term *reduplication* will be

[2] This form is more common in Taiwan than in Mainland China.

used to refer specifically to the AA, A-*yi*-A, A-*le*-A, A-*le*-*yi*-A, ABAB and AB-*le*-AB forms, if not specified otherwise.

The reduplication has a similar syntactic distribution to an unreduplicated verb. The reduplication cannot be aspect-marked, though, except with the perfective aspect marker *le* (for further discussion, see Section 2.2). The reduplication is incompatible with an expression that quantifies the duration or the extent of the event expressed in the sentence, as in (3) (L. Chen 2005: 114–115; Li 1998: 83–84). This is probably because the reduplication already contains a quantity meaning (L. Chen 2005: 114–115; Li 1998: 84).

(3) a. ta yi tian pao shi li.
he one day run ten mile
'He runs ten miles a day.'

b. * ta yi tian *pao-pao* shi li.
he one day run-run ten mile

The reduplication has a *delimitative* meaning (e.g. Chao 1968; Q. Chen 2001; Dai 1997; Li 1996; Li & Thompson 1981; Tsao 2001; Xiao & McEnery 2004; Yang 2003; Zhu 1998). The semantics of the reduplication has the properties of transitoriness, holisticity and dynamicity (Dai 1997: 70–79; Xiao & McEnery 2004: 155–159). It presents the situation as a transitory and non-decomposable whole, which involves not only changes in the initiation and termination of an event, but also changes in the transitory process itself. Compared to (4a), which could mean that the protagonist kept staring at the footprint, (4b) indicates that the protagonist took a brief look or several brief looks at the footprint and looked away in the end, which is a process full of changes.

(4) a. Wu Xumang kan-le zuo-an shi liuxia de jiaoyin …
Wu Xumang look-PFV commit-crime when leave DE footprint
(Xiao & McEnery 2004: 158)
'Wu Xumang looked at the footprint left when the crime was committed.'

b. Wu Xumang *kan-le-kan* zuo-an shi liuxia de jiaoyin …
Wu Xumang look-PFV-look commit-crime when leave DE footprint
(Xiao & McEnery 2004: 158)
'Wu Xumang looked a little bit at the footprint left when the crime was committed.'

As for the other forms of the reduplication, A-*yi*-A is considered to have the same core semantics as AA, although its pragmatic uses may be different (Yang 2003). The semantics of A-*le*-A can be deduced compositionally from its structure. It is a combination of the perfective aspect and delimitativeness, "conveying a transitory event which has been actualized" (Xiao & McEnery 2004: 151). In contrast, AA-*kan* and A-*kan-kan* are described as expressing a "try … and find out" meaning (Cheng 2012: 63). Tsao (2001: 290) also observed that the tentative meaning is particularly prominent when the reduplication is followed by *kan* 'look'. We consider the tentativeness implied by these two forms to be a pragmatic extension of delimitativeness. The tentative meaning is made prominent by the verb *kan* 'look', and the whole structure can be understood as "do A a little bit and see".

## 2.1 Interaction with *Aktionsarten*

Previous research often claimed that the reduplication can only be used for verb classes of certain *Aktionsarten*, while it is infelicitous for others. Hong (1999: 277–278) and Li & Thompson (1981: 234–235) suggested that reduplication is only possible for volitional activity verbs. Dai (1997: 70–71) and Tsao (2001: 290) both considered that reduplication can only be used in dynamic situations. The former further claimed that achievement verbs cannot be reduplicated. Arcodia et al. (2014: 20), Basciano & Melloni (2017) and Xiao & McEnery (2004: 155) proposed that only [+dynamic] and [−result] verbs can be reduplicated. This means that the reduplication can only interact with activities and semelfactives, but not with states and achievements.

Q. Chen (2001: 53) and Yang (2003: 10–11) acknowledged that the reduplication of non-volitional verbs is more restricted than that of volitional ones. But Zhu (1998: 381–382) listed a number of non-volitional predicates that can be reduplicated. We found the examples shown in (5) in CCL where non-volitional verbs *weiqu* 'feel wronged', *ren-xing* 'be willful' and *diao* 'drop' are reduplicated.

(5) a. dajia ye zhihao *weiqu-weiqu* le. (CCL)
everybody also can.only feel.wronged-feel.wronged PTC
'Everybody can only feel wronged a little bit.'

b. ta-men neng zuo de buguo shi *ren-ren-xing* shua
she-PL can do DE just be be.willful-be.willful-temperament play
dian'er xiao piqi *diao-diao* yanlei shenme de. (CCL)
a.little small temper drop-drop tear what DE
'What they can do is just to be a little bit willful, to lose their temper a little bit and to drop a little bit of tears or something.'

It is true that the reduplication of stative and achievement verbs is not as easily acceptable as that of activities and semelfactives. Compared to the questionable reduplication of the stative verb *bing* 'be sick' in (6a) and that of the achievement verb *ying* 'win' in (6b), the reduplication of the activity verb *kan* 'watch' in (6c) and that of the semelfactive verb *kesou* 'cough' in (6d) is readily acceptable.

(6) a. ? ta *bing-bing* jiu hao le. (Xiao & McEnery 2004: 155)
he be.sick-be.sick then well PTC
Intended: 'He was sick for a little while and then got well.'

b. ? ta *ying-le-ying* na chang bisai. (Xiao & McEnery 2004: 155)
he win-PFV-win that CLF competition
Intended: 'He won that competition a little bit.'

c. ta *kan-le-kan* na chang bisai.
he watch-PFV-watch that CLF competition
'He watched that competition for a little while.'

d. ta *kesou-kesou* jiu hao le.
he cough-cough then well PTC
'He coughed a little bit and then got well.'

However, examples such as those in (7a)–(7b) were found in novels and plays written by native speakers, and sentences like (7c) and (7d) were constructed by native speaker linguists. Here, achievement verbs like *wang* 'forget' and *sheng* 'give birth to' and stative verbs like *shutan* 'be comfortable' and *bing* 'be sick' are reduplicated.

(7) a. deng ren-men ba zhe jian shi *wang-wang* zai shuo ba.[3]
wait people-PL BA this CLF incident forget-forget then talk PTC
'Let's wait until people forget this incident a little bit and then talk about it.'

b. huitou mo ge zao *shutan-shutan* ba.[4]
later wipe CLF bath be.comfortable-be.comfortable PTC
'Let's take a bath later and be comfortable for a little while.'

c. wo zhen xiang *bing-yi-bing*, xie ta ge shi tian ban yue.
I really want be.sick-one-be.sick rest it CLF ten day half month
(Q. Chen 2001: 54)
'I really want to be sick for a little while and rest for ten days or half a month.'

d. jiao ta *sheng-sheng* xiaohai, jiu zhidao zuo muqin de gan-ku le.
let she give.birth.to-give.birth.to child then know COP mother DE sweet-bitter PTC
(L. Chen 2005: 112)
'Let her try to give birth to a child and then she will know the bittersweetness of being a mother.'

This shows that although the reduplication does have a tendency to interact with volitional verbs and with activities and semelfactives due to its dynamic meaning, this is by no means a rigid constraint, and non-volitional verbs, states and achievements can be reduplicated in certain contexts as well.

## 2.2 Interaction with aspect markers

As mentioned above, the reduplication can only be marked by the perfective aspect marker *le* but not other aspect markers.[5] We believe this incompatibility to be for semantic reasons.

[3] Liu, Zhen. 1963. *Chang chang de liushui [Long long water]*, 72. Beijing: The Writers Publishing House.

[4] Tian, Han. 1959. *Tianhan xuanji [Selected works of Tianhan]*, 122. Beijing: People's Literature Publishing House.

[5] There is no consensus on which elements exactly are considered aspect markers in Mandarin Chinese. We only discuss the most commonly recognized ones here.

Xiao & McEnery (2004: Ch. 4) considered the markers *le* and *guo*, as well as reduplication, to indicate perfective aspects. The perfective aspect marker *le* is compatible with reduplication, while the experiential aspect marker *guo* is not. *Le* "can focus on both heterogeneous internal structures and changing points" (Xiao & McEnery 2004: 129). It is compatible with the reduplication because its dynamicity can relate not only to the termination or instantiation of an event (a point of change), but also to the process of the situation, just like the dynamicity of the reduplication.

On the other hand, the experiential aspect marker *guo* cannot co-occur with a reduplicated verb because its dynamicity relates to an "experiential change" (Xiao & McEnery 2004: 148), namely that a situation has been experienced historically and that "the final state of the situation no longer obtains" at the reference time (Xiao & McEnery 2004: 144). It is clear that *guo* only indicates a change at the termination of a situation and cannot express the dynamicity within a situation. Hence, it is incompatible with the semantics of the reduplication.

Due to the holistic semantics of the reduplication, it is incompatible with imperfective aspect markers—the durative aspect marker *zhe* and the progressive aspect marker *zai*—as both only focus on a part of the situation and do not view the situation as a whole (Xiao & McEnery 2004: Ch. 5).

From the illustration above, it seems that due to its semantics, reduplication can only be marked by *le* but not the other aspect markers.

## 2.3 Word vs. phrase

The literature on reduplication makes different assumptions on whether it is a morphological or syntactic phenomenon. Chao (1968) and Li & Thompson (1981) listed reduplication under morphological processes. Arcodia et al. (2014), Basciano & Melloni (2017), Melloni & Basciano (2018), Xie (2020), Xiong (2016) and Yang & Wei (2017), on the other hand, claimed it to be syntactic. This section reviews the arguments in Xie (2020) and applies the tests proposed by Duanmu (1998) and Schäfer (2009) to distinguish words from phrases in Mandarin Chinese. The results argue for a morphological status of reduplication.

Xie (2020) compared the AA and the ABAB forms of reduplication with the AABB form and claimed that AA and ABAB are syntactic processes, while AABB is morphological. She pointed out that AA and ABAB behave differently from AABB in their productivity, possibility of *le* insertion, categorial stability, transitivity and input/output constraints. While AA and ABAB are highly productive, AABB shows low productivity. *Le* can be inserted freely into AA and ABAB but not into AABB. The output of AA and ABAB does not change the grammatical category of the input (verb), but the output of AABB could have other categories such as adverb or adjective. AA and ABAB do not change the valency of the input verb, but AABB makes a transitive verb intransitive. The two groups also have different input and output constraints. Xie (2020) claimed that only dynamic and volitional verbs can undergo AA or ABAB reduplication (but see Section 2.1). On the other hand, AABB requires its input to be a complex verb whose constituents are either synonymous, antonymous or logically coordinated. Moreover, the output of AABB has an increasing meaning, i.e. an event happens repeatedly or continuously, as opposed to the delimitative meaning of AA and ABAB.

However, these criteria do not suitably distinguish morphological and syntactic processes. A morphological process can be productive, and it does not necessarily change the category or valency of the input. Further, if *le* is considered to be a morphological element (e.g. Huang et al. 2009; Müller & Lipenkova 2013), the insertion of *le* does not have to be viewed as a syntactic process either. It seems that Xie (2020) only showed that AA and ABAB are different processes than AABB, but not necessarily that the former is syntactic while the latter morphological.

It is, therefore, necessary to resort to other tests that are intended to distinguish words from phrases. Duanmu (1998) and Schäfer (2009) proposed the following four tests to distinguish words from phrases in Mandarin Chinese: semantic compositionality, phrasal extension, phrasal substitution and conjunction reduction.[6]

The semantic criterion is that the meaning of a phrase is usually built up in a compositional way while that of a word is usually not (Duanmu 1998: 140; Schäfer 2009: 275). The meaning of the reduplication is not compositional, as it does not mean that the event denoted by the verb happens twice or multiple times, but rather that the event happens for a short duration and/or a low frequency. This non-compositionality suggests that a reduplication is more word-like.

The first syntactic test is phrasal extension, namely the addition of optional elements (Duanmu 1998: 150; Schäfer 2009: 280). If the unit is a phrase, then optional elements that may appear in phrases should be able to be added into it. And subparts of a phrase should be able to be modified separately. If the unit is a word, however, then neither of these should be possible. As illustrated in (2) in Section 1, the base verb and its reduplicant can only be separated by *le* and *yi*, but the word status of these elements cannot be easily defined. We mentioned above that whether aspect markers like *le* are considered to be morphological or syntactic elements depends on the theoretical framework (and possibly the target language). And the status of *yi* is unclear. Turning to the second part of this test, separate modification, we see that elements in the reduplication cannot be modified individually. Compared to (8a), where the adverbial *qingsheng de* 'quietly' modifies the whole reduplication, (8b) is ungrammatical, as the adverbial cannot modify the reduplicant alone. All in all, by the test of phrasal extension, reduplications behave more like words than like phrases.

(8) a. ta qingsheng de *xiao-le-xiao*.
he quietly DE laugh-LE-laugh
'He quietly laughed a little bit.'

b. * ta *xiao-le* qingsheng de *xiao*.
he laugh-PFV quietly DE laugh

The second syntactic test is phrasal substitution, namely the substitution of smaller exemplars of a specific category with a full-blown XP (Duanmu 1998: 152; Schäfer

[6] It is important to note that none of these criteria are sufficient or necessary to determine the word or phrase status of an expression. Nevertheless, they together might suggest which of the two statuses is more likely.

2009: 280). If a part of an expression is actually an XP that only contains one element, a full realization of this XP should be possible as well. Otherwise, this expression is considered to be a word. As (9) shows, in a reduplication structure, it is ungrammatical to substitute each element with a full VP. Again, reduplications look more word-like than phrase-like.

(9) a. ta *chang-le-chang* tang.
he taste-PFV-taste soup
'He tasted the soup a little bit.'

b. * ta *chang tang le chang tang*.
he taste soup PFV taste soup

Finally, the third syntactic criterion is conjunction reduction. Reduction should only be possible for coordinated phrases and not for coordinated words (Duanmu 1998: 137; Schäfer 2009: 283). For the reduplication, conjunction reduction does not seem to be possible. In (10a), the reduplication *jiao-jiao* 'chew a little bit' is coordinated with a simple verb *mo* 'apply' together with the adverbial *yidian* 'a little bit'. Without the adverbial *yidian* 'a little bit', *mo* 'apply' by itself cannot express the additional 'a little bit' meaning, even when it is coordinated with a reduplicated verb. Similarly, in (10b), the reduplication *kan-le-kan* 'looked a little bit' is coordinated with the predicate *zou-le chulai* 'walked out'. The verb in the latter case is not reduplicated, and it cannot express the delimitative meaning either. Once again, this criterion suggests that reduplications do not have this expected property of phrases.

(10) a. wujian gong-xiu mo dian bohe-gao huo *jiao-jiao*
midday work-break apply a.little mint-cream or chew-chew
kouxiangtang. (CCL)
chewing.gum
'During the working break at midday, apply a little bit of mint cream or chew some chewing gum a little bit.'

b. Song Ailing *kan-le-kan* yupen you zou-le chulai. (CCL)
Song Ailing look-PFV-look bath.tub again walk-PFV out
'Song Ailing looked at the bath tub a little bit and walked out again.'

Following the analyses above, it is clear that the reduplication failed all of the tests for phrasal status. Therefore, it seems more likely to assume the reduplication to be a morphological process rather than a syntactic one.

## 3 Previous analyses

Previous analyses of the reduplication in Mandarin Chinese and in other languages can be classified into three groups: those that consider the reduplicant to be a verbal classifier, those that take the reduplicant to be an aspect marker and those that postulate a special reduplication structure.

Chao (1968), Fan (1964) and Xiong (2016) analyzed the reduplicant in Mandarin Chinese as a verbal classifier. A verbal classifier is a measure for verbs of action that "expresses the number of times an action takes place" (Chao 1968: 615). In this analysis, the first element in the reduplication is the actual verb, the second element is a verbal classifier borrowed from the verb, and *yi* 'one' is an optional pseudo-numeral that only has an abstract 'a little bit' meaning. Although the reduplication and the verbal classifier both serve to quantify the extent of an event and can often be used interchangeably, they behave differently in the following three ways. First, the verb and the verbal classifier can be separated, while the reduplication cannot (Paris 2013: 269). Second, unlike verbal classifiers, the *yi* 'one' in A-*yi*-A cannot be replaced by other numerals (Yang & Wei 2017: 299–230). Third, idioms lose their idiomatic meaning when used with verbal classifiers, but maintain their idiomatic meaning with reduplications (Yang & Wei 2017: 230–231). Based on these observations, it seems inappropriate to view the reduplicant as a kind of verbal classifier.

A number of studies consider the reduplicant to be a delimitative aspect marker (Arcodia et al. 2014; Basciano & Melloni 2017; Yang & Wei 2017) due to the delimitative meaning of the reduplication. Travis (1999; 2000) also analyzed the reduplication in Tagalog as an imperfective aspect marker. In Arcodia et al. (2014) and Basciano & Melloni's (2017) analysis, the reduplication of stative and achievement verbs is structurally ruled out, which does not fit the empirical observations we presented in Section 2.1. The other analyses along these lines all have problems with the A-*yi*-A form, as the addition of *yi* in the reduplication does not lead to further syntactic or semantic functions. Moreover, although the reduplicant is postulated as a special affix that copies the phonology of the base morpheme, the exact nature of this copying process is not formalized.

Ghomeshi et al. (2004) gave an analysis for Contrastive Reduplications (CRs) in English like (11) based on the Parallel Architecture proposed by Jackendoff (1997; 2002), as shown in Figure 1.[7]

(11) I make the tuna salad, and you make the *SALAD-salad*.

$$\begin{array}{ccc} \text{Phonology} & \text{Syntax} & \text{Semantics} \\ \mathrm{P}_{j,k}\ \mathrm{P}_k & \mathrm{X/XP}^{min} & \\ & \mathrm{CR}^{syn}{}_j\ \ \mathrm{X/XP}^{min}{}_k & \begin{bmatrix} Z_k \\ \begin{bmatrix} P/E/S \\ CTR \end{bmatrix}_j \end{bmatrix} \end{array}$$

Figure 1: Analysis for CRs in English according to Ghomeshi et al. (2004: 344)

Applying this to the reduplication in Mandarin Chinese, the structure should be something like Figure 2.[8,9] Further, A-*le*-A can be handled as two compositional processes [[[A]-*le*] -A]. Moreover, the *yi* in A-*yi*-A and A-*le*-*yi*-A can simply be

[7] P = phonological unit, P/E/S CTR = prototypical/extreme/salient contrast, $\mathrm{XP}^{min}$ = XP without its specifier

[8] DELIM = delimitative

[9] Although the reduplication in Mandarin Chinese does not have a contrastive meaning, we preserved the notation of $\mathrm{CR}^{syn}$ in Ghomeshi et al. (2004) to simply refer to the reduplicant. In English, it makes

viewed as a dangling phonological unit. In this case, the phonological unit ⟨ *yi* ⟩ is coindexed neither with a syntactic unit nor with a semantic one.

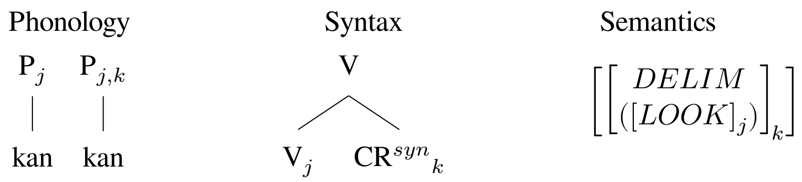



Figure 2: Analysis for AA following Ghomeshi et al. (2004)

This analysis correctly captures the fact that the addition of *yi* does not change the syntactic and semantic behavior of the reduplication. It also provides a formal account for the phonology of the reduplication. On the other hand, by assuming a construction specially for the reduplication, Ghomeshi et al.'s (2004) approach loses the connection between the reduplication and other aspect markers in Mandarin Chinese, unlike the affixation analysis.

Finally, Fan et al. (2015) provided a unified HPSG analysis for the reduplication of both verbs and adjectives in Mandarin Chinese. They considered reduplication to be a morphological process and modeled the reduplication via lexical rules. They regarded the reduplication as functioning as an intensifier predicate, which has the subtypes *redup_up_x_rel* and *redup_down_x_rel*. They provided the lexical rule (12) for reduplication in general, and further proposed *redup-a-lr* and *redup-v-lr* as subtypes of *redup-type*, as illustrated in (13) and (14) respectively. The orthography is handled separately. The AABB form for adjectives and the ABAB form for verbs, as well as the AAB form for V-O compounds, are handled as irregular derivation forms.

(12)
$$\begin{bmatrix} \textit{redup-type} & \\ \textsc{cat|head} & \boxed{1} \\ \textsc{val} & \boxed{2} \\ \textsc{cont} & \boxed{3}\ \textsc{hook} \begin{bmatrix} \textsc{ltop} & \boxed{4} \\ \textsc{ind} & \boxed{5} \end{bmatrix} \\ \textsc{c-cont} & \left\langle \begin{bmatrix} \textit{event-rel} & \\ \textsc{pred} & \textit{intensifier\_x\_rel} \\ \textsc{lbl} & \boxed{4} \\ \textsc{arg1} & \boxed{5} \end{bmatrix} \right\rangle \end{bmatrix} \rightarrow \begin{bmatrix} \textsc{cat|head} & \boxed{1} \\ \textsc{val} & \boxed{2} \\ \textsc{cont} & \boxed{3} \end{bmatrix}$$

(13)
$$\begin{bmatrix} \textit{redup-a-lr} \subset \textit{redup-type} & \\ \textsc{cat|head} & \textit{adjective} \\ \textsc{val} & \begin{bmatrix} \textsc{spr}\ \langle\rangle \end{bmatrix} \\ \textsc{c-cont} & \left\langle \begin{bmatrix} \textsc{pred}\ \textit{redup\_up\_x\_rel} \end{bmatrix} \right\rangle \end{bmatrix}$$

sense to assume $CR^{syn}$ to be a syntactic unit, because the base can be $XP^{min}$. But for Mandarin Chinese, the base can only be V. As Ghomeshi et al. (2004: 353) wrote: "when applying to its smallest scope, X inside of a word, it has the feel of other things that attach there, i.e., morphological affixes". It seems that it suffices to assume the reduplication in Mandarin Chinese to be a morphological phenomenon (cf. Section 2.3). We continue to call the second column "syntax" to preserve the consistency of the notations.

ORTHOGRAPHY: A $\rightarrow$ AA; (irregular AB $\rightarrow$ AABB)

(14) $\begin{bmatrix} \textit{redup-v-lr} \subset \textit{redup-type} & \\ \text{CAT|HEAD} & \textit{verb} \\ \text{CONT|HOOK} & \begin{bmatrix}\text{ASPECT} & \textit{non-aspect}\end{bmatrix} \\ \text{C-CONT} & \left\langle \begin{bmatrix}\text{PRED} & \textit{redup\_down\_x\_rel}\end{bmatrix} \right\rangle \end{bmatrix}$

ORTHOGRAPHY: A $\rightarrow$ AA; A $\rightarrow$ A-*yi*-A; (irregular AB $\rightarrow$ ABAB)

This approach provided a unified account for adjectival and verbal reduplication. Their commonalities are captured by inheritance hierarchies of the intensifier predicates and the lexical rules. In the case of verbal reduplication, A-*yi*-A is analyzed as an alternative orthographical form of AA. This correctly captured the intuition that AA and A-*yi*-A express the same meaning and only differ from each other phonologically/orthographically.

Nevertheless, this analysis has some shortcomings. To begin with, since the combination with aspect markers is completely forbidden, it is impossible for this approach to account for A-*le*-A. Moreover, as verbal reduplication is considered to express a delimitative aspectual meaning, it seems unconvincing to assume that there is no aspect information in its semantics. We consider a semantic explanation as described in Section 2.2 to be more reasonable for ruling out aspect markers other than *le*. Furthermore, this account can only deal with monosyllabic reduplication and handles ABAB and AAB as irregular forms, for the reason that ABAB and AAB reduplication of AB verbs is supposedly "not very productive in Chinese" (Fan et al. 2015: 102). However, this is not true. Basciano & Melloni (2017), Melloni & Basciano (2018), Xie (2020) and H. Xing (2000) all considered both AA and ABAB to be productive, and H. Xing (2000) concluded that AAB is productive as well. Therefore, ABAB and AAB should not be handled as irregular forms, but should be derivable from lexical rules.

The shortcomings of previous analyses lead us to propose a new HPSG analysis of verbal reduplication that formalizes its phonology, resolves the problem of *yi* and preserves the generalization on aspect marking.

## 4 A new HPSG analysis

In what follows, we suggest a new lexical-rule-based analysis of aspect marking and reduplication using Minimal Recursion Semantics (MRS) as the semantic representation formalism (Copestake et al. 2005).

The implicational constraint in (15) shows the constraints on all structures of type *verbal-reduplication-lr* for Mandarin Chinese. Such structures take a verb as LEX-DTR. The output reduplicates the phonology of the input verb with the possibility to have further phonological material in between. $\square$ indicates an underspecified list which could be empty or not. A delimitative relation is appended to the RELS value of the input verb, and it takes the event index of the input verb as argument. The label of the output ($\boxed{2}$) is identified with the label of the input and with the label

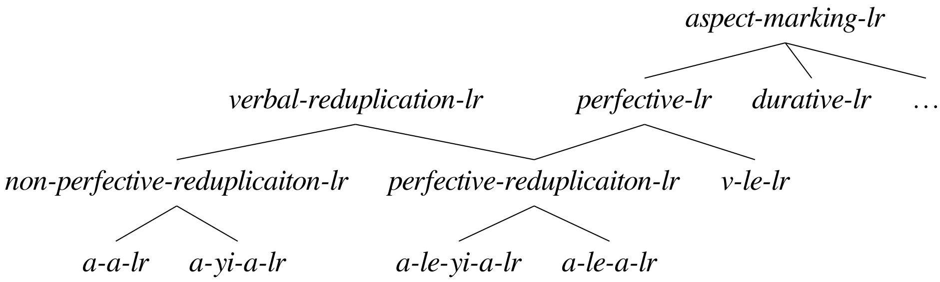



Figure 3: Type hierarchy for lexical rules of verbal reduplication and *le*

of the delimitative relation, hence *delimitative-rel* is treated as a modifier. Further relations can be added at the beginning of the RELS list to allow for the additional perfective meaning in A-*le*-A and A-*le*-*yi*-A. The combination with the perfective will be elaborated on in the following paragraphs.

(15) *verbal-reduplication-lr* ⇒

$$\begin{bmatrix} \text{PHON} & \boxed{1} \oplus \square \oplus \boxed{1} \\ \text{SYNSEM} & \begin{bmatrix} \text{LOC|CONT} & \begin{bmatrix} \text{LTOP} & \boxed{2} \\ \text{IND} & \boxed{3} \end{bmatrix} \end{bmatrix} \\ \text{RELS} & \square \oplus \boxed{4} \oplus \left\langle \begin{bmatrix} \textit{delimitative-rel} & \\ \text{LBL} & \boxed{2} \\ \text{ARG0} & \boxed{3} \end{bmatrix} \right\rangle \\ \text{LEX-DTR} & \begin{bmatrix} \text{PHON} & \boxed{1} \\ \text{SYNSEM|LOC} & \begin{bmatrix} \text{CAT} & \begin{bmatrix}\text{HEAD} & \textit{verb}\end{bmatrix} \\ \text{CONT} & \begin{bmatrix}\text{LTOP} & \boxed{2} \\ \text{IND} & \boxed{3}\end{bmatrix}\end{bmatrix} \\ \text{RELS} & \boxed{4} \end{bmatrix} \end{bmatrix}$$

To account for the variations in the phonology of the reduplication as well as the combination with the phonology and semantics of the perfective aspect marker *le*, the type hierarchy of lexical rules in Figure 3 is put forward. Apart from the type *perfective-reduplication-lr*, which adds the inherited perfective relation, there is a subtype *non-perfective-reduplication-lr*, which does not add further relations. Hence, what is $\square$ in the RELS list in (15) is the empty list in (16):

(16) *non-perfective-verbal-reduplication-lr* ⇒

$$\begin{bmatrix} \text{RELS} & \boxed{1} \oplus \langle [\,] \rangle \\ \text{LEX-DTR} & \begin{bmatrix}\text{RELS} & \boxed{1}\end{bmatrix} \end{bmatrix}$$

The RELS list of the output of the lexical rule ($\boxed{1}$) is the RELS list of the daughter plus one element. Since the element is specified in the supertype, it has not been specified in (16) again.

*non-perfective-verbal-reduplication-lr* has *aa-lr* and *a-yi-a-lr* as direct subtypes. (18) and (19) show *aa-lr* and *a-yi-a-lr*, respectively. As subtypes of *verbal-reduplication-lr* illustrated in (15), both inherit the constraints on the LEX-DTR and on the semantics of the output, and because of (16), no extra material is appended to the RELS value of the input verb and the list containing the *delimitative-rel*. In addition to the inherited constraints, *aa-lr* and *a-yi-a-lr* specify the phonology of the output differently. *aa-lr* determines that the $\square$ between the two phonological copies in (15) is empty, whereas *a-yi-a-lr* specifies this list of phonological material as $\langle$ *yi* $\rangle$:

(17) Constraints on lexical rules of type *aa-lr* and *a-yi-a-lr*:

*aa-lr* $\Rightarrow$ $\begin{bmatrix} \text{PHON} & \boxed{1} \oplus \boxed{1} \\ \text{LEX-DTR} & \begin{bmatrix} \text{PHON} & \boxed{1} \end{bmatrix} \end{bmatrix}$

*a-yi-a-lr* $\Rightarrow$ $\begin{bmatrix} \text{PHON} & \boxed{1} \oplus \langle\ \textit{yi}\ \rangle \oplus \boxed{1} \\ \text{LEX-DTR} & \begin{bmatrix} \text{PHON} & \boxed{1} \end{bmatrix} \end{bmatrix}$

The lexical rules with all inherited constraints are given in (18) and (19):

(18) The AA lexical rule with all constraints inherited from the supertypes:

$$\begin{bmatrix} \textit{aa-lr} & \\ \text{PHON} & \boxed{1} \oplus \boxed{1} \\ \text{SYNSEM} & \begin{bmatrix} \text{LOC}|\text{CONT} & \begin{bmatrix} \text{LTOP} & \boxed{2} \\ \text{IND} & \boxed{3} \end{bmatrix} \end{bmatrix} \\ \text{RELS} & \boxed{4} \oplus \left\langle \begin{bmatrix} \textit{delimitative-rel} & \\ \text{LBL} & \boxed{2} \\ \text{ARG0} & \boxed{3} \end{bmatrix} \right\rangle \\ \text{LEX-DTR} & \begin{bmatrix} \text{PHON} & \boxed{1} \\ \text{SYNSEM}|\text{LOC} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{HEAD} & \textit{verb} \end{bmatrix} \\ \text{CONT} & \begin{bmatrix} \text{LTOP} & \boxed{2} \\ \text{IND} & \boxed{3} \end{bmatrix} \end{bmatrix} \\ \text{RELS} & \boxed{4} \end{bmatrix} \end{bmatrix}$$

*v-le-lr* is a direct subtype of the *perfective-lr*. *perfective-reduplication-lr* inherits from both *verbal-reduplication-lr* and *perfective-lr* and has two subtypes, *a-le-yi-a-lr* and *a-le-a-lr* itself. *verbal-reduplication-lr* is already presented in (15). We now turn to the constraints on *perfective-lr* and its subtypes.

(19) The A-*yi*-A lexical rule with all constraints inherited from the supertypes:

$$\begin{bmatrix} \textit{a-yi-a-lr} & \\ \text{PHON} & \boxed{1} \oplus \langle\ \textit{yi}\ \rangle \oplus \boxed{1} \\ \text{SYNSEM} & \begin{bmatrix} \text{LOC}|\text{CONT} & \begin{bmatrix} \text{LTOP} & \boxed{2} \\ \text{IND} & \boxed{3} \end{bmatrix} \end{bmatrix} \\ \text{RELS} & \boxed{4} \oplus \left\langle \begin{bmatrix} \textit{delimitative-rel} & \\ \text{LBL} & \boxed{2} \\ \text{ARG0} & \boxed{3} \end{bmatrix} \right\rangle \\ \text{LEX-DTR} & \begin{bmatrix} \text{PHON} & \boxed{1} \\ \text{SYNSEM}|\text{LOC} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{HEAD} & \textit{verb} \end{bmatrix} \\ \text{CONT} & \begin{bmatrix} \text{LTOP} & \boxed{2} \\ \text{IND} & \boxed{3} \end{bmatrix} \end{bmatrix} \\ \text{RELS} & \boxed{4} \end{bmatrix} \end{bmatrix}$$

Müller & Lipenkova (2013: 246) proposed the perfective lexical rule given in (20), adapted to the formalization adopted in the current paper. It takes a verb as LEX-DTR and appends $\langle$ *le* $\rangle$ to its phonology. Further, it accounts for the change in semantics by appending the RELS value of the input verb to a *perfective-rel*.

(20) Perfective lexical rule adapted from Müller & Lipenkova (2013: 246):

$$\begin{bmatrix} \textit{perfective-lr} & \\ \text{PHON} & \boxed{1} \oplus \langle\, \textit{le} \,\rangle \\ \text{SYNSEM|CONT} & \begin{bmatrix}\text{LTOP} & \boxed{2}\\ \text{IND} & \boxed{3}\end{bmatrix} \\ \text{RELS} & \left\langle \begin{bmatrix} \textit{perfective-rel} & \\ \text{LBL} & \boxed{2} \\ \text{ARG0} & \boxed{3} \\ \text{ARG1} & \boxed{4}\end{bmatrix}\right\rangle \oplus \boxed{5} \\ \text{LEX-DTR} & \begin{bmatrix} \text{PHON} & \boxed{1} \\ \text{SYNSEM|LOC} & \begin{bmatrix}\text{CAT} & \begin{bmatrix}\text{HEAD} & \textit{verb}\end{bmatrix} \\ \text{CONT} & \begin{bmatrix}\text{LTOP} & \boxed{4}\\ \text{IND} & \boxed{3}\end{bmatrix}\end{bmatrix} \\ \text{RELS} & \boxed{5}\end{bmatrix}\end{bmatrix}$$

The event variables ($\boxed{3}$) of the input and the output verb are shared. The LTOP of the output of the lexical rule ($\boxed{2}$) is the label of the perfective relation, and this relation scopes over the embedded verb. The handle of the embedded verb ($\boxed{4}$) is the argument of the *perfective-rel*.

The lexical rule suggested in (20) only explains simple perfective aspect marking with *le*, where *le* immediately follows the verb. But it cannot account for the perfective aspect marking of a reduplicated verb, as *le* does not occur after the reduplication, nor can *le* be reduplicated together with the verb. It can only appear between the verb and the reduplicant. In order to accommodate *le* marking for both simple and reduplicated verbs, a general perfective lexical rule as in (21) and a subtype *v-le-lr* as in (22) are posited here. Besides adding a *perfective-rel* in the RELS list of the output as in (20), the *perfective-lr* in (21) allows an underspecified list to be appended at the end of the RELS list. The PHON value of the output makes it possible for further phonological material to occur both before and after $\langle\, \textit{le} \,\rangle$.

(21) Type constraints on the type *perfective-lr* from which other subtypes inherit:

$$\begin{bmatrix} \textit{perfective-lr} & \\ \text{PHON} & \square \oplus \langle\, \textit{le} \,\rangle \oplus \square \\ \text{SYNSEM|CONT} & \begin{bmatrix}\text{LTOP} & \boxed{2}\\ \text{IND} & \boxed{3}\end{bmatrix} \\ \text{RELS} & \left\langle \begin{bmatrix} \textit{perfective-rel} & \\ \text{LBL} & \boxed{2} \\ \text{ARG0} & \boxed{3} \\ \text{ARG1} & \boxed{4}\end{bmatrix}\right\rangle \oplus \boxed{5} \oplus \square \\ \text{LEX-DTR} & \begin{bmatrix} \text{SYNSEM|LOC} & \begin{bmatrix}\text{CAT} & \begin{bmatrix}\text{HEAD} & \textit{verb}\end{bmatrix} \\ \text{CONT} & \begin{bmatrix}\text{LTOP} & \boxed{4}\\ \text{IND} & \boxed{3}\end{bmatrix}\end{bmatrix} \\ \text{RELS} & \boxed{5}\end{bmatrix}\end{bmatrix}$$

*v-le-lr* as given in (22) inherits from *perfective-lr* and specifies that the first element in the output PHON list is identified with the PHON value of the input verb and that nothing else comes after $\langle\, \textit{le} \,\rangle$. Furthermore, no other list can be appended at the end of the RELS list of the output anymore. This corresponds to the proposal of Müller

& Lipenkova (2013: 246) shown in (20), which accounts for the simple perfective marking of verbs.

(22) Structure of type *v-le-lr* with constraints inherited from *perfective-lr*:

$$\begin{bmatrix} \textit{v-le-lr} & \\ \text{PHON} & \boxed{1} \oplus \langle \textit{le} \rangle \\ \text{SYNSEM|CONT|LTOP} & \boxed{2} \\ \text{RELS} & \left\langle \begin{bmatrix} \textit{perfective-rel} & \\ \text{LBL} & \boxed{2} \\ \text{ARG0} & \boxed{3} \\ \text{ARG1} & \boxed{4} \end{bmatrix} \right\rangle \oplus \boxed{5} \\ \text{LEX-DTR} & \begin{bmatrix} \text{PHON} & \boxed{1} \\ \text{CAT} & \begin{bmatrix} \text{HEAD} & \textit{verb} \\ \text{CONT} & \begin{bmatrix} \text{LTOP} & \boxed{4} \\ \text{IND} & \boxed{3} \end{bmatrix} \end{bmatrix} \\ \text{RELS} & \boxed{5} \end{bmatrix} \end{bmatrix}$$

*perfective-reduplication-lr* inherits from both *verbal-reduplication-lr* and *perfective-lr*. The PHON value of the output reduplicates the phonology of the input verb and states that there is ⟨ *le* ⟩ in between, as well as potentially further phonological material. The RELS list of the output appends the *delimitative-rel* to the *perfective-rel* and the RELS value of the input verb. The arguments of both *perfective-rel* and *delimitative-rel* share the event index of the input verb ($\boxed{3}$) to ensure that they apply to the same event denoted by the input verb. The label of the *delimitative-rel* and the input verb are identified (*delimitative-rel* is a modifier) and this shared label is embedded under the *perfective-rel*.

(23) Perfective and reduplication combined: type *perfective-reduplication-lr* with constraints inherited from *perfective-lr* and *verbal-reduplication-lr*:

$$\begin{bmatrix} \textit{perfective-reduplication-lr} & \\ \text{PHON} & \boxed{1} \oplus \langle \textit{le} \rangle \oplus \square \oplus \boxed{1} \\ \text{SYNSEM|CONT|LTOP} & \boxed{2} \\ \text{RELS} & \left\langle \begin{bmatrix} \textit{perfective-rel} & \\ \text{LBL} & \boxed{2} \\ \text{ARG0} & \boxed{3} \\ \text{ARG1} & \boxed{4} \end{bmatrix} \right\rangle \oplus \boxed{5} \oplus \left\langle \begin{bmatrix} \textit{delimitative-rel} & \\ \text{LBL} & \boxed{4} \\ \text{ARG0} & \boxed{3} \end{bmatrix} \right\rangle \\ \text{LEX-DTR} & \begin{bmatrix} \text{PHON} & \boxed{1} \\ \text{SYNSEM|LOC} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{HEAD} & \textit{verb} \end{bmatrix} \\ \text{CONT} & \begin{bmatrix} \text{LTOP} & \boxed{4} \\ \text{IND} & \boxed{3} \end{bmatrix} \end{bmatrix} \\ \text{RELS} & \boxed{5} \end{bmatrix} \end{bmatrix}$$

For example (9a), we get the following MRS representation, where h1 and h2 correspond to the handles $\boxed{2}$ and $\boxed{4}$ and e1 to the event variable $\boxed{3}$:

(24) h1 ⟨ h1:perfective(e1,h2), h2:taste(e1,he,soup), h2:delimitative(e1) ⟩

So the delimitative relation is treated as an adjunct to the main relation of the verb, and the perfective relation scopes over both the main relation and the delimitative relation.

Two subtypes of *perfective-reduplication-lr* are posited: *a-le-yi-a-lr* and *a-le-a-lr*, as shown in (25). They take over the semantic change to the input from *perfective-reduplication-lr*, but specify the PHON value differently. Specifically, *a-le-yi-a-lr* specifies the middle phonological material as ⟨ *le, yi* ⟩, while *a-le-a* specifies it as ⟨ *le* ⟩ only.

(25)
$$\begin{bmatrix} \textit{a-le-yi-a-lr} & \\ \textsc{phon} & \boxed{1} \oplus \langle \textit{le, yi} \rangle \oplus \boxed{1} \\ \textsc{lex-dtr} & \begin{bmatrix} \textsc{phon} & \boxed{1} \end{bmatrix} \end{bmatrix} \qquad \begin{bmatrix} \textit{a-le-a-lr} & \\ \textsc{phon} & \boxed{1} \oplus \langle \textit{le} \rangle \oplus \boxed{1} \\ \textsc{lex-dtr} & \begin{bmatrix} \textsc{phon} & \boxed{1} \end{bmatrix} \end{bmatrix}$$

Since the above-described lexical rules do not constrain the number of syllables of the input verb, but simply reduplicate its phonology as a whole, they can also account for the ABAB and the AB-*le*-AB forms of reduplication, as long as the input verb is disyllabic. Notice that the lexical rules above also produce AB-*yi*-AB and AB-*le-yi*-AB for disyllabic input verbs. Although these forms are generally considered unacceptable (Basciano & Melloni 2017: 160, Hong 1999: 275–276, Li & Thompson 1981: 30, Yang & Wei 2017: 239), Fan (1964: 269) and Sui (2018: 143) considered AB-*yi*-AB and AB-*le-yi*-AB to be possible, even though they both recognized that these two forms are rare. Indeed, a few examples of AB-*yi*-AB and AB-*le-yi*-AB were found (26).

(26) a. ta *weixiao-le-yi-weixiao*, you *mingxiang-le-yi-mingxiang*.[10]
he smile-PFV-one-smile and meditate-PFV-one-meditate
'He smiled a little bit and meditated a little bit.'

b. feichang yansu de ba jinshi yanjing
very seriously DE BA nearsighted glasses
*duanzheng-le-yi-duanzheng*.[11]
straighten-PFV-one-straighten
'[He] very seriously straightened the nearsighted glasses quickly.'

c. jiduo sanluan-zhe de chuan li de dengguang, ye huyinhumie de
many scattered-DUR DE boat in DE light also flicker DE
*bianhuan-le-yi-bianhuan* weizhi. (CCL)
change-PFV-one-chang position
'Many scattered lights in the boats also changed their positions a little bit, flickering.'

This suggests that even though AB-*yi*-AB and AB-*le-yi*-AB might be degraded, they are not ungrammatical *per se*. The reason for this degradedness is probably phonological, since AB-*yi*-AB and AB-*le-yi*-AB contain too many syllables (Fan 1964: 274, Sui 2018: 143, Yang & Wei 2017: 239, Zhang 2000: 15), but we argue that it is not an issue of grammaticality. Thus, they can still be produced via the

[10]Rou, Shi. 1975. *Roushi xiaoshuo xuanji [Selected novels of Roushi]*, 31. Beijing: People's Literature Publishing House.

[11]Li, Jieren. 1962. *Da bo [Great wave]*, 3rd band, 171. Beijing: The Writers Publishing House.

lexical rules posited above, but are ruled out or degraded due to a general phonological constraint.

AAB, A-*yi*-AB, A-*le*-AB, AA-*kan* and A-*kan-kan* can also be accounted for by the lexical rules proposed in this section. They can be analyzed as compounds consisting of a reduplicated monosyllabic verb and another element. Specifically, AAB, A-*yi*-AB and A-*le*-AB can be considered as the compound of a reduplicated monosyllabic verb (A) and a noun (B).[12] AA-*kan* can be regarded as the compound of a reduplicated monosyllabic verb (A) and the verb *kan* 'look', whereas A-*kan-kan* is the compound of a monosyllabic verb (A) and the reduplication of *kan* 'look'. A-*yi*-A-*kan* is also possible, though rare, presumably also due to its length. An inquiry in CCL found 55 hits of A-*yi*-A-*kan*. A sample is listed in (27).

(27) a. danshi dui fa mei fa-guo hege-zheng, yijing shuo bu
but about issue not issue-EXP conformity-certificate already say not
qing le, xuyao *cha-yi-cha-kan*. (CCL)
clealy PTC need check-one-chek-look

'But one already cannot say it clearly anymore, whether a certificate of conformity is issued or not. One needs to have a check and see.'

b. da-laoban-men yao *deng-yi-deng-kan* (CCL)
big-boss-PL need wait-one-wait-look

'Big bosses need to wait a little bit and see.'

c. furen ni dao *shu-yi-shu-kan*, zhe zhu hua de huaduo
madam you just count-one-count-look this CLF flower DE blossom
gong you ji zhong yanse. (CCL)
in.total have how.many CLF color

'Madam, just try to count and see how many colors the blossom of this flower has in total.'

Due to the prominent tentative, trying meaning of AA-*kan* and A-*kan-kan*, they are not compatible with the perfective aspect marker *le* semantically, as one usually cannot try something that is already realized. Unacceptable structures such as A-*le*-A-*kan* and A-*kan-le-kan* are thus semantically ruled out.

The current analysis provides a unified account for all forms of delimitative verbal reduplication in Mandarin Chinese. Like in Fan et al. (2015), *yi* is handled as a phonological element which does not make any contribution to the semantics, and an inheritance hierarchy is used to capture the commonalities among different forms of reduplication. But the present proposal also reflects the connection between the reduplication and aspect marking via multiple inheritance. This account makes use of a semantic mechanism, which correctly rules out aspect marking with forms other

[12] Huang (1984) and Her (1996; 2010) argued that some of this kind of structures are compounds, some are phrases, and some have dual status (both compounds and phrases). Following this approach, AAB, A-*yi*-AB and A-*le*-AB can (also) be considered as the phrasal combination of a reduplicated verb and its object.

than *le*. By providing a semantic explanation, this mechanism seems less *ad hoc* than the one used in Fan et al. (2015), which simply assumed that the reduplication cannot combine with aspect information. The present approach also has a broader coverage of the forms of verbal reduplication than the one in Fan et al. (2015). Furthermore, all the forms are derivable from the lexical rules proposed here, so that there is no need to resort to irregular lexicon entries, and the productivity of these forms is correctly captured. In sum, the analysis proposed in this paper possesses greater explanatory power and resolves the problems of previous studies.

# 5 Conclusion

The current study provides an HPSG account for verbal reduplication in Mandarin Chinese. We presented empirical evidence that reduplication is possible with all *Aktionsarten*. We gave a semantic explanation for the incompatibility of reduplication with aspect markers other than *le*. We argued that reduplication is a morphological rather than a syntactic process. We modeled reduplication as a lexical rule, and the different forms of reduplication are captured in an inheritance hierarchy using underspecified lists. The interaction between verbal reduplication and aspect marking is handled by multiple inheritance. This analysis is compatible with both mono- and disyllabic verbs, so that all productive forms of reduplication are derivable by lexical rules. The analysis is implemented as part of the CoreGram project (Müller 2015) in a Chinese grammar in the TRALE system (Meurers, Penn & Richter 2002; Penn 2004).

## References

Arcodia, Giorgio Francesco, Bianca Basciano & Chiara Melloni. 2014. Verbal reduplication in Sinitic. In Sandra Augendre, Graziella Couasnon-Torlois, Déborah Lebon, Michard Clément, Gilles Boyé & Fabio Montermini (eds.), *Proceedings of the Décembrettes 8th international conference on morphology*, 15–45. Bordeaux: CLLE-ERSS.

Basciano, Bianca & Chiara Melloni. 2017. Event delimitation in Mandarin: The case of diminishing reduplication. *Italian Journal of Linguistics* 29(1). 143–166.

Chao, Yuen Ren. 1968. *A grammar of spoken Chinese*. Berkeley, CA: University of California Press.

Chen, Limin. 2005. Lun dongci chongdie de yufa yiyi [On the grammatical meaning of verbal reduplication]. *Zhongguo yuwen [Studies of the Chinese Language]* 305(2). 110–191.

Chen, Qianrui. 2001. Dongci chongdie de qingzhuang tezheng ji qi ti de diwei [The situational features of Chinese verbal reduplication and its aspectual status]. *Yuyan jiaoxue yu yanjiu [Language Teaching and Linguistic Studies]* (4). 48–56.

Cheng, Yi-Yang. 2012. Verbal reduplication and grammaticalization: A study of Mandarin VV-kan and V-kankan constructions. *Annual Meeting of the Berkeley Linguistics Society* 38. 63–77.

Copestake, Ann, Dan Flickinger, Carl Pollard & Ivan A. Sag. 2005. Minimal Recursion Semantics: An introduction. *Research on Language and Computation* 3(2–3). 281–332.

Dai, Yaojing. 1997. *Xiandai hanyu shiti xitong yanjiu [Studies on the tense and aspect system of Modern Chinese]*. Hangzhou: Zhejiang Education Publishing Group.

Duanmu, San. 1998. Wordhood in Chinese. In Jerome L. Packard (ed.), *New approaches to Chinese word formations*, 135–196. Berlin: De Gruyter Mouton.

Fan, Fanglian. 1964. Shi lun shuowei "dongci chongdie" [A tentative analysis of the so-called "verbal reduplication"]. *Zhongguo Yuwen [Studies of the Chinese Language]* 4. 264–278.

Fan, Zhenzhen, Sanghoun Song & Francis Bond. 2015. Building Zhong, a Chinese HPSG Shared-Grammar. In Stefan Müller (ed.), *Proceedings of the 22nd International Conference on Head-Driven Phrase Structure Grammar, Nanyang Technological University (NTU), Singapore*, 96–109. Stanford, CA: CSLI Publications.

Ghomeshi, Jila, Ray Jackendoff, Nicole Rosen & Kevin Russell. 2004. Contrastive focus reduplication in English (the salad-salad paper). *Natural Language & Linguistic Theory* 22(2). 307–357.

Her, One-Soon. 1996. Variation of the VO construction in Chinese: A synchronic account. *Linguistics* 34(4). 733–751.

Her, One-Soon. 2010. *Interaction and variation in the Chinese VO construction*. Revised edn. Taipei: Crane Publishing.

Hong, Zhou. 1999. Cognate objects in Chinese. *Toronto Working Papers in Linguistics* 17. 263–284.

Huang, C.-T. James. 1984. Phrase structure, lexical integrity, and Chinese compounds. *Journal of Chinese Language Teachers Association* 12(2). 53–78.

Huang, C.-T. James, Y.-H. Audrey Li & Yafei Li. 2009. *The syntax of Chinese* (Cambridge Syntax Guides). Cambridge: Cambridge University Press.

Jackendoff, Ray. 1997. *The architecture of the language faculty* (Linguistic Inquiry Monographs 28). Cambridge, MA: MIT Press.

Jackendoff, Ray. 2002. *Foundations of language: Brain, meaning, grammar, evolution*. Oxford: Oxford University Press.

Li, Charles N. & Sandra A. Thompson. 1981. *Mandarin Chinese: A functional reference grammar*. Berkeley, CA: University of California Press.

Li, Yuming. 1996. Lun ciyu chongdie de yiyi [On the meaning of reduplication]. *Shijie hanyu jiaoxue [Chinese Teaching in the World]* 35(1). 10–19.

Li, Yuming. 1998. Dongci chongdie de ruogan jufa wenti [Some syntactic issues on verbal reduplication]. *Zhongguo Yuwen [Studies of the Chinese Language]* 2. 83–92.

Melloni, Chiara & Bianca Basciano. 2018. Reduplication across boundaries: The case of Mandarin. In Olivier Bonami, Gilles Boyé, Georgette Dal, Hélène Giraudo & Fiammetta Namer (eds.), *The lexeme in descriptive and theoretical morphology*, 325–363. Berlin: Language Science Press.

Meurers, W. Detmar, Gerald Penn & Frank Richter. 2002. A web-based instructional platform for contraint-based grammar formalisms and parsing. In Dragomir Radev & Chris Brew (eds.), *Effective tools and methodologies for teaching NLP and CL: Proceedings of the workshop held at 40th Annual Meeting of the Association for Computational Linguistics. Philadelphia, PA*, 19–26. Ann Arbor, MI: Association for Computational Linguistics.

Müller, Stefan. 2015. The CoreGram project: Theoretical linguistics, theory development and verification. *Journal of Language Modelling* 3(1). 21–86.

Müller, Stefan & Janna Lipenkova. 2013. ChinGram: A TRALE implementation of an HPSG fragment of Mandarin Chinese. In *Proceedings of the 27th Pacific Asia Conference on Language, Information, and Computation (PACLIC 27)*, 240–249. Taipei: Department of English, National Chengchi University.

Paris, Marie-Claude. 2013. Verbal reduplication and verbal classifiers in Chinese. In Guangshun Cao, Hilary Chappell, Redouane Djamouri & Thekla Wiebusch (eds.), *Breaking* *down the barriers: Interdisciplinary studies in Chinese linguistics and beyond*, vol. 1, 257–278. Taipei, Taiwan: Institute of Linguistics, Academia Sinica.

Penn, Gerald. 2004. Balancing clarity and efficiency in typed feature logic through delaying. In Donia Scott (ed.), *Proceedings of the 42nd Meeting of the Association for Computational Linguistics (ACL'04)*, 239–246. Barcelona, Spain: Association for Computational Linguistics.

Schäfer, Martin. 2009. A+N constructions in Mandarin and the 'compound vs. phrase' debate. *Word Structure* 2(2). 272–293.

Sui, Yanyan. 2018. Affixation or compounding? Reduplication in Standard Chinese. In Rita Finkbeiner & Ulrike Freywald (eds.), *Exact repetition in grammar and discourse* (Trends in Linguistics, Studies and Monographs (TiLSM) 323), 127–157. Berlin: De Gruyter Mouton.

Travis, Lisa deMena. 1999. A syntactician's view of reduplication. In Carolyn Smallwood & Catherine Kitto (eds.), *Proceedings of AFLA VI (the sixth meeting of the Austronesian Formal Linguistics Association)*, 313–331. Toronto: Department of Linguistics, University of Toronto.

Travis, Lisa deMena. 2000. Event structure in syntax. In Carol L. Tenny & James Pustejovsky (eds.), *Events as grammatical objects: The converging perspectives of lexical semantics and syntax* (CSLI Lecture Notes 100), 145–185. Stanford, CA: CSLI Publications.

Tsao, Feng-fu. 2001. Semantics and syntax of verbal and adjectival reduplication in Mandarin and Taiwanese Southern Min. In Hilary Chappell (ed.), *Sinitic grammar: synchronic and diachronic perspectives*, 285–308. Oxford University Press.

Xiao, Richard & Tony McEnery. 2004. *Aspect in Mandarin Chinese: A corpus-based study* (Studies in Language Companion Series 73). Amsterdam: John Benjamins.

Xie, Zhu. 2020. Two types of verb reduplications in Mandarin Chinese. *Studies in Chinese Linguistics* 41(1). 73–108.

Xing, Hongbing. 2000. Hanyu ciyu chongdie jiegou tongji fenxi [Statistical analysis on reduplication Modern Chinese words]. *Yuyan Jiaoxue yu Yanjiu [Language Teaching and Linguistic Studies]* (1). 32–37.

Xiong, Zhongru. 2016. Dongci chongdie de jufa fenxi [A syntactic analysis of verbal reduplication]. *Shijie Hanyu Jiaoxue [Chinese Teaching in the World]* 30(2). 156–169.

Yang, Ping. 2003. Dongci chongdie de jiben yiyi [The basic function of verb reduplication in Chinese Language]. *Yuyan Jiaoxue yu Yanjiu [Language Teaching and Linguistic Studies]* (5). 8–16.

Yang, Yifan & Wei Wei. 2017. Verbal reduplication in Mandarin Chinese: An analysis at the syntax-phonology interface. In Michael Yoshitaka Erlewine (ed.), *Proceedings of GLOW in Asia XI*, vol. 1, 227–242. Cambridge, MA: MIT Working Papers in Linguistics.

Zhan, Weidong, Rui Guo, Baobao Chang, Yirong Chen & Chen Long. 2019. Beijing Daxue CCL yuliaoku de yanzhi [the building of the CCL corpus: Its design and implementation]. *Yuliaoku Yuyanxue [Corpus Linguistics]* 6(1). 71–86.

Zhan, Weidong, Rui Guo & Yirong Chen. 2003. *Beijing Daxue Zhongguo Yuyanxue Yanjiu Zhongxin CCL yuliaoku (Guimo: 7 yi zi; shijian: gongyuanqian 11 shiji - dangdai)[the CCL corpus of Chinese texts: 700 million Chinese characters, the 11th Century B.C. – present]*.

Zhang, Cheng. 2000. Xiandai hanyu "VyiV" shi he "VV" shi de laiyuan [The origin of "V-yi-V" and "VV" form in modern Chinese]. *Yuyan Jiaoxue yu Yanjiu [Language Teaching and Linguistic Studies]* 4. 10–17.

Zhu, Jingsong. 1998. Dongci chongdieshi de yufa yiyi [The semantics of verbal reduplication]. *Zhongguo Yuwen [Studies of the Chinese Language]* 266(5). 378–386.

# Constraining the identification of epistemic judges across different syntactic categories

Jakob Maché
Universidade de Lisboa

Proceedings of the 28th International Conference on
Head-Driven Phrase Structure Grammar

Online (Frankfurt/Main)

Stefan Müller, Nurit Melnik (Editors)

2021

Frankfurt/Main: University Library

pages 104–124

Keywords: HPSG, epistemic modality, objective epistemic modality, information seeking questions, questions, binding, locality, logophor

Maché, Jakob. 2021. Constraining the identification of epistemic judges across different syntactic categories. In Stefan Müller & Nurit Melnik (eds.), *Proceedings of the 28th International Conference on Head-Driven Phrase Structure Grammar, Online (Frankfurt/Main)*, 104–124. Frankfurt/Main: University Library. DOI: 10.21248/hpsg.2021.6.

**Abstract**

As observed at various occasions, the usage of epistemic adverbs in information seeking questions is by far more restricted than the usage of epistemic adjectives. Starting from Lyons (1977) this contrast was motivated assuming that different types of epistemic operators come with different semantics and scope positions in the utterance, namely objective vs. subjective epistemic modality. However it is not possible to define clear classes of objective epistemic modal operators in terms of clear diagnostics. It will be shown here that the contrast of acceptability is more accurately explained in terms of locality and binding properties of the variable for the attitude holder rendering the epistemic judgement. If locally bound, epistemic modal operators can be embedded, if not, they are subject to much stricter conditions in order to be interpretable.

# 1 Introduction

This paper addresses the question under which conditions epistemic modal operators can be embedded in information seeking questions and complement clauses. Starting with Greenbaum (1969: 111, 153) and Jackendoff (1972: 344–345), it was observed that epistemic adjectives like *probable* with finite clausal complements can be more readily embedded in questions than their morphological cognate adverbs like *probably* (cf. 1). These contrast were originally observed in data from English.

(1) a. Is it probable that Frank beat all his opponents?
b. * Did Frank probably beat all his opponents?

Similar contrasts between epistemic adverbs and adjectives are also reported in other West Germanic languages such as with Dutch *waarschijnlijk* 'probable' and its German cognate *wahrscheinlich* (cf. Nuyts 2001a: 55–59, Nuyts 2001b: 389–390, 393), as well as with Hungarian adverbs *talán* 'perhaps', *valószinüleg* 'probably' and *biztosan* (Kiefer 1984: 69–70).[1]

This paper is structured as follows: Section 2 discusses some earlier explanations to account for this contrasting behaviour of epistemic adjectives and epistemic adverbs, which assume that the different syntactic categories

[†]First, I am grateful to three anonymous reviewers for their comments and suggestions. Furthermore, I owe special thanks to Amália Mendes, Frank Richter, Manfred Sailer and Symon Stevens-Guille for their comments on this paper before, during and after the conference. I am grateful to Łukasz Jędrejowski and Felix Bildhauer for helping me with literature. Finally, I would express my gratitude to Robin Cooper and Jonathan Ginzburg for comments about modality, types and message-typesn in Situation Semantics.

[1]These authors do not provide explicit data for a contrast between epistemic adverbs and epistemic adjectives, but it follows from their claim that epistemic adverbs in these languages are excluded from questions.

come with different semantics. Moreover, challenges will be addressed, which these explanation face. In Section 3, it will be shown that it is necessary to take a broader perspective on that matter in order to understand how these modifiers differ precisely. It will investigate how different epistemic modal expressions are subject to different constraints to identify the attitude holder who renders the epistemic judgement. As German modal operators have a richer array of uses, the discussion will mainly draw from German data. Section 4 will present an alternative analysis, which demonstrates that the difference of acceptability is due to a difference of how the attitude holder involved in the epistemic judgement is syntactically represented and how much it is accessible for binding processes.

## 2 Objective vs. Subjective Epistemic Modality

In subsequent research on the different behaviour of epistemic adverbs and adjectives in information seeking questions, Lyons (1977: 799) suggested that the diverging behaviour is due to a difference in semantics: Epistemic adverbs are always interpreted in a 'subjective' epistemic manner, by means of which the speaker weakens their commitment to the truth. In contrast, epistemic adjectives always are interpreted in an 'objective' epistemic interpretation, which is based on 'quantifiable logical probability'. Lyons (1977: 749, 802) is inspired by R.M Hare's (1971) work, who assumes that each utterance consists of three components: (i) a *phrastic component*, which corresponds to the propositional content of the utterance; (ii) a *tropic component*, which determines the type of speech act and (iii) and finally a *neustic component*, which specifies the degree of commitment of the speaker to that speech act.

In Lyons' (1977: 749, 802) model, utterances are structures consisting of two operator positions; for the neustic and the tropic component and a slot for the proposition $p$. An assertion involves an "unqualified" neustic component with the meanining 'I-say-so' represented by a full stop and an "unqualified" tropic component with the meaning 'It-is-so', also represented by a full stop. Moreover, he gives a classification of five other types of speech acts which are result of the interaction of different 'qualifiers' '?' for questions, '!' for directives and '~' for negation and the different scopal positions.

(2)

| | | | |
|---|---|---|---|
| a. assertion | . | . | $p$ |
| b. tropic negation | . | ~ | $p$ |
| c. question | ? | . | $p$ |
| d. command | . | ! | $p$ |
| e. prohibition | . | ~! | $p$ |
| f. deliberative question | ? | ! | $p$ |

Building on this model of speech acts, Lyons (1977: 804) claims that the diverging degree of acceptability with epistemic adjectives and adverbs in information seeking questions is due to their different scopes they may take in the representation of an utterance. Hence, he postulates two distinct types of epistemic modality: *objective epistemic modality* (ObjEM), qualifying the tropic *it-is-so* component (cf. 3) and *subjective epistemic modality* (SbjEM), qualifying the neustic *I-says-so* component (cf. 4):

(3) a. I say that it is possibly the case that *p*.
b. $.\Diamond \mathrm{p}$

(4) a. Possibly/perhaps it is the case that *p*.
b. $\Diamond.\mathrm{p}$

From this model it follows that SbjEM operators and question operators compete for the same scopal position in the utterance, predicting that they can never co-occur (p.799–800).

> This suggests that subjectively modalized utterances, unlike categorical assertions and objectively modalized statements, are not acts of telling; and that their illocutionary force is in this respect similar to that of questions, which are also non-factive.

Although there is no clear statement about epistemic adverbs, Lyons (1977: 805–806) claims that epistemic modal verbs are much more appropriate for the expression of SbjEM, whereas epistemic adjectives and nouns in copula constructions are much more natural for the expression of ObjEM.[2] However, Lyons (1977: 797–801) notes that some epistemic modal auxiliaries can also be interpreted in an 'objective' epistemic way. His assumption is motivated by the observation that there are some uses of epistemic modal auxiliaries in English which can occur under negation, in antecedents of event-related conditionals and in information seeking questions. Accordingly, he concludes that a restricted group of modal auxiliaries can be used in an 'objective' way, whereas the majority only is acceptable with a 'subjective' epistemic interpretation. Despite the fact Lyons explicitly mentions that *can*, *must*

[2]Actually, Lyons (1977: 800) mentions the possibility that epistemic adverbs can come with a ObjEM interpretation:

> But we can express at least three different degrees of factuality in English by selecting one modal adverb rather than another from a set which includes, certainly', 'probably',and 'possibly'; and the difference between 'probably' and 'possibly', when they are used in objectively modalized statements, would seem to correlate, at least roughly, with the difference between a degree of factuality that is greater than and one that is less than 0.5.

On page 798, Lyon discusses and example with *perhaps*, which he classifies as SbjEM.

and *may* have an 'objective' epistemic interpretation in English, he does not systematically specify the precise extension of the class of ObjEM auxiliaries.[3]

Turning to their specific meaning, Lyons (1977: 797, 799–800) notes that ObjEM is related to alethic modality, both being subtypes of Carnap's quantifiable logical probability. However, they cannot be sharply distinguished from one another. In contrast, SbjEM expresses a proper illocutionary act of assuming.

Finally, Lyons (1977: 797, 806) assumes that SbjEM is more basic than ObjEM and that the latter is derived from the former by a process of 'objectification', but that is impossible to draw a sharp distinction between the two of them either. At this point it should be stressed that Lyons hardly ever becomes explicit how different syntactic categories relate to the SbjEM vs. ObjEM distinction and that Lyons barely provides examples and thus does not come up with exhaustive lists of lexical items which can only be interpreted in an ObjEM way, only in a SbjEM way or in both ways.

Shedding more light on the usage of epistemic adjectives, Watts (1984: 136–137) argues that *likely* and *possible* yield 'objective' epistemic interpretations whenever occurring with *for-to*-infinitives and 'subjective' epistemic interpretations whenever occurring with finite *that*-clauses. In contrast, Watts (1984: 138) claims that adverbials are always interpreted in a SbjEM way and that *can* has only an ObjEM interpretation and *may* is allows for both interpretations.

Hengeveld (1988: 236–240) is much more explicit and systematic bringing constructed examples from English, which are meant to demonstrate that epistemic adverbs and epistemic adjectives are clearly distinguished by the meaning they convey: Whereas epistemic adverbs are always SbjEM, epistemic adjectives are always ObjEM. As regards their semantic contribution, Hengeveld is fairly loyal to Lyons' original proposal. But he crucially departs from Lyons' original claims, as he suggests that epistemic adverbs are always SbjEM. However, Hengeveld (1988: 237) makes a somewhat confusing statement too. He observes that epistemic *may* and *must* cannot occur in the scope of a negation. From this, Hengeveld (1988: 237) concludes that the inability of the modal auxiliaries to occur in the scope of a negation must be due to their are SbjEM nature. This is fairly surprising as this entails that Hengeveld assumes that they cannot be 'objective' epistemic. If they had an ObjEM variant, they were expected to be totally acceptable in the negation. At this point he contradicts Lyons (1977: 797–798), who takes precisely these two verbs as the most prototypical examples which can be interpreted in either way: SbjEM and ObjEM.

According to Hengeveld (1988: 236–240), this difference in semantics

[3]Lyons is not very explicit. Below are enlisted examples he uses for *may* as ObjEM (14) pp. 797–798, (24–25) p. 801, (45) p.804; *can't* as ObjEM (26–27) pp. 801, *must* (15) pp. 797–798, ObjEM, SbjEM hardly natural with *needn't* (31) p. 801; Examples of *may* as SbjEM (14) p. 797, (24–25) p. 801, *must* as SbjEM (15) p. 797.

is the reason why epistemic adjectives occur in a whole range of syntactic environments from which epistemic adverbs are excludes, such as: (i) embedded in information seeking questions, (ii) in the scope of a negation, (iii) embedded in the antecendent of an event-related conditional, (iv) in the scope of a past or future tense marker, (v) and they can be challenged.

In later research, the distinction between objective and ‘subjective’ epistemic modality is motivated by the type of evidence on which the epistemic judgement is based. This has been most explicitly elaborated by Nuyts (2001b: 384, 386) who argues that ‘subjective’ epistemic modality makes reference to evidence that is accessible to the speaker alone, whereas ‘objective’ epistemic modality makes reference to evidence that is accessible to a bigger group of referents. Some formal semantic approaches such as Tancredi (2007: 2) and Huitink (2008: 7) follow the idea that the accessibility of the evidence is the key to distinguish between these two types of epistemic modality. Departing from Lyons’ original idea, Nuyts (2001b: 393) suggests that ‘objective’ epistemic modality is not related to alethic reasoning and that therefore it should be renamed into ‘inter-subjective’ modality. Crucially, Nuyts (2001a: 72–78) argues that the acceptability of epistemic modal operators in the scope of question operators or negations or in antecedents of event-related conditionals is not determined by the dimension ‘objective’ vs. ‘subjective’ but by a second, more functional dimension: descriptive vs. performative. As epistemic adverbs are always performative, they are excluded from these non-canonical environments, in opposition, epistemic adjectives are always descriptive, which renders them acceptable in the same contexts.

Turning to analyses on German, Öhlschläger (1989: 207, 210) and Diewald (1999: 82–84, 274) assume in their work inspired by Lyons (1977) that there are ‘objective’ epistemic modal auxiliaries in German, too. In contrast to Lyons, their study is based on a much broader selection of empirical data and it is much more systematic. Their analysis of German modal verbs leads them to the conclusion that the forms *kann* and *muss* allow for objective interpretations whereas the forms *mag* and *könnte* clearly do not. As they argue the former can be embedded in questions and in the scope of a negations, but the latter fail to do so.

The assumption that there are two separate types of epistemic modality with different interpretation and different scope comes with various problematic consequences, as shown by Maché (2013: 360–373). To start with, there is no consensus at all what ObjEM really is and which elements can be used express it and which cannot, as illustrated in Table 1. For instance, Lyons (1977: 800, 805–806) assumes that epistemic adverbs may be more appropriate to express a SbjEM interpretation, he notes that ObjEM uses are not totally excluded. Opposed to that, Watts (1984: 138) and Hengeveld (1988: 236–240) claim that epistemic adverbs are limited to SbjEM uses. Moreover, Lyons (1977: 797–798) considers *may* and *must* as prototypical ObjEM, whereas Hengeveld (1988: 237) argues that these verbs cannot be negated as they are SbjEM. Finally, Nuyts (2001a: 72–78) suggests that the acceptability of epistemic operators in questions is not determined by their degree of objectivity but by an entirely different dimension: performativity vs. descriptivity.

Summing up, there is only one observation which is supported by a broader range of studies, which is that epistemic adverbs are hardly acceptable in the scope information seeking question operator or negation whereas epistemic adjectives are to a much larger extent.

| author | ADJ | ADV | VERB | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ENGLISH | | | | DUTCH | GERMAN | | | |
| | | | *can* | *can't* | *may* | *must* | *kunnen* | *kann* | *müssen* | *dürfte* | *mögen* |
| Lyons (1977) | | s/o | | s/o? | s/o | s/o | | | | | |
| Perkins (1983: 101) | | s/o | | | | | | | | | |
| Kiefer (1984: 68–70) | obj | sbj | | | | | | | | | |
| Watts (1984: 133) | s/o | sbj | obj | | s/o | | | | | | |
| Hengeveld (1988: 236–240) | obj | sbj | | | sbj? | sbj? | | | | | |
| Nuyts (2001a) | | | | | | | | | | | |
| Nuyts (2001b: 387–393) | s/o | s/o | | | | | s/o | | | | |
| Tancredi (2007: 2) | s/o | s/o | | | | | | | | | |
| Huitink (2008) | | sbj | | | s/o | s/o | s/o | | | | |
| Öhlschläger (1989: 207, 210) | | sbj | | | | | | s/o | s/o | s/o | sbj |
| Diewald (1999: 82–84, 274) | | sbj | | | | | | s/o | s/o | | sbj |

Table 1: Different statements on categories, elements and their interpretation

Secondly, there are different conceptions about which of the two modalities is more basic. Lyons (1977: 797, 806) and Nuyts (2001b: 392–393) assume that SbjEM is the more common and basic one and that ObjEM is derived from the latter. However, there is challenging evidence. Hengeveld (1988: 259) and Diewald (1999: 273,366) have shown that, from a historical perspective, it is ObjEM which is the base from which subjective modality develops. In similar vein, Watts (1984: 138) argues that *can* only can be interpreted in an SbjEM way. This would be surprising if ObjEM should always be derived from SbjEM uses. Finally, it remains to be shown for theories that assume that epistemic adjectives are restricted to ObjEM interpretations and epistemic adverbs to SbjEM interpretations, how there can be morphological derivation rules which derive the further from the latter.

Thirdly, there are instances of elements which are interpreted with respect to the knowledge of a singe attitude holder which occur in non-canonical environments. The instance of *können* (cf. 5) is definitely interpreted with respect to a single attitude holder who is rendering a intuitive judgement rather than in terms of quantifiable logical probability. Despite of that, they are attested in information seeking questions. Likewise, modal particles such as *wohl* are not considered to be compatible with quantifiable logical reasoning (cf. 6), nevertheless they occur in information seeking questions too, as shown by Zimmermann (2004: 263–264). A much more detailed discussion is provided by Maché (2013: 360–373).

(5) a. „Wer *kann* Ihnen etwas ins Glas geworfen
who can you something into.the glass throw-PTCP.PRF
haben?", fragte der Richter.
have-INF asked the judge

b. „Ich denke, es war dieser Bekannte", erwiderte die Frau.[4]
I think it was that friend answered the woman
' "Who could have thrown something in your glass?" , the judge asked. "I think it was this friend", the woman answered.'

(6) Ist Hein wohl auf See?
Is Hein wohl at sea
'Tell me your assumption concerning Hein's being at sea or his not being at sea: Is he at sea or not?'

Note that all of the involved modal operators involve a modal force on the lower end of the scale such as possibility or probability, epistemic necessity modals are not attested in information seeking questions (cf. Maché 2013: 304–309).

Fourthly, it is impossible to model something like objective public evidence. Attitude holder A and B can sit in the same foot ball stadium watching the same game *SL Benfica Lisboa* against *Sporting Club de Lisboa* but nevertheless use the claimed ObjEM adjective in a conflicting way based on their individual knowledge and expectations. Speaker A can say *It is probable that Benfica is going to lose today*, Speaker B can say at the very same moment *It is probable that Sporting is going to lose today.* If *probable* were an ObjEM, it would be expected that they yielded the same interpretation for any attitude in a given situation. Even expressions like *probable* are highly dependent on the individual speaker's beliefs, cf. Maché (2013: 366–367) for more details.

Summing up, studies on 'objective' epistemic modality only agree in a single point: That the use of epistemic adverbs are much more limited in the scope of a information seeking question operator or a negation as compaired to epistemic adjectives in predicative use. However, it was shown that the assumption of two independent types of epistemic modality fails to account for the bigger picture. A more elegant and accurate solution will be developed in Sections 3 and 4.

## 3 Context dependence of epistemic operators

Among the West Germanic languages, German has the richest array of modal verbs which are interpreted with respect to an attitude holder's knowledge

[4] DeReKo: BVZ07/FEB.00540 Burgenländische Volkszeitung, 07/02/2007.

and beliefs, namely reportative uses of *wollen* and *sollen*. Therefore, the remaining discussion will focus on German but it can easily be extended to the other West Germanic languages under discussion as well.

The main idea here is that epistemic modal operators introduce a variable for a *deictic center* (DC) who makes the epistemic judgement, as already suggested by Stephenson (2007: 497). As illustrated in more detail below, there are various ways to identify this DC-variable with an appropriate referent of an attitude holder which is syntactically encoded in the utterance.

With epistemic modal verbs such as *dürfte* 'be.probable/may' and epistemic adverbs such as *wahrscheinlich* which occur in canonical matrix declarative clauses the deictic center is identical to the speaker referent (8):

(7) Der Joseph *dürfte* die Maria kennen.
the Joseph be.probable the Mary knows-INF
'Joseph probably knows Mary.'
DEICTIC CENTRE=*spkr*

(8) Der Joseph kennt die Maria wahrscheinlich.
the Joseph knows the Mary probably
'Joseph probably knows Mary.'
DEICTIC CENTRE=*spkr*

In cases in which an epistemic modal verb or epistemic modal adverb is embedded under non-factive attitude predicates such as *denken* 'think' or *vermuten* 'assume', the DC-variable is identified with an appropriate attitude holder argument in the matrix clause, mostly the subject referent but sometimes also an object referent (cf. Stephenson 2007: 497)

(9) Der Gabriel vermutet, [dass der Joseph die Maria kennen
the Gabriel assumes that the Joseph the Mary knows-INF
*dürfte*].
may
'Gabriel assumes that Joseph might know Mary.'
DEICTIC CENTRE=matrix EXP = *Gabriel*

Note that in contrast to some claims (eg. Lyons 1977: 799), epistemic modal verbs are also attested embedded under factive predicates which embed *w*-interrogative clauses, such as *ermitteln* 'determine'.

(10) In Auswertungen des Netzwerks unter der Leitung von Pavel
in examinations the network-GEN under the direction of Pavel
Spurný von der Akademie der Wissenschaften der
Spurný of the Academy of Sciences the-GEN
Tschechischen Republik konnte schnell ermittelt
Czech Republic can-PST quickly determine-INF

werden, [was beim Durchgang durch die Erdatmosphäre
PASS.AUX-INF what at.the transit through the earth.atmosphere
geschehen sein *musste*].[5]
happen-PTCP.PST PRF.AUX-INF must-PST
'In examinations carried out by Pavel Spurný's team in the Czech Academy of Sciences, it was quickly determined [what must have happened during the transit through the Earth's atmosphere].'
DEICTIC CENTRE=matrix EXP = *Gabriel*

Examples like the one above provide further evidence that factive/resolutive predicates do actually not embed complements of the semantic type *question* but rather *facts* (cf. discussion in Ginzburg & Sag 2000: 63–80). The crucial fact is that epistemic necessity verbs like *müssen* are not common at all in information seeking *w*-questions as shown by Maché (2013: 304–309). Thus, the embedded interrogative in (10) does not have any counterpart as a main clause *w*-question.

As observed by Lasersohn (2005), Zimmermann (2004), Maché (2013: 299–305, 306–309), there are even more ways of how deictic centres can be interpreted. Epistemic modal verbs, epistemic adverbs and particles which occur in information seeking questions are interpreted with respect to the addressee.

(11) Wen dürfte der Joseph hier aller kennen?
who.ACC be.probable the Joseph here of.all know-INF
'Whom do you believe does Joseph know here?'
DEICTIC CENTRE=*addr*

It is important to stress that epistemic operators in information seeking interrogatives impose strict conditions of use on the contexts in which they can be employed. They are only felicitous in utterance situations in which the speaker assumes that the addressee is not in the position to commit to any answer and only able to provide assumptions that reflect the modal strength of the modal operator suggested by the speaker.

Unlike most European languages, German developed so-called reportative modal verbs, a highly specialised type of necessity verbs (cf. Becker 1836: 181, Bech 1949: 5–6, 11–13, 39). It is the only language which has two different of these verbs: The control verb *wollen*, which marks its subject as the source of some claim (cf. 12), and the raising verb *sollen*, which marks some referent which cannot be phonetically expressed by an argument but whose existence is at least presupposed (13). Arguably this could be some argument which lacks phonetical realisation. They behave like prototypical epistemic modal operators in many respects, but they crucially differ in that

[5] https://steiermark.orf.at/stories/3121388/ 14th September 2021.

the DEICTIC CENTRE is always identified with an attitude holder argument introduced by the modal verb itself.

(12) Der Joseph *will* die Maria kennen.
the Joseph wants the Mary knows-INF
'Joseph wants everybody to add the proposition to the common ground that Joseph knows Maria.'
DEICTIC CENTRE=SUBJ

(13) Der Joseph *soll* die Maria kennen.
the Joseph shall the Mary knows-INF
'someone wants everybody to add the proposition to the common ground that Joseph knows Maria.'
DEICTIC CENTRE=EXP

As Manfred Sailer (pers. commun.) pointed out, there is yet another possibility to bind open DC-variables. Reportative adverbials such as *laut*-PPs 'according to' may bind DC-variables under certain circumstances, but this relation only optional. Alternatively, the *laut*-PP can be interpreted as the source of evidence that makes the speaker assume the content of the prejacent proposition (cf. 15), similar observations have been made by Döring (2013: 115–117) for the German modal particle *wohl*. .

(14) [Laut dem Woiferl] *dürfte* der Joseph die Maria kennen.
according.to the Woiferl be.probable the Joseph the Mary knows-INF
(i)'Woiferl provided evidence that makes SPKR assume Joseph knows Maria.'
DEICTIC CENTRE=*spkr*
(ii)'Woiferl is assuming that Joseph probably knows Maria.'
DEICTIC CENTRE=*Woiferl*

(15) [Laut dem Woiferl] *soll* der Joseph die Maria kennen.
according.to the Woiferl be.claimed the Joseph the Mary knows-INF
'According to Woiferl, Joseph knows Maria.'
DEICTIC CENTRE=*Woiferl*

Coming to a conclusion, there are five different ways in which epistemic operators can be interpreted: They can be evaluated with respect to the knowledge of the speaker, of the addressee, of some argument of a superordinate clause and with respect to the knowledge of a referent which is contributed by the predicate meaning itself. As shown by Maché (2013: 422), the DC-variable is always bound by the most local potential binder:

(16) *Locality Requirement for Deictic Centres (LRDC)*

1. If the epistemic modal operator itself provides an appropriate argument referring to an attitude holder, a free DC-variable will be bound by that argument
2. If the epistemic modal operator is embedded by an attitude predicate and if there is no other more local intervening binder, a free DC-variable will be bound by the predicates argument that refers to the attitude holder
3. If there is no other more local intervening binder, a free DC-variable can be bound by the referent expressed by a *laut*-PP
4. If there is no other more local intervening binder, a free DC-variable will be bound by the most salient participant involved in updating the common ground,
   (a) which is the speaker in the case of assertions
   (b) which is the addressee in the case of questions

In order to yield an interpretable utterance, DC-variables have to be bound in order to ensure the *Condition on Deictic Centres* is met.

(17) *Condition on Deictic Centres (CoDeC)*
The use of an epistemic operator indicates that the embedded proposition is not part of the DEICTIC CENTRE's knowledge.

# 4 Analysis

In this section, it will be shown how to model lexicon entries of the different types of epistemic modifiers and how to formalise the *Locality Requirements for Deictic Centres*. Finally, some tree structures which involve the various types of epistemic modifiers will be exemplified.

## 4.1 Lexicon entries of modal predicates and adverbs

Presently, there is little work on modal semantics within the existing semantic frameworks of HPSG. The foundations are yet to be developed for Minimal Recursion Semantics and Lexical Resource Semantics. Thus, the semantic aspects will remain fairly superficial in the analysis outlined here. However, there is an implementation for a possible world semantics for *Type Theory with Records* in work under development by Robin Cooper, based on Kratzer's (1978) analysis which might be a possible way to follow for the analysis developed here.

Turning to predicative uses of epistemic adjectives like *wahrscheinlich* or *probable*, they can be modelled based on previous work by Pollard & Sag (1994: 330) and Müller (2013a: 80–82), as illustrated in Figure 1. It comes *wahrscheinlich* ‘probable’

$$\begin{bmatrix} \text{PHON} & /\text{vaʁˈ.ʃaɪ̯n.lɪç}/ \\ \text{SS}|\text{LOC} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{HEAD} & \begin{bmatrix} \text{PRD} \; + \\ \textit{adjective-prd} \end{bmatrix} \\ \text{SUBJ} & \left\langle \boxed{1}\ \textit{dass}\text{-S}_i \right\rangle \\ \text{COMPS} & \left\langle \left( \boxed{2}\ \text{PP}_{\textit{für}-j} \right) \right\rangle \\ \text{ARG-ST} & \left\langle \boxed{1}\ \textit{dass}\text{-S}_i\ ,\ \boxed{2}\ \text{PP}_{\textit{für}-j} \right\rangle \\ \text{MOD} & \langle\rangle \end{bmatrix} \\ \text{CONT} & \begin{bmatrix} \text{SOA} & i \\ \text{MFORCE} & \textit{mforce} \\ \text{MBASE} & \textit{soa} \\ \text{OSOURCE} & \textit{soa} \\ \text{EXP} & j \\ \text{DC} & \textit{ind} \\ \text{CLOSED} & \textit{boolean} \\ \textit{epistemic-soa} & \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

Figure 1: *wahrscheinlich* ‘probable’ – epistemic adjective (predicative)

with two arguments one subject clause and an optionally realised *für*-PP which encodes the attitude holder making the epistemic evaluation. If the latter is not spelled out, it is usually interpreted as a generic pronoun similar to $\text{PRO}_{arb}$.

The analysis of modal semantics presented here follows Robin Cooper’s (pers. comm.) approach to model propositions as *RecordTypes*, an situation semantic entity in *TTR* which could be roughly translated as *state-of-affairs.*[6]Accordingly, the CONT of an epistemic modifier is of the type *epistemic-soa* which is specified for the following attributes: SOA for the modified prejacent proposition, MFORCE to determine the modal force (possibility, probability, necessity,. . . ), MBASE for a modal base, and OSOURCE for ordering source. Moreover there is a variable for a deictic center DC, which is required to identify the attitude holder with respect to whose knowledge the epistemic modal operator is identified. Independently from that variable some epistemic modifiers have the potential to phonetically realise that attitude holder as an argument; this is represented under the attribute EXPERIENCER-argument. In the case of epistemic adjectives, this argument can be phonetically realised by a *für*-PP in German and as the subject-NP in the case of reportative *wollen.* Provided the right syntactic configuration, this argument qualifies as the most local legitimate binder of the DC-variable. Note that, following Cooper, the modal base and ordering source are modelled as *RecordTypes* here loosely translated as *soa*, an epistemic modal base could be conceived then as the very rich *soa* corresponding to the model of the actual world consistent with the knowledge of the speaker rather than as a set of possible worlds in the Kratzerian tradition. Finally, there is the boolean feature CLOSED which indicates whether or not the DC-variable is already locally bound by some argument directly introduced by the model operator itself. It is needed

$$\begin{bmatrix} \text{PHON} & /\textit{vaʁˈ.ʃaɪ̯n.lɪç}/ \\ \text{SYNSEM} & \begin{bmatrix} \text{LOC} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{HEAD} & \begin{bmatrix} \text{MOD} & \begin{bmatrix} \text{LOC} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{HEAD} & \textit{verb} \end{bmatrix} \\ \text{CONT} & \textit{soa}_i \end{bmatrix} \end{bmatrix} \end{bmatrix} \\ \text{COMPS} & \langle\rangle \\ \text{ARG-ST} & \langle \text{VP}_i \rangle \\ \textit{adverb} & \end{bmatrix} \\ \text{CONT} & \begin{bmatrix} \text{SOA} & i \\ \text{DC} & \textit{ind} \\ \textit{epistemic-soa} & \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

Figure 2: *wahrscheinlich* 'probably' – epistemic adverb

to explain why there are some operators that embed epistemic operators which are locally bound ($\begin{bmatrix}\text{CLOSED} & +\end{bmatrix}$), but fail to whenever they are not ($\begin{bmatrix}\text{CLOSED} & -\end{bmatrix}$), as shown in the corpus study by Maché (2013: 261–404). In the remainder of this paper, the features MFORCE, MBASE and OSOURCE will no longer be shown, as they are not relevant to the analysis presented here.

Epistemic adverbs in turn can be modelled along the lines of the entry for sentential negation as suggested by Müller (2020: 223) or Kim (2021: vii), cf. Figure 2. The main difference between epistemic adjectives and adverbs is that adjectives still have the potential to phonetically realise its attitude holder argument, for adverbs PP/NP arguments are no longer available on the ARG-ST list and the CONT-value. This is confirmed by the fact that those German adjectives which can license arguments in there predicative uses, such as *treu* + $\text{NP}_{\text{DAT}}$ 'loyal', *ähnlich* + $\text{NP}_{\text{DAT}}$ 'similar', *bewusst* + $\text{NP}_{\text{GEN}}$ 'aware' or *schuldig* + $\text{NP}_{\text{GEN}}$, they no longer have the potential to realise their arguments in their adverbial uses. In other words, they lack representations of these arguments in their CONT and ARG-ST attributes. Thus predicative epistemic adjectives always involve some mostly phonetically unrealised generic pronoun, similar to *sollen*, which is commonly analysed as predicating a wish to a unrealised referent different from the subject referent (cf. Becker 1836: 181, Bech 1949: 11). This is much in line with Lasersohn's (2005: 273–277) observation that predicates of personal taste always come with a variable for a judge according to whose attitude the predicate is evaluated.

Epistemic modal verbs are a subclass of raising verbs and can be modelled along the lines of the analysis developed by Müller (2013b: 243, 277), as illustrated in Figure 3. Crucially, their CONT-value does not include any attitude holder argument, only a DC-variable, as they are never observed with phonetically realised arguments – just as with epistemic adverbs.

Reportative *wollen* is a control predicate which introduces an attitude holder argument as its subject, yielding a structure with a verbal head which

[6] The analysis developed here is also perfectly compatible with Ginzburg & Sag's (2000: 38–44) alternative assumption of distinct *message* types.

$$\begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{HEAD} & \textit{verb} \\ \text{ARG-ST} & \boxed{1} \oplus \boxed{2} \oplus \left\langle \text{V}\begin{bmatrix} \textit{bse}, \text{ LEX } +, \text{ SUBJ}\boxed{1}, \text{ COMPS}\boxed{2} \end{bmatrix}_i \right\rangle \end{bmatrix} \\ \text{CONT} & \begin{bmatrix} \text{SOA} & i \\ \text{DC} & \textit{ind} \\ \textit{epistemic-soa} & \end{bmatrix} \end{bmatrix}$$

Figure 3: *dürfte* ‘be.probable’ – epistemic modal verb

$$\begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{HEAD} & \textit{verb} \\ \text{ARG-ST} & \left\langle \text{NP}\begin{bmatrix} \textit{str} \end{bmatrix}_i \right\rangle \oplus \boxed{2} \oplus \\ & \left\langle \text{V}\begin{bmatrix} \textit{bse}, \text{ LEX } +, \text{ SUBJ } \left\langle \text{NP}\begin{bmatrix} \textit{str} \end{bmatrix}_i \right\rangle, \text{ COMPS}\boxed{2} \end{bmatrix}_j \right\rangle \end{bmatrix} \\ \text{CONT} & \begin{bmatrix} \text{EXP} & i \\ \text{SOA} & j \\ \text{DC} & i \\ \text{CLOSED} & + \\ \textit{epistemic-soa} & \end{bmatrix} \end{bmatrix}$$

Figure 4: *wollen* ‘want/claim’ – reportative modal verb

has a EXP-argument on its ARG-ST and its CONT and its CONT is of the type *epistemic-soa*, as shown in Figure 4. As already demonstrated in Section 4.2, this is exactly the configuration in which *LRDC 1* can apply, binding the DC-variable is locally by the EXP-argument. The analysis of control verbs employed follows the spirit suggested by Müller (2013b: 280). The entry for reportative *sollen* is almost identical except that its attitude holder argument is not its subject but it remains phonetically unrealised.

## 4.2 Formalising the *Locality Requirement for Deictic Centres*

The first clause of the *LRDC* applies to epistemic modifiers which introduce an EXPERIENCER-argument referring to the attitude holder that locally binds the DC-variable. The requirement is that the input structure has to contain a verbal head, a CONT-value of the type *epistemic-soa* and a representation of an EXP-argument in its CONT-attribute, as shown in Figure 5. This constraint applies to configurations which involve either predicative epistemic adjectives or reportative modal verbs.

The formalisation of *LRDC 2* states that whenever an attitude predicate embeds a finite or nonfinite clauses which contains an epistemic operator indicated by the type *epistemic-soa* whose DC-variable is still free ($\begin{bmatrix} \text{CLOSED} & - \end{bmatrix}$), this DC-variable is co-indexed by an appropriate argument in the matrix clause referring to the attitude holder, as demonstrated in Figure 6. The

$$\begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{HEAD} & \textit{verb} \end{bmatrix} \\ \text{CONT} & \begin{bmatrix} \text{EXP} & i \\ \textit{epistemic-soa} & \end{bmatrix} \end{bmatrix} \rightarrow \begin{bmatrix} \text{CONT} & \begin{bmatrix} \text{DC} & i \\ \text{CLOSED} & + \end{bmatrix} \end{bmatrix}$$

Figure 5: Locality Requirement for Deictic Centres – Clause 1

$$\left[\begin{array}{ll}\textsc{cat} & \left[\begin{array}{l}\textsc{arg-st}\ \mathit{list} \oplus \left\langle \mathrm{NP}_i \right\rangle \oplus \mathit{list} \oplus \\ \quad \left\langle \mathrm{S}\left[\begin{array}{ll}\textsc{h-dtr}|\textsc{synsem}|\textsc{loc} & \left[\begin{array}{ll}\textsc{cat}|\textsc{head}|\textsc{ic} & - \\ \textsc{cont} & \left[\begin{array}{l}\textsc{closed}\ - \\ \mathit{epistemic\text{-}soa}\end{array}\right]\end{array}\right]\end{array}\right]\right\rangle\end{array}\right] \\ \textsc{cont} & \left[\textsc{exp}\ i\right]\end{array}\right] \rightarrow$$
$$\left[\textsc{cat}\left[\textsc{arg-st}\ \mathit{list} \oplus \left\langle \mathrm{S}\left[\textsc{h-dtr}|\textsc{ss}|\textsc{cont}\left[\textsc{dc}\ i\right]\right]\right\rangle\right]\right]$$

Figure 6: Locality Requirement for Deictic Centres – Clause 2

$$\left[\begin{array}{ll}\textsc{head} & \left[\begin{array}{ll}\textsc{ic} & + \\ \textsc{vform} & \mathit{fin} \\ \mathit{verbal} & \end{array}\right] \\ \textsc{cont} & \left[\begin{array}{ll}\textsc{soa} & \left[\begin{array}{l}\textsc{closed}\ - \\ \mathit{epistemic\text{-}soa}\end{array}\right] \\ \mathit{proposition} & \end{array}\right] \\ \textsc{bckgrd} & \left\{\left[\begin{array}{l}\textsc{prop}\left[\textsc{soa}\left[\textsc{nucl}\left[\begin{array}{l}\textsc{inst}\ i \\ \mathit{spkr\text{-}rel}\end{array}\right]\right]\right] \\ \mathit{fact}\end{array}\right]\right\} \oplus \text{list}\end{array}\right] \rightarrow$$
$$\left[\textsc{cont}\left[\begin{array}{ll}\textsc{soa} & \left[\begin{array}{l}\textsc{dc}\ i \\ \mathit{epistemic\text{-}soa}\end{array}\right] \\ \mathit{proposition} & \end{array}\right]\right]$$

Figure 7: Locality Requirement for Deictic Centres – Clause 4a

feature IC− (INDEPENDENT CLAUSE) as suggested by Ginzburg & Sag (2000: 41, 45) signals that the relevant clause is embedded.

Clause 4a addresses cases in which a declarative main clause (IC+) contains an epistemic operator (type *epistemic-soa*) which has a DC-variable, which has not been locally bound yet (CLOSED−). In such a configuration the DC-variable is bound by the representation of the speaker referent he BACKGROUND feature proposed by Ginzburg & Sag (2000: 120–124).

Clause 4b is almost identical except that CONT is of the type *question* and that the DC-variable is bound to the representation of the addressee in BCKRD. As *LRDC 3* is more complicated to describe and and requires more space, it cannot be addressed in this paper.

### 4.3 Binding of the deictic centre

In this section, it will be shown why the interpretation of clauses that contain some epistemic modifiers is mostly almost identical in many cases despite the fact that these modifiers may be entirely different categories. Secondly, it will shed light on the differences between epistemic adverbs and epistemic adjectives, which cause the former to be by far less acceptable in information seeking questions than the latter.

Figure (8) illustrates the combination of a predicative epistemic adjective with a copula by means of predicate complex formation as suggested by Müller (2013b: 28). The essential assumption here is that the copula is not

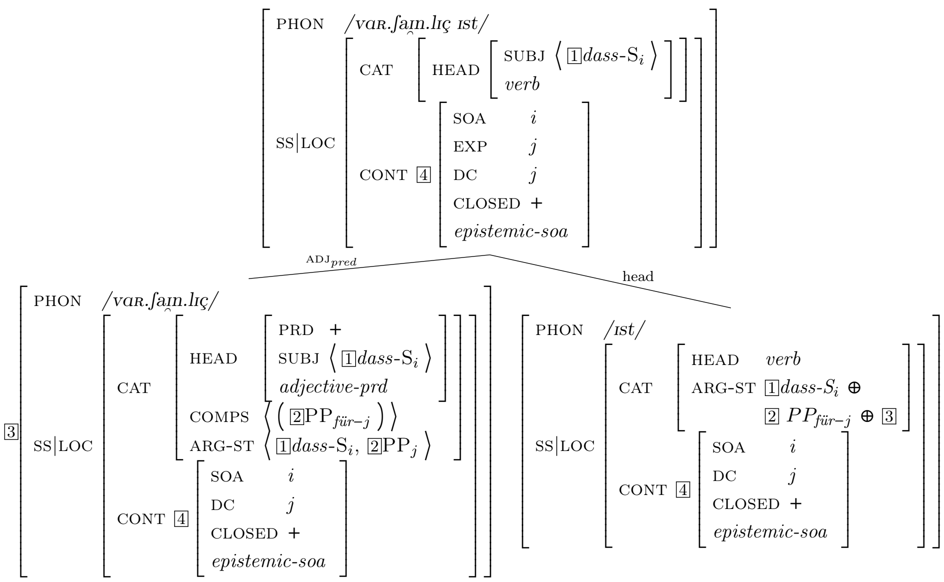



Figure 8: Copula with predicative epistemic adjective

semantically empty but transparent, in other words, it inherits the full lexical content of the embedded predicative. Note that in Müller's (2013b: 20) MRS-based analysis the copula only inherits parts of the embedded predicative's CONT-value. The inspiration for the analysis pursued here comes from the fact that a copula with a predicative behaves semantically the same way as a verb. The combination of the predicative epistemic adjective with a copula yields a phrase which (i) contains a verbal head with an *epistemic-soa* as a CONT-value and (ii) its CONT-value has a EXP-argument. This is exactly the configuration in which *LRDC 1* applies and binds the DC-variable

In contrast, epistemic adverbs which are adjoined to VPs yield an argument structure which essentially differs from epistemic adjectives in predicative function, cf. Figure 9. As the adverb is lacking a representation of an EXP-argument in its CONT-attribute, the VP resulting from the adjunction of the adverb does not have any CONT-attribute which contains an EXP-argument either, which means *LRDC 1* fails to apply and the DC-variable is left free. So *LRDC 2*, *3* & *4* are the only options. Embedded in an information seeking question, the DC-variable theoretically still could be bound by the addressee by means of *LRDC 4*. But it appears that there are pretty strict conditions on discourse: the speaker believes the addressee is not able to commit to truth value of the proposition but only to the degree reflected by the modal force of the epistemic operator.

So why are predicative epistemic adjectives in information seeking questions then more acceptable despite the fact that they also are used in contexts in which the speaker believes that the addressee is not able to commit to truth

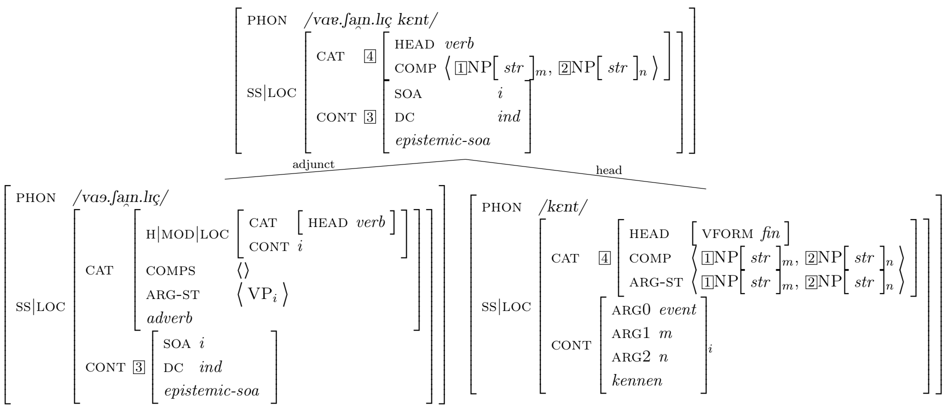


Figure 9: Epistemic adverbs adjoined to VP

value of the proposition? The crucial difference is that in the case of epistemic adverbs the request of epistemic evaluation is directed to the addressee alone. In contrast, predicative epistemic adjectives most typically select a generic pronoun as their attitude holder argument and by means of that the addressee may include epistemic evaluations done by some other referent. Due to their lack of an EXP-argument in their CONT-value, the DC-variable in epistemic adverbs is only available to binders in a superordinate clause (attitude holder of a matrix attitude predicate) or participating in the speech act (speaker, addressee). In contrast, predicative adjectives involve a generic pronoun as optional argument, which means the DC-variable is bound by that generic pronoun also allowing for reported assessments. This would also account for the more 'objective' or 'inter-subjective' flavour which is often associated with these adjectives.

Despite their very different argument structure, epistemic modal verbs share two important aspects with epistemic adverbs adjoined to a VP. Firstly, they do not have an ARG-ST with an EXP-argument and secondly, their CONTENT-value that lacks an EXP-argument. These parallels predict that epistemic modal verbs and epistemic adverbs should behave in a similar manner. And indeed they do. When embedded under attitude predicates, they are always interpreted with respect to the attitude holder argument in the superordinate clause:

(18) Der Opa glaubt, dass ich vielleicht den Kurz gewählt habe[7]
the granpa thinks that I maybe the Kurz vote-PTCP.PST have
'Grandpa thinks that I maybe voted for Kurz.'
DEICTIC CENTRE=*Opa*

The binding behaviour in Example (18) also demonstrates that Nuyts's

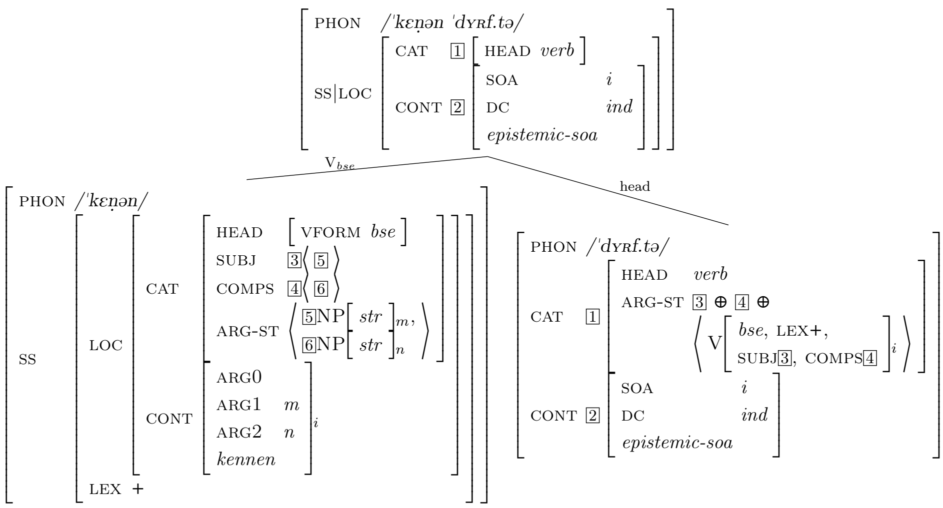


Figure 10: Epistemic modal verbs

(2001a: 72–78) claim that epistemic adverbs are intrinsically performative, in other words performing a weakening of the commitment to the truth by the speaker is not accurate: The epistemic adverb is interpreted with respect the matrix subject alone, excluding the speaker. Thus, epistemic adverbs are context dependent operators.

### 4.4 Further Evidence

There is another puzzle yet to be solved. As shown by Doherty (1985: 118–119), Reis (2001: 296), Maché (2013: 387–390), reportative *sollen* and *wollen* are attested in information seeking questions and they are subject to less restrictions than epistemic modal verbs are. Example (19) was uttered in a context in which the common ground contains the following facts: (i) house searches were conducted in several apartments of Austrian politicians. (ii) in order to order house searches, the federal prosecutor for corruption has to file a report in which accusation against the suspected are documented.

(19) Fabian erklär mir das nochmal, was genau sollen die Beschuldigten getan haben?[8]
Fabian explain-IMP me this again what exactly is.claimed the accused do-PTCP.PST have-INF
'Fabian, explain me this once again. What exactly are the accused claimed to have committed?'

[8] *Hausdurchsuchungen: Der Anfang vom türkisen Ende?* https://www.derstandard.at/story/2000130226235/hausdurchsuchungen-der-anfang-vom-tuerkisen-ende?ref=rec. Time 4:48. Accessed on October 6 2021.

(20) Wo will Grass eine Tabuisierung von Israel-Kritik entdeckt
where wants Grass a taboo of Israel.criticism find-PPP
haben? Kein anderes Land wird so viel kritisiert wie Israel.[9]
have-INF no other country is so much criticised as Israel
'Where does Grass claim to have found a criticism of Israel? No other country is subject to as much criticism as Israel is.'

Examples (19–20) involve some puzzling aspects, too. As mentioned above, reportative *wollen* and *sollen* are counted among epistemic necessity verbs in the broader sense, but unlike these latter they are acceptable in information seeking questions. As shown in Section 4.3, unbound DC-variables are only licensed in information seeking questions if a full range of discourse conditions are met. One condition states that epistemic necessity operators are almost impossible in this environment. However, reportative modal verbs have a bound DC-variable, by virtue of which they are not subject to these conditions. The analysis proposed here is further supported by accurately predicting the diverging preferences of epistemic necessity verbs and reportatives.

## 5 Conclusions

The different behaviour of predicative epistemic adjectives and epistemic adverbs in West Germanic languages is due to a difference in argument structure: The former have an potentially phonetically unrealised attitude holder argument, which by virtue of predicate complex formation is attracted onto the copulas valency list and treated as its own argument. In this configuration the argument becomes a legitimate local binder of the variable for the deictic centre. Epistemic operators which contain a bound DC-variable are subject to less discourse conditions as free ones. With epistemic adverbs this is not the case. When they adjoin to a VP they do not contribute any attitude holder argument to the VP, which means the DC-variable remains free and the epistemic operator is only interpretable under rather unlikely circumstances.

## References

Bech, Gunnar. 1949. Das Semantische System der Modalverben. *Travaux du Cercle Linguistique de Copenhague* VI. 3–46.

Becker, Karl Ferdinand. 1836. *Ausführliche deutsche Grammatik als Kommentar der Schulgrammatik*. 2nd edn. Vol. 1. Frankfurt am Main: G. F. Kettembeil.

Diewald, Gabriele. 1999. *Die Modalverben im Deutschen: Grammatikalisierung und Polyfunktionalität*. Tübingen: Niemeyer.

Doherty, Monika. 1985. *Epistemische Bedeutung*. Berlin: Akademie Verlag.

[9] DeReKo: RHZ12/MAI.09565 Rhein-Zeitung, 09.05.2012.

Döring, Sophia. 2013. Modal particles and context shift. In Daniel Gutzmann & Hans-Martin Gärtner (eds.), *Beyond expressives*, 95–124. Leiden: Brill.

Ginzburg, Jonathan & Ivan A. Sag. 2000. *Interrogative investigations*. Stanford: CSLI.

Greenbaum, Sidney. 1969. *Studies in english adverbial usage*. London: Longman.

Hare, R. M. 1971. *Practical inferences*. London: Macmillan.

Hengeveld, Kees. 1988. Illocution, mood and modality in a functional grammar of Spanish. *Journal of Semantics* 6. 227–269.

Huitink, Janneke. 2008. Scoping over epistemics in English and in Dutch. In *Collection of the papers selected from the CIL held at Korea University in Seoul, Linguistic Society of Korea*, 2077–2089.

Jackendoff, Ray. 1972. *Semantic interpretation in generative grammar*. Cambridge, MA: MIT Press.

Kiefer, Ferenc. 1984. Focus and modality. *Groninger Abreiten zur Germanistischen Linguistik* 24. 55–81.

Kim, Jong-Bok. 2021. Negation. In Stefan Müller, Anne Abeillé, Robert D. Borsley & Jean-Pierre Koenig (eds.), *Head-driven phrase structure grammar: the handbook*. Berlin: Language Science Press.

Kratzer, Angelika. 1978. *Semantik der Rede. Kontexttheorie – Modalwörter – Konditionalsätze*. Scriptor.

Lasersohn, Peter. 2005. Context dependence, disagreement and predicates of personal taste. *Linguistics and Philosophy* 28. 643–686.

Lyons, John. 1977. *Semantics*. Vol. 2. Cambridge: CUP.

Maché, Jakob. 2013. *On black magic. How epistemic modifiers emerge*. Freie Universität Berlin. (Doctoral dissertation).

Müller, Stefan. 2013a. *Head-Driven Phrase Structure Grammar. Eine Einführung*. 3rd edn. Tübingen: Stauffenburg.

Müller, Stefan. 2013b. On the Copula, Specificational Constructions and Type Shifting.

Müller, Stefan. 2020. German clause structure: and analysis withspecial consideraton of so-called multiple frontings. To be published in Language Science Press.

Nuyts, Jan. 2001a. *Epistemic Modality, Language, and Conceptualization*. Amsterdam: John Benjamins.

Nuyts, Jan. 2001b. Subjectivity as an evidential dimension in epistemic modal expression. *Journal of Pragmatics* 33(3). 383–400.

Öhlschläger, Günther. 1989. *Zur Syntax und Semantik der Modalverben*. Tübingen: Niemeyer.

Perkins, Michael R. 1983. *Modal expressions in English*. Norwood, NJ: Ablex.

Pollard, Carl & Ivan A. Sag. 1994. *Head driven phrase structure grammar*. Stanford: CSLI.

Reis, Marga. 2001. Bilden Modalverben im Deutschen eine syntaktische Klasse? In Marga Reis & Reimar Müller (eds.), *Modalität und Modalverben im Deutschen*, 239–262. Hamburg: Buske.

Stephenson, Tamina. 2007. Judge Dependence, Epistemic Modals and Predicates of Personal Taste. *Linguistics and Philosophy* 30(4). 487–525. DOI: 10.1007/s10988-008-9023-4.

Tancredi, Christopher. 2007. *A Multi-Model Modal Theory of I-Semantics. Part I: Modals*. Ms. University of Tokyo.

Watts, Richard J. 1984. An analysis of epistemic possibility and probability. *English Studies* 65(2). 129–140. DOI: 10.1080/00138388408598312.

Zimmermann, Malte. 2004. Zum Wohl: Diskurspartikel als Satztypmodifikatoren. *Linguistische Berichte* 199. 253–286.

# Semantics-oriented resultatives: Evidence from valency alternation verbs

Tsuneko Nakazawa
The University of Tokyo

Rui Cao
The University of Tokyo

Proceedings of the 28th International Conference on
Head-Driven Phrase Structure Grammar

Online (Frankfurt/Main)

Stefan Müller, Nurit Melnik (Editors)

2021

Frankfurt/Main: University Library

pages 125–143

Keywords: resultatives, valency alternation, DOR, HPSG, Japanese, Chinese

Nakazawa, Tsuneko & Rui Cao. 2021. Semantics-oriented resultatives: Evidence from valency alternation verbs. In Stefan Müller & Nurit Melnik (eds.), *Proceedings of the 28th International Conference on Head-Driven Phrase Structure Grammar, Online (Frankfurt/Main)*, 125–143. Frankfurt/Main: University Library. DOI: 10.21248/hpsg.2021.7.

**Abstract**

Resultative phrases are generally believed to conform to the Direct Object Restriction: that is, they describe the direct object if verbs are transitive. However, some exceptions have occasionally been reported, and this paper investigates the problem by focusing on resultative phrases that occur with the valency alternation verbs in Japanese and Mandarin Chinese. Verbs that license the locative alternation and locatum-subject alternation describe events that involve two arguments, the location and the locatum, which are perceived to concurrently undergo a change of state. It will be shown that resultative phrases with a valency alternation verb can be predicated of either argument regardless of whether it is expressed as direct object. Furthermore, resultative verbal suffixes in Mandarin, interpreted as description of either the location or the locatum, give rise to the locative alternation while their interpretation remains the same. Thus, it is claimed that in Japanese and Mandarin, the predication relation of resultative phrases is not determined by the grammatical function of arguments as generally believed, but rather by the lexical semantics of the verbs.

## 1 Introduction

It is generally claimed that resultative phrases in Japanese are similar to those in English in that they obey the Direct Object Restriction, i.e. they are predicated of the direct object of transitive verbs, or the subject of unaccusative intransitive verbs (Simpson, 1983). However, some authors have pointed out examples that do not follow the generalization. (In the following examples, resultative phrases are underlined while the NPs whose referents are described by resultative phrases are in bold.)

(1) otoko-wa **kabe**-ni penki-o <u>aka-ku</u> nut-ta.
man-TOP wall-LOC paint-ACC red-KU smear-PAST
'(lit.) The man smeared paint on the wall (so that it became) red.'
(Nitta, 2002: 52)

The resultative phrase *aka-ku* 'red' describes the oblique NP *kabe* 'wall' rather than the direct object *penki* 'paint,' and the acceptability contrasts with the well-known pair of examples, which shows that the predication relation between resultative phrases and argument NPs is syntactically constrained in English.

(2) a. John loaded **the wagon** <u>full</u> with hay.
b. *John loaded **the hay** into the wagon <u>full</u>.
(Williams, 1980: 204)

Examples in (2) show that resultative phrases in English must be predicated of the direct object while (1) demonstrates that the same syntactic constraint does not apply to Japanese.

Nitta (2002) analyzes the resultative phrase in (1) as an exception and argues that some "verbs of attachment" allow resultative phrases to be predicated of the oblique NP marked with the suffix *-ni* 'on, in, to,' which denotes the goal of attachment. According to him, the exception arises because verbs of attachment describe the events where not only what is attached, but sometimes also what it is attached to can undergo a change of state. While this paper shares his analysis based upon the lexical semantics of verbs, it will show that such resultative phrases are not isolated exceptions, but rather found systematically, and their occurrences are not limited either to the verbs of attachment or to *ni*-marked oblique NPs. In particular, this paper focuses on the verbs of locative alternation. The verb *nur-* 'smear' in (1) and the verb *load* in (2) are locative alternation verbs in Japanese and English respectively. It is claimed that locative alternation verbs allow resultative phrases to be predicated of oblique NPs as well as direct objects.

The phenomenon observed in (1) can also be found in Mandarin Chinese. Cao (2018) argued that resultative verb compounds ($V_{action}$+$V_{result}$) can go through the locative alternation in Mandarin and the example is shown in (3).

(3) a. Tailang zai-**baisede-huaping**-li cha-<u>man</u>-le meiguihua
Tailang LOC-white-vase-LOC put-full-PERF rose
'(lit.) Tailang put the roses into the white vase full'

b. Tailang yong-meiguihua cha-<u>man</u>-le **baisede-huaping**
Tailang with-rose put-full-PERF white-vase
'(lit.) Tailang put the white vase full with roses'

(Cao, 2018: 51)

In (3), the $V_{result}$ *man* 'full' describes the resultant state of *baisede-huaping* 'white vase' regardless of whether it is expressed as oblique in (3a) or as a direct object in (3b). Apparently (3b) obeys the Direct Object Restriction but (3a) does not.

This paper claims that resultative phrases are predicated of the argument that undergoes a change of state in the event denoted by the main verb. The locative alternation verbs involve two arguments that undergo a change, and consequently allow either argument to be described by a resultative phrase. Furthermore, the predication relation between resultative phrases and arguments of verbs remain constant regardless of which argument appears as the direct object in the alternative syntactic structures. The analysis is cast in Head-driven Phrase Structure Grammar to encode the lexical semantics of locative alternation verbs. The semantic structure triggers the alternative syntactic variants while the interpretation of resultative phrases is not anchored to the syntactic realization of arguments, as the Direct Object Restriction predicts, but is analyzed to be tied to the shared semantic representation which identifies two arguments undergoing a change.

## 2 The resultative construction

Resultative constructions refer to clauses in which, in addition to the main verb (V), there is an additional, secondary predicate known as the result XP, predicating some state that comes about for some participant in the event as a result of the action described by the clause (Beavers, 2016). Some examples in English, Japanese and Mandarin Chinese are given in (4) through (6).

(4) John hammered **the metal** flat.

(5) John-ga **kabe**-o aka-ku nut-ta. (Japanese)
John-NOM wall-ACC red-KU smear-PAST
'John sprayed the wall red.'

(6) Ta ba-**yifu** xi-de ganganjingjing. (Mandarin)
he BA(ACC)-clothes wash-DE clean
'(lit.) He washed the clothes clean.'

The resultant state *flat/aka-ku/ganganjingjing* 'flat/red/clean' in the event are caused by the action expressed by the main verb *hammer/nut-/xi-* 'hammer/smear/wash.' Furthermore, there is another type of resultative construction in Mandarin, which is known as resultative verb compounds, exemplified in (7). A resultative verb compound in Mandarin is, very roughly, a compound verb made up of two parts, the first indicating an action and the second the result of that action (Thompson, 1973). In other words, resultatives are expressed as the second component of the verb compound. Similarly to (6), the resultant state *kai/hong* 'open/red' in (8) and (9) are caused by the action expressed by the main verb *la-/tu-* 'pull/smear.'

(7) La-kai
'pull-open' ($V_{action}$ + $V_{result}$)

(8) Ta la-kai-le **men**.
He pull-open-PERF door
'He pulled the door open.'

(9) John tu-hong-le **qiangmian**.
John smear-(become) red-PERF wall
'John smeared the wall red.'

Regardless of whether a result is expressed by resultative phrases or resultative verb compounds, they are generally believed to conform to the

Direct Object Restriction (the DOR henceforth). The DOR, originally observed by Simpson (1983), and later dubbed by Levin & Rappaport Hovav (1995), states that a resultative phrase in English licensed by a transitive verb is predicated of the postverbal NP, but may not be predicated of a subject or of an oblique complement as shown in (10). Examples (11) and (12) demonstrate that the DOR is equally applicable to Japanese and Mandarin, respectively.

(10)John smeared the **wall** red.

(11)John-ga **kabe**-o akaku nut-ta. (Japanese)
John-NOM wall-ACC red smear-PAST
'John smeared the wall red.'

(12)John tu-hong-le **qiangmian.** (Mandarin)
John smear-(become)red-PERF wall
'John smeared the wall red.'

In the examples above, *red* in English, *akaku* 'red' in Japanese, *hong* 'red' in Mandarin are the resultatives, and they all describe the state of the *wall*, *kabe* 'wall' or *qiagmian* 'wall,' which is the direct object of the verb.

Semantically, Washio (1997), analyzing the Japanese resultative construction, classifies the semantic relations between the main verbs and resultative phrases into "weak" and "strong." "Weak resultatives" describe a result which is predictable from the event denoted by the main verb; resultatives are "strong" if an unpredictable result is described. English and Mandarin allow both strong and weak resultatives, while Japanese only allows weak resultatives according to Washio (1997). Some examples of English and Mandarin are shown below as (13) and (14).

(13)English
a. The horses dragged the **logs** smooth. (Strong)
b. I froze the **ice cream** solid. (Weak)

(14)Mandarin
a. Na-tiao-gou fei-xing-le **wo-baba.** (Strong)
that-CL-dog bark-awake-PREF my-father
'That dog barked my father awake.'
b. John ti-po-le **qiuxie.** (Weak)
John kick-broken-PREF sneaker
'(lit.) John kicked the sneaker broken.'

Thus, while English, Japanese and Mandarin all seem to follow the DOR in basic cases, the semantic property of resultative phrases is more restricted than those in English and Mandarin. In the following sections, however, a closer look at the predication relation of resultative phrases reveals that Japanese and Mandarin are more permissive in that they allow resultative phrases to be predicated of arguments that are expressed as oblique NPs.

## 3 Valency alternation verbs in Japanese

This section discusses resultative phrases that appear in the locative alternation construction as well as the locatum-subject alternation construction in Japanese.

### 3.1 The resultative construction in Japanese

It has been long understood (e.g. Kageyama, 1996) that resultative phrases in Japanese follow the DOR as is the case with English.[1] The previous example (5), repeated here, and (15) show the resultative phrases describing the referent of direct object.

| | | | | |
|---|---|---|---|---|
| (5) | John-ga | **kabe**-o | aka-ku | nut-ta. |
| | John-NOM | wall-ACC | red-KU | smear-PAST |

'John sprayed the wall red.'

| | | | | |
|---|---|---|---|---|
| (15) | Taro-ga | **kabin**-o | konagona-ni[2] | kowasi-ta. |
| | Taro-NOM | vase-ACC | pieces-NI | break-PAST |

'Taro broke a vase into pieces.'

Since resultative phrases describe a result of a change, it follows that the verbs which allow a resultative phrase generally express an event involving a change of state of the direct object. Some authors further conclude that, unlike English, verbs that appear in the Japanese resultative construction must encode such a change as part of their lexical semantics, distinguishing those verbs as "affected-theme transitives" (Koizumi, 1994), or "change-of-state verbs" (Kageyama, 1996 and 2001). For example, unlike the English counterpart, the Japanese verb of applying force *tatak-* 'hit, beat, pound' does not allow a resultative phrase, e.g. **usu-ku tatak-u* '(lit.) pound thin,' because the state change of the theme argument is not entailed by the verb although it may be likely (Washio, 1997: 9).

Furthermore, the Japanese resultative construction allows only "weak resultatives" (Washio, 1997), or "Type B resultatives" (Iwata, 2006), i.e.

[1]Although this paper deals with transitive verbs, resultative phrases in Japanese also cooccur with unaccusative intransitive verbs describing the referent of subject as characterized by the DOR. Among the Simpson's analyses (1983: 146-147), however, a fake object, e.g. *I laughed myself sick*, or an unsubcategorized object, e.g. *I ate him out of house and home*, are not allowed in Japanese.

[2]Resultative phrases are morphologically marked by the suffix *-ku* as in (5) or *-ni* in (15), depending on their syntactic categories; the difference of those suffixes have no significant consequences for the analysis.

resultative phrases that describe a predictable result. The sentence *The horses dragged the logs smooth* in (13a) has no well-formed Japanese equivalent because, it is claimed, logs' being smooth is not a result predictable from horses' dragging them (Washio, 1997). Thus, the semantic representation of the verbs contains not only a change of state of an argument but also a reference to a specific result.

### 3.2 Goal-oriented resultatives

Although it is generally claimed that resultative phrases in Japanese also obey the DOR as described in the previous section, some authors (e.g. Nitta, 2002; Miyakoshi, 2006) have pointed out the examples that do not follow the generalization: e.g. in the previous example (1), repeated here, the resultative *aka-ku* 'red' describes the location argument *kabe* 'wall' expressed as an oblique; the resultative *siro-ku* 'white' in (16) describes the oblique *tenzyou-to kabe* 'the ceiling and wall'.

(1) otoko-wa **kabe**-ni penki-o <u>aka-ku</u> nut-ta.
man-TOP wall-LOC paint-ACC red-KU smear-PAST
'(lit.) The man smeared paint on the wall (so that it became) red.'
(Nitta, 2002: 52)

(16) Kyou-wa **tenzyou-to kabe**-ni <u>siro-ku</u> penki-o nut-ta.
today-TOP ceiling-and wall-to white-KU paint-ACC spray-PAST
'(lit.) Today, (I) sprayed paint on the ceiling and wall white.'
(Miyakoshi, 2006: 9)

Example (16) is considered to be a deviation in that the resultative is predicated of the oblique locative. Nitta (2002) calls such examples *ni* 'to'-marked NP resultatives and Miyakoshi (2006) goal-oriented resultatives, and both authors attribute the deviation of the predication relation to the event structure of spraying: if paint is sprayed on a wall, the wall necessarily undergo a change of color, thus allowing a resultative phrase to describe the wall.

However, the oblique NPs which resultative phrases are predicated of are not limited to the *ni*-marked NP, and the next section shows that what is crucial for the acceptability of (1) and (16) is not the locative NP but the locative alternation verb *nut-ta* 'smeared, sprayed'.

### 3.3 Location-oriented resultatives in the locative alternation

Levin (1993: 118) characterizes the locative alternation verbs as describing events of "covering surfaces and putting things into containers," and they exhibit alternative argument structures: for example, English locative alternation verb *load* allows the location argument *the wagon* to be expressed either as direct object *John loaded the wagon with hay*, or an oblique *John* *loaded the hay into the wagon*. However, since the DOR predicts that a resultative phrase is predicated of the direct object, the location can be described by a resultative phrase only when it appears as direct object, as confirmed in (2) in Section 1, repeated here.

(2) a. John loaded **the wagon** <u>full</u> with hay.
b.* John loaded the hay into **the wagon** <u>full</u>.
(Williams, 1980: 204)

The resultative phrase *full*, which describes the state of *the wagon*, is acceptable only when *the wagon* is expressed as the direct object.

The verb *nut-ta* 'sprayed' in (16) is a locative alternation verb in Japanese. Unlike the English locative alternation verb *load* in (2), however, the verb allows the location-oriented resultative *siro-ku* 'white' in both alternative syntactic structures.

(17) a. Kyou-wa **tenzyou-to kabe**-o <u>siro-ku</u> penki-de nut-ta.
today-TOP ceiling-and wall-ACC white-KU paint-with spray-PAST
'Today, (I) sprayed the ceiling and wall white with paint.'

b. Kyou-wa **tenzyou-to kabe**-ni <u>siro-ku</u> penki-o nut-ta. (=(16))
today-TOP ceiling-and wall-to white-KU paint-ACC spray-PAST
'(lit.) Today, (I) sprayed paint on the ceiling and wall white.'

Locative alternation verbs generally involve two arguments (in addition to the agent if the verb is transitive): the locatum argument that corresponds to what moves, and the location argument that corresponds to the goal of motion: e.g., *penki* 'paint' in (17) is the locatum argument, and *tenzyo-to kabe* 'the ceiling and wall' is the location argument. As many authors argue (e.g. Pinker, 1989), verbs' ability to participate in the locative alternation is lexically constrained: they describe the events where both arguments are perceived to concurrently undergo a change of state or position. The simultaneous changes give rise to alternative syntactic structures that map a distinct argument, i.e. *tenzyo-to kabe* 'the ceiling and wall' in (17a) and *penki* 'paint' in (17b), to the direct object.

This paper claims that resultative phrases in Japanese, as well as those in Mandarin discussed in Section 4, are predicated of the argument that undergoes a change of state in the event denoted by the main verb. That is, the predication relation of resultative phrases is determined by the lexical semantics of verbs, rather than syntactic structures they appear in. Thus, the location-oriented resultative phrase *siroku* 'white' is predicated of the location argument *tenzyo-to kabe* 'the ceiling and wall' regardless of whether the argument appears as the direct object in (17a) or as an oblique in (17b). Furthermore, the next section shows that locative alternation verbs allow not only the location argument but also the locatum argument to be described by a resultative phrase in either syntactic alternative.

### 3.4 Locatum-oriented resultatives in the locative alternation

The next examples show that a resultative phrase can be predicated of the locatum argument of locative alternation verbs in Japanese, whether it is expressed as direct object or as an oblique. The verb *mai-* 'bind, wind' in (18a) and (18b) is another locative alternation verb in Japanese, although the English counterpart *wind* is not an alternation verb. The locatum argument *houtai* 'bandage' is expressed as direct object in (18a) and described by the resultative phrase *atuku* 'thick,' conforming to the DOR. The resultative phrase can, however, also be predicated of the locatum argument expressed as *de*-marked oblique NP in (18b). The example is taken (and simplified) from the BCCWJ-NT corpus.

(18) a. me-no-ue-ni **houtai-o** atuku mai-ta.
eye-GEN-top-LOC bandage-ACC thick bind- PAST
'(Someone) bound a bandage thick on top of eyes.'

b. me-no-ue-o **houtai-de** atuku mai-ta.
eye-GEN-top-ACC bandage-with thick bind-PAST
'(lit.) (Someone) bound the top of eyes with a bandage thick.'
[Nijo, 2000; simplified]

Although English locative alternation verbs, e.g. *spray,* allow a resultative phrase to be predicated of the locatum argument also, the argument must appear as direct object, as shown in (19).

(19) a. John sprayed **paint** thick on the wall.
b.*John sprayed the wall with **paint** thick.

The Japanese examples in (18) show that the oblique NPs which resultative phrases are predicated of are not limited to *ni*-marked locative NPs, and provide strong evidence that what is crucial for the oblique-oriented resultatives is the locative alternation verbs, which lexically encode multiple arguments that undergo a change of state. Note that, as the examples in (17) and (18) show, there is no syntactic clue as to which argument a resultative phrase is predicated of, and a resultative phrase is interpreted on the semantic basis.

### 3.5 Resultatives in the locatum-subject alternation: further evidence

The locatum-subject alternation (Levin, 1993: 81) provides further evidence for the semantic nature of constraints on the Japanese resultative construction. Locatum-subject alternation verbs also involve locatum and location arguments, which undergo a change of state. In the alternative syntactic structures, the locatum argument is expressed either as an oblique or the subject: e.g. *water* in *He filled a bottle with water*/*Water filled a bottle*. Levin (1993) shows that in English, only *fill*-type verbs, which require the location argument to appear as direct object, license the locatum subject alternation. In Japanese, however, *mita-su* 'fill' is a locative alternation verb and some locative alternation verbs also appear in the locatum-subject alternation. Consequently, the variant (20b) with the locatum oblique appears both in the locative alternation (20a and 20b) and in the locatum-subject alternation (20b and 20c).

(20) a. Taro-ga bin-ni mizu-o mitas-ita.
Taro-NOM bottle-to water-with fill-PAST
'(lit.) Taro filled water in a bottle.'

b. Taro-ga bin-o mizu-de mitas-ita.
Taro-NOM bottle-ACC water-with fill-PAST
'Taro filled a bottle with water.'

c. mizu-ga bin-o mitas-ita.
water-NOM bottle-ACC fill-PAST
'Water filled a bottle.'

While Sections 3.3 and 3.4 demonstrated resultatives that appear in the locative alternation, the corpus data show that a resultative phrase can be predicated of either argument in the locatum-subject variant (such as 20c) as well. The resultative phrase *ike-no-you-ni* 'pond-like' describes the location argument *kubon-da-tokoro* 'a hollow' in (21). Since the location is expressed as direct object, the predication relation is equally predicted either syntactically or semantically.

(21) sizuku-ga [...] **kubon-da** **tokoro**-o ike-no-you-ni mitas-i, ...
drop-NOM subside-PAST place-ACC pond-GEN-appearance-NI fill-and
'(lit.) Big drops (of water) filled a hollow (in the ground) like a pond ...'
[Zola, 2003; simplified]

Unlike the syntactic prediction by the DOR, however, the locatum subject can also be described by a resultative phrase as demonstrated in (22).

(22) **tanihyouga-**ga atu-ku tani-o mitas-i ...
valley.glacier-NOM thick-KU valley-ACC fill-and ...
'(lit.) The valley glacier fills the valley thick ... '
[Takahashi, 2006; simplified]

The resultative phrase *atuk-u* 'thick' describes the spatial configuration of the locatum subject *tani-hyouga* 'valley glacier' that results from its motion.

These examples together with those in the previous sections show that the predication relation of resultative phrases is not constrained by the syntactic realization of arguments but by the lexical semantics of verbs. Generally, a resultative phrase can be predicated of either argument in a single variant, and of the same argument in either syntactic variant.

## 4 Valency alternation verbs in Mandarin Chinese

This section will introduce the locative alternation in Mandarin first and then analyze the resultative phrases and resultative verb compounds that appear in locative alternation construction. It is shown that Mandarin, as well as Japanese, allows locatum/location-oriented resultatives in alternative syntactic structures of the locative alternation.

### 4.1 Locative alternation verbs

Mandarin also has locative alternation verbs such as the verb *tu* 'smear' and *pu* 'spread' in examples (23) and (24) respectively:

(23) a. locatum-as-object variant

| | | | |
|---|---|---|---|
| John | zai-qiangmian-shang | tu-le | youqi. |
| John | LOC-wall-LOC | smear-PERF | paint |

'John smeared the paint on the wall.'

b. location-as-object variant

| | | | |
|---|---|---|---|
| John | yong-youqi | tu-le | qiangmian. |
| John | with-paint | smear-PERF | wall |

'John smeared the wall with paint.'

(24) a. locatum-as-object variant

| | | | |
|---|---|---|---|
| John | zai-zhuozi-shang | pu-le | baozhi. |
| John | LOC-wall-LOC | spread-PERF | newspaper |

'John spread the newspaper on the table.'

b. location-as-object variant

| | | | |
|---|---|---|---|
| John | yong-baozhi | pu-le | zhuozi. |
| John | with-newspaper | spread-PERF | table |

'John spread the table with newspaper.'

Pinker (1989) argues that a necessary criterion for a verb to participate in the locative alternation is that the verb allows the description of either a type of motion of the locatum argument or an end state of the location argument. A sentence like (23a), in which the locatum (*youqi* 'paint') is the direct object of the verb *tu* 'smear,' is called locatum-as-object variant. In locatum-as-object variant, the locatum argument *youqi* 'paint' undergoes a change of location, which is a type of motion. A sentence like (23b), in which the location (*qiangmian* 'wall') is the direct object of the verb *tu* 'smear' is called location-as-object variant. In location-as-object variant, the location argument *qiangmian* 'wall' undergoes a change of state.

### 4.2 Location-oriented resultatives in the locative alternation

This section will discuss the location-oriented resultatives that appear as resultative phrases with locative alternation verbs, and those that appear as the second component ($V_{result}$) of resultative verb compounds in Mandarin.

The verb *bie* 'fasten' is a locative alternation verb as shown in (25). A location-oriented resultative *jinjinde* 'tight' appears in both locatum-as-object and location-as-object variants respectively.

| | | | | | | |
|---|---|---|---|---|---|---|
| (25) | a. | Mary | zai-**toufa**-shang | jinjinde | bie-le | san-ge-faqia |
| | | Mary | LOC-hair-LOC | tight | fasten-PERF | three-CL-hairpin |

'(lit.) Mary fastened three hair pins on her hair tightly.'

| | | | | | |
|---|---|---|---|---|---|
| b. | Mary | yong-san-ge-faqia | jinjinde | bie-le | **toufa** |
| | Mary | with- three-CL-hairpin | tight | fasten-PERF | hair |

'(lit.) Mary fastened her hair tightly with three hair pins.'

In (25), the resultative phrase *jinjinde* 'tight' describes the resultant state of the location argument *toufa* 'hair,' regardless of whether the location is expressed as oblique in (25a) or as a direct object in (25b).

Cao (2018) argues that verb compounds can also go through the locative alternation in Mandarin. For instance, the verb *pu* 'spread' mentioned in Section 4.1 can form a resultative verb compound if combined with a resultative verbal suffix *man* 'full,' as *pu-man* 'spread-full' in (26), which still can go through the locative alternation. The examples below show that the $V_{result}$ can be predicted of the location argument of alternation verbs regardless of whether the location is expressed as oblique or as a direct object.

(26) Location-oriented resultatives

| | | | | |
|---|---|---|---|---|
| a. | John | zai-**zhuozi**-shang | pu-man-le | baozhi |
| | John | LOC-table-LOC | spread-full-PERF | newspaper |

'(lit.) John spread the newspaper on the table full.'

| | | | | |
|---|---|---|---|---|
| b. | John | yong-baozhi | pu-man-le | **zhuozi** |
| | John | with-newspaper | spread-full-PERF | table |

'(lit.) John spread the table full with newspaper.'

Specifically, the $V_{result}$ *man* 'full' describes the resultant state of the location argument *zhouzi* 'table' in both variants, whether it is expressed as oblique in (a) or direct object in (b). Apparently, (26b) obeys the DOR but (26a) does not.

The discussion of resultative verb compounds in Mandarin shows that the second component ($V_{result}$) of resultative verb compounds are actually predicated of the argument that undergoes the change of state in the event denoted by the main verb. In other words, the predication relation of resultatives is determined by the lexical semantics of verbs, rather than the syntactic structures they appear in.

### 4.3 Locatum-oriented resultatives in the locative alternation

This section will discuss the locatum-oriented resultatives in the locative alternation that appear as a resultative phrase and as the second component of resultative verb compounds.

Examples (27) and (28) show locative alternation verbs *chan* 'wrap' and *gaizhu* 'cover' respectively. In (27a) and (27b), a locatum-oriented resultative *mimi* 'close' appears in both location-object and locatum-object variants.

(27) Locatum-oriented resultatives in the locative alternation

a.

| | | | | |
|---|---|---|---|---|
| yong-**jiaodai** | mimi | chan-le | yibian | da-daizi |
| with-sellotape | close | wrap-PERF | around | big-bag |

'(lit.) (someone) wrapped the sellotape around the big bag closely.'

[Wobubai, 2017; simplified]

b.

| | | | | |
|---|---|---|---|---|
| zai-da-daizi-shang | mimi | chan-le | yibian | **jiaodai** |
| LOC-big-bag-LOC | close | wrap-PERF | around | sellotape |

'(lit.) (someone) wrapped the big bag with sellotape closely.'

In (27), the resultative phrase *mimi* 'close' describes the resultant state of the locatum argument *jiaodai* 'sellotape,' regardless of whether the locatum is expressed as oblique in (27a) or as a direct object in (27b).

Likewise, in (28), the resultative phrase *houhoude* 'thick' describes the resultant state of *baozhi* 'newspaper,' regardless of whether the locatum argument is expressed as oblique in (28a) or as a direct object in (28b).

(28) Locatum-oriented resultatives in the locative alternation

a.

| | | | |
|---|---|---|---|
| chuanghu | yong-**baozhi** | houhoude | gaizhu-le |
| window-TOP | with-newspaper | thick | cover-PERF |

'(lit.) (someone) covered the window with newspaper thick.'

[*Sino News*, 2019; simplified]

b.

| | | | |
|---|---|---|---|
| zai-chuanghu-shang | houhoude | gaizhu-le | **baozhi** |
| LOC-window-LOC | thick | cover-PERF | newspaper |

'(lit.) (someone) covered the newspaper thick on the window.'

Similarly to *pu* 'spread' mentioned in (26), locative alternation verb *tu* 'smear' can appear in a resultative verb compound by combining with a resultative verbal suffix *yun* 'even,' as *tu-yun* 'smear-even,' which still can go through the locative alternation as shown below.

(29) Locatum-oriented resultatives

a.

| | | | |
|---|---|---|---|
| John | zai-qiangmian-shang | tu-yun-le | **youqi**. |
| John | LOC-wall-LOC | smear-even-PERF | paint |

'(lit.) John smeared the paint even on the wall.'

b. John yong-**youqi** tu-yun-le qiangmian.
John with-paint smear-even-PERF wall
'(lit.) John smeared the wall with paint even.'

It has been introduced in Section 2 that both resultative phrases and resultative verb compounds are believed to conform to the DOR, and DOR predicts that resultatives are predicated of the direct object. However, in (29) the $V_{result}$ *yun* 'even' (the second component of resultative verb compound *tu-yun*) describes the state of *youqi* 'paint' in both variants instead of describing the direct object *youqi* in locatum-as-object variant and the direct object *qiangmian* 'wall' in location-as-object variant. That is to say, the resultative *yun* 'even' describes the resultant state of *youqi* 'paint,' regardless of whether the locatum is expressed as a direct object in (29a) or as oblique in (29b).

The analysis of resultative phrases and resultative verb compounds in Mandarin aligns with the discussion of Japanese resultatives, and provides evidence for the claim that the predication relation of resultatives is determined by the lexical semantics of verbs, rather than syntactic structures they appear in.

## 5 Analysis

In order to formally represent the predication relation between resultative phrases and arguments of locative alternation verbs, the lexical semantics of locative alternation verbs is analyzed in the framework of Head-Driven Phrase Structure Grammar (Sag et al., 2003) with semantic representation based on Minimal Recursion Semantics (Copestake et al., 2005). Although the choice of specific framework is not crucial, the feature structure formalism is chosen because it allows the underspecified mapping between lexical semantics and its syntactic realization.

### 5.1 Semantic approaches to the locative alternation construction

Since the syntactic notion of direct object is closely tied to the semantic notion of THEME/PATIENT, it is not surprising that there have been semantic approaches to the resultative construction which reanalyze the DOR in terms of the thematic roles. In Construction Grammar approach (Goldberg, 1995 and 2006), for example, the argument labeled as PATIENT is interpreted as the logical subject of a resultative phrase, and is mapped to the direct object. In Lexical Conceptual Structure (LCS) approach (e.g., Levin and Rapoport, 1988; Rappaport and Levin, 1988; Pinker 1989; Kageyama, 1996), the notion of thematic roles is represented in terms of argument positions (or variables) of primitive predicates such as CAUSE. Resultative phrases are represented in terms of the primitive predicate BECOME, and its first argument is associated with the direct object.

Although the two approaches differ in details, both associate a distinct semantic representation with each variant of valency alternations, and identify a single argument to stand in the predication relation of resultatives in each valiant. Given the data in the previous sections, both approaches would pose a problem in analyzing the Japanese and Mandarin resultative constructions since resultative phrases are predicated of either location or locatum argument regardless of which variant they appear in.

The crucial assumption underlying the proposed semantic analysis is that, following the view of such authors as Markantonatou and Sadler (1979) based upon Lexical Functional Grammar, and Beavers (2005 and 2010) based upon Head-Driven Phrase Structure Grammar, locative alternation verbs are associated with a single semantic representation which is mapped to alternative syntactic structures, rather than associating each syntactic variant with a distinct semantic representation. The shared lexical semantics of verbs encodes concurrent changes of state and position of two arguments, either of which can be described by resultative phrases regardless of which argument is mapped onto the direct object. Consequently, the interpretation of resultative phrases is not anchored to the syntactic realization of each variant, as the DOR predicts, but is determined based on the shared semantics.

### 5.2 Representing locative alternation verbs

The feature-value structure in (30) represents the lexical entry for the locative alternation verb *nut-* 'spray' in Japanese that licenses the variant with the locatum object: e.g. *kabe-ni penki-o nut-ta* 'sprayed paint on a wall,' similar to (17b).

(30) *nur-* 'spray'

$$\begin{bmatrix} \text{ARG-ST} < \text{NP}_i, \text{NP}_j, \text{NP}_k > \\ \text{SEM} \begin{bmatrix} \text{INDEX } s_1 \\ \text{RESTR} < \begin{bmatrix} \text{RELN } \textit{smear} \\ \text{SMEARER } i \\ \text{LOCATION } j \\ \text{LOCATUM } k \\ \text{BECOME} < s_2, s_3 > \\ \text{SIT } s_1 \end{bmatrix}, \begin{bmatrix} \text{RELN } \textit{colored} \\ \text{INST } j \\ \text{SIT } s_2 \end{bmatrix}, \begin{bmatrix} \text{RELN } \textit{spread} \\ \text{INST } k \\ \text{SIT } s_3 \end{bmatrix} > \end{bmatrix} \\ \text{SYN} \begin{bmatrix} \text{HEAD } \textit{verb} \\ \text{VAL} \begin{bmatrix} \text{SPR} < \text{NP}_i\text{-}\textit{ga} > \\ \text{COMPS} < \text{NP}_j\text{-}\textit{ni}, \text{NP}_k\text{-}\textit{o} > \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

As specified in the value of SEM, the verb's main semantic content is a smearing relation among the individuals indexed as *i* for agent (SMEARER), the location *j* (LOCATION), and the locatum *k* (LOCATUM). The BECOME feature encodes as part of the lexical semantics that two arguments *j* and *k* undergo a state change in situations $s_2$ and $s_3$ respectively: *j* becomes *colored* and *k* becomes *spread*.

Syntactically, as specified in the value of COMPS, the locatum *k* is realized as direct object NP*k* marked by *-o*. It is assumed that a separate lexical entry (not shown) for the same verb specifies a value of COMPS in which the location *j* appears as direct object NP*j* marked by -o while the locatum *k* is mapped to oblique complement NP*k-de*. The crucial part of the analysis is that those two lexical entries license alternative syntactic structures in the locative alternation while sharing the same semantic value.

### 5.3 Resultative lexical rule

A resultative phrase is introduced by the lexical rule in (31), following the idea of Wechsler and Noh (2001). It targets verbs with lexical semantics that includes a non-empty BECOME value, specifying a change of state of arguments, including, but not limited to, valency alternation verbs, and licenses a resultative phrase which describes the result of such a change of arguments.

(31) Resultative lexical rule

$$\begin{bmatrix} \text{INPUT} & \begin{bmatrix} \text{ARG-ST} & \boxed{1} \\ \text{SEM} & \begin{bmatrix} \text{INDEX } s \\ \text{RESTR} \ \left\langle \begin{bmatrix} \text{BECOME} \langle \ldots, s', \ldots \rangle \\ \text{SIT } s \end{bmatrix}, \ldots, \boxed{2} \begin{bmatrix} \text{RELN } adj\text{-}rel \\ \text{INST } x \\ \text{SIT } s' \end{bmatrix}, \ldots \right\rangle \end{bmatrix} \end{bmatrix} \\ \text{OUTPUT} & \begin{bmatrix} \text{ARG-ST } \boxed{1} + \left\langle \text{XP} \begin{bmatrix} \text{SEM [RESTR} \langle \boxed{2} \rangle \\ \text{SYN [VAL [SPR} \langle \text{NP}_x \rangle]] \end{bmatrix} \right\rangle \end{bmatrix} \end{bmatrix}$$

The OUTPUT of the lexical rule appends a resultative phrase XP to the ARG-ST list. In effect, the resultative phrase will become an additional member of the VAL and be realized syntactically. Its semantic contribution is coindexed with one of the predications in the input RESTR list, and further instantiates it: e.g. the property *colored* in the predication $s_2$ in (30) is instantiated as *white* if a resultative phrase *siro-ku* 'white' is added by the lexical rule.[3]

Note that if the predication of the resultative phrase is not unifiable with

[3] The audience of the conference correctly pointed out that, while the lexical rule unifies the predication of the resultative phrase with one of the predications of the verb as intended, the general principle that amalgamates predications of all complements, e.g. the Semantic Compositionality Principle in Sag et al. (2003), puts both (identical) predications in the RESTR list. The semantic effect of having two identical members in the RESTR list is not clear to us, and we do not have an immediate solution to obviate the problem.

any of the predications in the RESTR list of an input verb, the lexical rule fails to apply. It is a desirable result since Japanese allows only "weak resultatives," expressing a result that is predictable from the lexical semantics of the verb. In effect, the semantic content of a resultative phrase and the predictable result specified by the verb both contribute to the description of a resultant state of the argument *x*. Mandarin, however, allows "strong resultatives," and a resultative lexical rule need be more permissive to allow addition of a predication not unifiable with any of the predications in the lexical semantics of the verb.

The SEM value in (30) captures the characteristic shared by all valency alternation verbs: the concurrent state changes of the location and the locatum arguments. It in turn satisfies the requirements of verbs that license a resultative phrase in Japanese discussed in Section 3.1: entailing a change of state of an argument, and specifying its predictable result. Furthermore, the lexical rule in (31) targets a situation that appears in the BECOME list, which encodes the state of an argument that undergoes a change of state. When the lexical semantics of verbs involve more than one argument which undergoes a change of state, i.e. when the BECOME list contains more than one situation, as is the case with (30), a resultative phrase can be predicated of only the argument whose property is unifiable with its property: e.g. the property of a resultative phrase *siro-ku* 'white' is assumed to be unifiable with *colored*, but not with *spread* in (30). As discussed in Section 3.4, there is no syntactic clue as to which argument a resultative phrase is predicated of, and a resultative phrase is only interpreted on the basis of semantic plausibility.

## 6 Conclusion

This paper analyzes the resultative phrases that occur with valency alternation verbs in Japanese and Mandarin Chinese, and shows that, unlike commonly believed, the restrictions on the predicate relation in the resultative construction are basically semantic rather than syntactic: resultative phrases can describe the result of a state change of a participant in the event regardless of whether such a participant is expressed as direct object or not. The data involving valency alternation verbs are used because they denote an event in which both locatum and location arguments are lexically specified to undergo concurrent changes. Resultative phrases are predicated of either argument regardless of which syntactic variant they appear in, providing evidence that their predication relation is constrained not by the grammatical function but the semantic property of arguments.

## References


Beavers, John. 2005. Towards a semantic analysis of argument/oblique alternations in HPSG. In Stefan Müller (ed.), *Proceedings of the 2005 HPSG conference*, 28-48. Stanford: CSLI Publications.

Beavers, John. 2010. The structure of lexical meaning: Why semantics really matters. *Language* 86. 821-864.

Beavers, John. 2012. Resultative constructions. In Robert I. Binnick (ed.), *The Oxford handbook on tense and aspect,* 908-933. Oxford: Oxford University Press.

Cao, Rui. 2018. Locative alternation in Mandarin Chinese: A comparison with Japanese and English, Master's thesis, The University of Tokyo.

Copestake, Ann, Dan Flickinger, Carl Pollard & Ivan A. Sag. 2005. Minimal recursion semantics: An introduction. *Research on Language and Computation* 3. 281-332.

Goldberg, Adele E. 1995. *Constructions: A construction grammar approach to argument structure*. Chicago: University of Chicago Press.

Goldberg, Adele E. 2006. *Construction at work: The nature of generalization in language*. New York: Oxford University Press.

Iwata, Seizi. 2006. Argument resultatives and adjunct resultative in a lexical constructional account: The case of resultatives with adjectival result phrases. *Language Sciences* 28. 449-496.

Kageyama, Taro. 1996. *Doshi imiron: Gengo-to ninchi-no setten* [Semantics of verbs: The interface between language and cognition]. Tokyo: Kurosio Publishers.

Kageyama, Taro. 2001. Kekka kobun [The resultative construction]. In Taro Kageyama (ed.), *Doshi-no imi-to kobun* [Semantics and constructions of verbs], 154-181. Tokyo: Taishukan.

Koizumi, Masatoshi. 1994. Secondary predicates. *Journal of East Asian Linguistics* 3(1). 25-79.

Levin, Beth. 1993. *English verb classes and alternation*. Chicago: University of Chicago Press.

Levin, Beth & Tova R. Rapoport. 1988. Lexical subordination. In Lynn Macleod, Gary Larson & Diane Brentari (eds.) *CLS 24, Papers from the 24th Annual Regional meeting of the Chicago Linguistic Society*, 275-289.

Levin, Beth & Malka Rappaport Hovav. 1995. *Unaccusativity: At the syntax-lexical semantics interface*. Cambridge, MA: MIT Press.

Markantonatou, Stella & Louisa Sadler. 1997. Linking indirect arguments and verb alternations in English. In Francis Corblin, Danièle Godard & Jean-Marie Marandink (eds.), *Empirical issues in formal syntax and semantics: Selected papers from te Colloque de syntaxe et de sémantique de Paris (CSSP 1995)*, 103-125. Bern: Peter Lang.

Miyakoshi, Koichi. 2006. Hi-mokutekigo-shiko-no kekka-jutsugo: Togoteki joho-kyoyu-no saranaru shoko [Non-object-oriented resultative predicates: Further evidence for syntagmatic information sharing]. In Nihongo Bunpo Gakkai [The Society of Japanese Grammar] (ed.), *Nihongo Bunpo* [Journal of Japanese Grammar] 6(1), 3-20.

Nitta, Yoshio. 2002. *Fukushi-teki hyogen-no shoso* [Aspects of adverbial expressions]. Tokyo: Kurosio Publishers.

Pinker, Steven. 1989. *Learnability and cognition: The acquisition of argument structure*. Cambridge, MA: MIT Press.

Rappaport, Malka & Beth Levin. 1988. What to do with theta-roles. In Wendy Wilkins (ed.) *Thematic relations* (Syntax and Semantics 21), 7-36. New York: Academic Press.

Sag, Ivan A., Thomas Wasow & Emily M. Bender. 2003. *Syntactic theory: A formal introduction*, 2nd edn. Stanford: CSLI Publications.

Simpson, Jane. 1983. Resultatives. In L. Levin, M. Rappaport & A. Zaenen (eds.), *Papers in Lexical-Functional Grammar*, 143-157. Bloomington, Indiana: Indiana University Linguistics Club.

Thompson, Sandra A. 1973. Resultative verb compounds in Mandarin Chinese: A case for lexical rules. *Language* 49: 361- 379.

Washio, Ryuichi. 1997. Resultatives, compositionality and language variation. *Journal of East Asian Linguistics* 6. 1-49.

Wechsler, Stephen & Bokyung Noh. 2001. On resultative predicates and clauses: Parallels between Korean and English. *Language Sciences* 23. 391-423.

Williams, Edwin. 1980. Predication. *Linguistic Inquiry* 11(1). 203-238.

**Sources of examples** (taken from the BCCWJ-NT corpus and indicated by the square brackets [ ])

Nijo, Mutsumi. 2000. *Kangoku joi* [The woman prison doctor]. Tokyo: Kadokawa Haruki Corporation.

Takahashi, Akira et al. 2006. *Shinsho chiri B* [Latest and detailed geography B]. Tokyo: Teikoku Shoin.

Zola, Émile. 2003. *Le Ventre de Paris* [The belly of Paris], trans. Koji Asahina. Tokyo: Fujiwara.

**Sources of Mandarin examples** (taken from BCC corpus and indicated by the square brackets [ ])

*Sino News*. 27/01/2019. Jiamianqishi shiwang 21hua gongkai longqipian zhengshi kaishi [Kamen Rider Zi-O officially released].

Wobubai. 2017. *Chongsheng zhi biran xingfu* [Reborn-Inevitable happiness]. (Online Novel)

# Polyadic quantification in hybrid coordination

Adam Przepiórkowski
University of Warsaw / ICS Polish Academy of Sciences / University of Oxford

Proceedings of the 28th International Conference on
Head-Driven Phrase Structure Grammar

Online (Frankfurt/Main)

Stefan Müller, Nurit Melnik (Editors)

2021

Frankfurt/Main: University Library

pages 144–164

Keywords: coordination, grammatical functions, polyadic quantifiers, cumulative lift, covers, HPSG

Przepiórkowski, Adam. 2021. Polyadic quantification in hybrid coordination. In Stefan Müller & Nurit Melnik (eds.), *Proceedings of the 28th International Conference on Head-Driven Phrase Structure Grammar, Online (Frankfurt/Main)*, 144–164. Frankfurt/Main: University Library. DOI: 10.21248/hpsg.2021.8.

**Abstract**

The aim of this paper is to provide a syntactico-semantic analysis of hybrid coordination, in which what is coordinated are phrases bearing different grammatical functions and different semantic roles. The proposed account improves on previous HPSG analyses by giving up the assumption that all conjuncts are dependents of the same head and, more importantly, by taking into account the syntax–semantics interface and providing semantic representations. This aspect of the analysis builds on and generalizes previous HPSG work on polyadic quantification.

# 1 Introduction

The empirical scope of this paper is what is known in the HPSG literature as Hybrid Coordination (HC; Chaves & Paperno 2007, Bîlbîie & Gazdik 2012) and what elsewhere is often called Lexico-Semantic Coordination (Sannikov 1979–1980, Mel'čuk 1988, Kallas 1993, Patejuk & Przepiórkowski 2012, and others). This phenomenon is illustrated with the attested (1)–(2).[1]

(1) Vam [nikto i ničego] ne predlagal eščë. (Russian)
you.DAT nobody.NOM and nothing.GEN NEG offered yet
'Nobody has offered you anything yet.' (Paperno 2012: 77)

(2) [Czego i ile] trzeba dostarczyć organizmowi?
what.GEN and how much.ACC should.IMPS provide.INF organism.DAT
(Polish)
'What – and how much – should one provide one's organism with?'
(Patejuk & Przepiórkowski 2019: 30)

The main feature of HC is that the conjuncts bear different grammatical functions, e.g., subject and object in (1). In Slavic, as well as in some neighbouring languages (including Hungarian and Romanian), the conjuncts may be obligatory arguments, as in the two examples above. By contrast, in English and other Germanic languages, only optional dependents may be coordinated in HC (Browne 1972, Gračanin-Yüksek 2007, Haida & Repp 2011, Citko & Gračanin-Yüksek 2013), as in (3). The common view is that, in Germanic, such constructions are elliptical, so that, e.g., (3) has the underlying structure (4), while in Slavic and at least Hungarian they are not, i.e., different grammatical functions are coordinated directly in (1)–(2).[2]

[†]I am grateful for comments from HPSG 2021 reviewers and from the audiences of *HPSG 2021* and *Sinn und Bedeutung 26*; special thanks go to Frank Richter and Manfred Sailer. As always, all remaining errors are mine alone.

[1]IMPS in (2) and (15) stands for 'impersonal'; other annotations follow the Leipzig Glossing Rules.

[2]Convincing arguments against elliptical analyses in these languages are adduced, e.g., in Kazenin 2001 (for Russian) and in Lipták 2003 (for Hungarian); see also Skrabalova

(3) [What and why] did you eat? (Citko & Gračanin-Yüksek 2013: 11)

(4) What ~~did you eat~~ and why did you eat?

In this paper I am only concerned with the Slavic – non-elliptical – variety of HC, leaving the integration of Germanic – elliptical – HC into the analysis for future work.

Most of the literature on HC only deals with coordinated *wh*-items, as in (2) and (3). However, at least since Sannikov 1979–1980, it is clear that many other series of conjuncts are possible in HC, including: 1) *n*-words, as in (1), 2) universal quantifiers, as in (5), 3) various series of lexical items expressing existential quantifiers, as in (6)–(7), etc.[3]

(5) Zdes' [vsem i vsegda] kofe podavala ona sama.
here all.DAT and always coffee.ACC served.F.SG she.NOM self.NOM (Russian)
'Here she always served coffee herself to everyone.' (Paperno 2012: 77)

(6) Ponjal li [kto-nibud' i čto-nibud']? (Russian)
understood Q anyone.NOM and anything.ACC
'Has anyone understood anything?' (Paperno 2012: 77)

(7) Dopustim, [kto-libo i kogo-libo] pobedil. (Russian)
assume someone.NOM and someone.ACC defeated
'Assume that someone defeated someone.' (Paperno 2012: 80)

Also, almost all of the literature concentrates on the syntax of this construction, neglecting its semantic properties. The notable exception is Paperno 2012: ch.4, which proposes – but ultimately abandons – an analysis in terms of polyadic quantification, specifically, in terms of the resumptive lift (see, e.g., Keenan & Westerståhl 2011: 899). In Section 2, I summarize the arguments of Przepiórkowski 2021a that the analysis of HC in terms of polyadic quantification was on the right track, although the right lift to be applied here is a mereological variant of the standard cumulative lift (Keenan & Westerståhl 2011: 899), rather than the resumptive lift.

However, the main contribution of this paper is HPSG-theoretical. First, in Section 3, I extend the HPSG representations of specific polyadic quantifiers proposed in Iordăchioaia & Richter 2009, Iordăchioaia 2010, and Richter 2016 to polyadic quantifiers of arbitrary lift type. Second, after laying out my assumptions about the syntax of coordination in Section 4, in Section 5 I sketch the syntactico-semantic HPSG analysis of HC that assumes these representations. Finally, Section 6 concludes.

---

2007: §§2 and 5 on Czech, Gribanova 2009: 136–137 on Russian, Bîlbîie & Gazdik 2012: §3.3 on Hungarian, and Lipták 2011 for a typological overview.

[3] See Przepiórkowski & Patejuk 2014 and Patejuk 2015: ch.5 for similar examples from Polish.

## 2 Polyadic Quantifiers in Hybrid Coordination

Paperno (2012: ch.4) provides the only worked out semantic analysis of HC I am aware of. Following earlier suggestions in the literature (e.g., Comorovski 1996: 138–139), he analyses HC in terms of resumptive quantification. The general idea of resumption (or absorption, as it is called by syntacticians after Higginbotham & May 1981: 49) is that two (or more) occurrences of a quantifier over entities are analysed as a single quantifier of the same type but over tuples of entities, that is two occurrences of a quantifier $Q$ are "lifted" to the single but more complex quantifier $Res^2(Q)$ defined as in (8).

(8) $Res^2(Q)(A, B, R) \stackrel{\text{df}}{\equiv} Q(A \times B, R)$

For example, in the varieties of English in which (9) means that no man loves any woman, the two occurrences of the generalized quantifier NO defined as in (10) are lifted to the resumptive quantifier $Res^2(\textsc{no})$ defined in (11).

(9) No man loves no woman.

(10) $\textsc{no}(A, B) \stackrel{\text{df}}{\equiv} A \cap B = \emptyset$

(11) $Res^2(\textsc{no})(A, B, R) \stackrel{\text{df}}{\equiv} (A \times B) \cap R = \emptyset$

In the case of (9), the two original quantifiers range over the set of men and the set of women, while the lifted resumptive quantifier ranges over the set of man–woman pairs. That is, after the resumptive lift, the meaning of (9) may be represented as in (12) (or, more compactly, as in (13)), which – according to the definition in (11) – is true iff the Cartesian product $man \times woman$ has the empty intersection with the *love* relation, i.e., iff the *love* relation contains no pair $\langle x, y\rangle$ such that $man(x)$ and $woman(y)$.

(12) $Res^2(\textsc{no})(\lambda x.man(x), \lambda y.woman(y), \lambda x\lambda y.love(x, y))$

(13) $Res^2(\textsc{no})(man, woman, love)$

In terms of Lindström's (1966) typology of generalized quantifiers, NO as defined in (10) is of type $\langle 1, 1\rangle$ (it is a binary relation on sets, i.e., on unary relations), while the lifted quantifier $Res^2(\textsc{no})$ is of type $\langle 1, 1, 2\rangle$, i.e., it is a ternary relation whose first two arguments are sets (i.e., unary relations), and the third argument is a binary relation. Both quantifiers are examples of polyadic quantifiers, which may be divided into monadic quantifiers such as NO, whose all arguments are sets, and properly polyadic quantifiers such as $Res^2(\textsc{no})$, whose at least one argument is a proper (non-unary) relation.

On Paperno's (2012) analysis, such a resumptive lift is applied to quantifiers expressed by all conjuncts in HC. This rightly predicts that the meaning of (1) is that there is no person–thing pair in the offering relation, i.e., that nobody has offered anything. Similarly, in the case of (5) this analysis rightly predicts the meaning on which all (contextually relevant) person–time pairs are in the appropriate coffee serving relation. However, Paperno (2012) abandons this analysis, and for two good reasons.[4] The first reason is that the

[4]As a possible alternative, Paperno (2012: ch.5) sketches a game-theoretic analysis,

resumptive lift takes quantifiers of exactly the same kind (2 x NO, 2 x EVERY, etc.), while HC is not so strict, e.g.:

(14) Lično menja [vsë i počti vsegda] besit.
personally me everything.NOM and almost always drives.nuts
(Russian)

'Everything almost always drives me nuts.' (Paperno 2012: 155)

In the case of (14), it is not clear whether the polyadic quantifier resulting from the resumptive lift should be $Res^2$(ALL) (which would wrongly mean that everything *absolutely always* drives me nuts) or $Res^2$(ALMOST ALL) (which would wrongly mean that *almost everything* rather than absolutely everything almost always drives me nuts). More importantly, in the case of some quantifiers the resumptive lift assigns wrong meanings to sentences, e.g., to (15):

(15) O něm uže [mnogoe i mnogimi] napisano. (Russian)
about him already much.ACC and many.INS write.IMPS

'Many wrote a lot about him.' (Paperno 2012: 143)

According to the resumptive analysis, for this sentence to be true it must be the case that there are many person–content pairs in the relevant writing relation, for example, when just a single person wrote a lot. But in such a situation (15) is false, as it implies both that there are many people who wrote about him and that many bits of content were written.

In Przepiórkowski 2021a, I argue that Paperno's (2012) polyadic analysis is on the right track, but there is another polyadic lift that much better approximates the intended meanings, namely, the cumulative lift defined in (16) and illustrated with the constructed Polish sentence (17) (similar to the Russian (15)).

(16) $Cum(Q_1, Q_2)(A, B, R) \stackrel{\text{df}}{\equiv} Q_1(A, \pi_1(R')) \wedge Q_2(B, \pi_2(R'))$, where:

a. $R' = R \cap (A \times B)$
b. $\pi_1(R') = \{x : \langle x, y \rangle \in R'\}$
c. $\pi_2(R') = \{y : \langle x, y \rangle \in R'\}$

(17) Pisało już o tym [wielu filozofów i w wielu artykułach].
wrote already about this many philosophers and in many articles
(Polish)

'Many philosophers wrote about this in many articles.'

In the case of sentence (17), the preliminary representation is that in (18).

(18) $Cum$(MANY, MANY)(*philosopher*, *article*, *write*)

That is, using the symbols in (16), $Q_1 = Q_2 =$ MANY, $A =$ *philosopher* (i.e., the set of philosophers), $B =$ *article* (the set of articles), $R =$ *write* (the "wrote about this" relation, whatever *tym* 'this' is in (17)). Additionally, $R'$ is the writing relation $R$ restricted to philosophers writing articles (so, e.g.,

which, however, also makes some wrong empirical predictions.

linguist–article, philosopher–book, and linguist–book pairs are removed from $R$), $\pi_1(R')$ is the set of philosophers who wrote in some articles about this, and $\pi_2(R')$ is the set of articles in which something was written about this by some philosophers. In effect, the meaning of (17) represented by (18) is that there are many philosophers who wrote about this in an article or other and there are many articles in which a philosopher or other wrote about this.

It may be verified that this standard cumulative lift leads to appropriate meanings of most HC sentences, but sometimes it is not sufficiently precise. In fact, this is the case with (17). Assume that in a given context five articles is many but five philosophers is not many – only 10 or more is. Then (17) does not truthfully describe a situation in which five articles were written by five different philosophers (there are not many philosophers), but it does truthfully describe a situation in which five articles were coauthored each by a different ensemble of philosophers, so that there are, say, twelve authors altogether. In this situation the extension of the writing relation also contains just five pairs, but in each pair the first argument is a plural entity consisting of a number of atoms (philosophers). Hence, a better representation of (17) is that given in (19), where the cumulative lift *Cum* is replaced by the cover lift *Cov* (Robaldo 2011; cf. Schwarzschild's 1996 covers) defined in (20).

(19) $Cov(\textsc{many}, \textsc{many})(\mathit{philosopher}, \mathit{article}, \mathit{write})$

(20) $Cov(Q_1, Q_2)(A, B, R) \overset{\text{df}}{\equiv} Q_1(A, at(\pi_1(R'))) \wedge Q_2(B, at(\pi_2(R')))$, where:

a. $R'$, $\pi_1(R')$, and $\pi_2(R')$ are defined as in (16),
b. *at* maps a set of possibly plural objects into the set of atoms in these plural objects.

(19) is the kind of representation that the HPSG analysis proposed in the following sections will result in, although, in order to better reflect the actual HPSG representations, a slightly different – more explicit – notation will be used, upon which (19) will be rendered as (21).

(21) $Cov(\textsc{many}_x, \textsc{many}_y)(\mathit{philosopher}(x), \mathit{article}(y))(\mathit{write}(x, y))$

## 3 Polyadic Quantifiers in HPSG

The analysis proposed in this paper relies heavily on previous HPSG work on polyadic quantification (Iordăchioaia & Richter 2009, 2015, Iordăchioaia 2010, Sailer 2015, Richter 2016) stated within Lexical Resource Semantics (LRS; Richter & Sailer 2004, Richter & Kallmeyer 2009). In LRS, particular words and constructions constrain meaning representations of particular syntactic constituents, without necessarily specifying their complete meanings. For example, words expressing quantifiers, e.g., *many*, may specify the quantifier constant, i.e., MANY, and the variable bound by this quantifier, e.g., $x$, without determining whether this is a monadic quantifier or a part of a larger polyadic quantifier. In the notation introduced at the end of the previous section, the lexical contribution of *many* may be represented as in (22), with $P$ representing the restriction and $S$ representing the nuclear scope, both to be contributed by other words in the sentence. In the simplest case, e.g., in the sentence *Many philosophers arrived*, this may lead to the schematic representation of the NP *many philosophers* in (23) and the representation of the whole sentence in (24).

(22) $\ldots \textsc{many}_x \ldots (\ldots P(x) \ldots)(S(\ldots x \ldots))$

(23) $\ldots \textsc{many}_x \ldots (\ldots \mathit{philosopher}(x) \ldots)(S(\ldots x \ldots))$

(24) $\textsc{many}_x(\mathit{philosopher}(x))(\mathit{arrive}(x))$

However, under appropriate conditions, two or more constituents may turn out to be contributing to the same semantic representation. For example, in (17) the underspecified semantic contribution of *wielu filozofów* 'many philosophers' may be represented as in (23), and similarly for *wiele artykułów* 'many articles', see (25), and these two representations may turn out to be partial specifications of a larger representation, still underspecified in (26).

(25) $\ldots \textsc{many}_y \ldots (\ldots \mathit{article}(y) \ldots)(S(\ldots y \ldots))$

(26) $\ldots \textsc{many}_x \ldots \textsc{many}_y \ldots (\ldots \mathit{philosopher}(x) \ldots \mathit{article}(y) \ldots)(S(\ldots x \ldots y \ldots))$

In the analysis made more precise below, it is the conjunction that specifies that all conjuncts contribute to the meaning representation of a single cover polyadic quantifier. This way the representation of the coordinate phrase in (17) may be represented as in (27), still with a placeholder for the nuclear scope relation, and that of the whole sentence – as in (28) (= (21) above).

(27) $\mathit{Cov}(\textsc{many}_x, \textsc{many}_y)(\mathit{philosopher}(x), \mathit{article}(y))(S(x, y))$

(28) $\mathit{Cov}(\textsc{many}_x, \textsc{many}_y)(\mathit{philosopher}(x), \mathit{article}(y))(\mathit{write}(x, y))$

This kind of representation is a generalization of previous HPSG representations of polyadic quantifiers, as it makes explicit the kind of lift that is applied to monadic quantifiers (here, *Cov*, i.e., cover lift).

In the analysis of Romanian Negative Concord in Iordăchioaia 2010 and Iordăchioaia & Richter 2009, 2015, the underspecified representations of *niciun student* 'no student', *nicio carte* 'no book', and *nu a citit* 'not read' in (29) are given in (30)–(32) (assuming the notation of the current paper), and they all contribute to the single representation in (33).

(29) Niciun student nu a citit nicio carte. (Romanian)
no student not has read no book
'No student read any book.' (Iordăchioaia 2010: 97)

(30) $\textsc{no}_{\ldots x \ldots}(\ldots \mathit{student}(x) \ldots)(S(\ldots x \ldots))$

(31) $\textsc{no}_{\ldots y \ldots}(\ldots \mathit{book}(y) \ldots)(S(\ldots y \ldots))$

(32) $\textsc{no}_{\ldots}(\ldots)(\mathit{read}(\ldots))$

(33) $\textsc{no}_{x,y}(\mathit{student}(x), \mathit{book}(y))(\mathit{read}(x, y))$

This representation is interpreted in terms of the resumptive lift, although this lift is not mentioned explicitly in the representation. Also, as all the quantifiers taking part in the resumptive lift must be of the same kind (here: NO), it is sufficient to mention this quantifier constant in the representation only once. Finally, an interesting aspect of that analysis is that quantifiers of different Lindström (1966) type may jointly undergo the resumptive lift; in the case of (29), *niciun* and *nicio* are normally treated as the usual quantifiers of type $\langle 1,1\rangle$ (i.e., a binary relation on sets), but the sentential negation *nu* is normally treated as logical negation, i.e., a quantifier of type $\langle 0\rangle$. This is possible because, in the actual LRS analysis, all these quantifiers are underspecified as to their Lindström type.

By contrast, the HPSG encoding made explicit below assumes that only $\langle 1,1\rangle$ quantifiers may be lifted. However, the gist of Iordăchioaia & Richter's analysis may be preserved by reanalysing the contribution of the negated verb from (32) to (34). That is, verbal negation is reanalysed as contributing a $\langle 1,1\rangle$ quantifier over events. This, together with the slightly modified representations of the two negative phrases given in (35)–(36) (cf. (30)–(31)), leads to the Davidsonian representation of (29) given in (37) (cf. (33) above).

(34) $\ldots \textsc{no}_e \ldots (\ldots \mathit{event}(e) \ldots)(\mathit{read}(e \ldots))$

(35) $\ldots \textsc{no}_x \ldots (\ldots \mathit{student}(x) \ldots)(S(\ldots x \ldots))$

(36) $\ldots \textsc{no}_y \ldots (\ldots \mathit{book}(y) \ldots)(S(\ldots y \ldots))$

(37) $\mathit{Res}(\textsc{no}_e, \textsc{no}_x, \textsc{no}_y)(\mathit{event}(e), \mathit{student}(x), \mathit{book}(y))(\mathit{read}(e, x, y))$

Note the explicit representation of the kind of lift in (37).

Another lift, specific to some constructions involving complex NPs (inverse linking, telescoping), is proposed in Sailer 2015. For example, the representation of (38) proposed there is equivalent to (39) (which follows the notation assumed in this paper). Again, the kind of lift is not specified explicitly there. A more explicit representation, consistent with the technicalities below, is that in (40), where *CNP* stands for "complex NP lift".

(38) An apple in every basket is rotten. (Sailer 2015: 542)

(39) $(\textsc{every}_y, \textsc{some}_x)(\mathit{basket}(y), \mathit{apple}(x) \land \mathit{in}(y, x))(\mathit{rotten}(x))$

(40) $\mathit{CNP}(\textsc{every}_y, \textsc{some}_x)(\mathit{basket}(y), \mathit{apple}(x) \land \mathit{in}(y, x))(\mathit{rotten}(x))$

Finally, Richter 2016 provides an LRS analysis of *different*, as in (41), with the proposed representation equivalent to (42) in the notation assumed here. As in Richter 2016, $\Delta$ stands for the quantifier expressed by *different*.

(41) Every ape picked different berries. (Richter 2016: 601)

(42) $(\textsc{every}_x, \Delta_y)(\mathit{ape}(x), \mathit{berry}(y))(\mathit{pick}(x, y))$

The particular semantics of such polyadic quantifiers given in Richter 2016: 607 is conditioned on the presence of $\Delta$ among the quantifier constants. On the setup of the current paper, the representation of (41) would be as in (43), with $\Delta$ treated as a kind of lift and with the quantificational contribution of the bare plural (i.e., SOME) made explicit.

(43) $\Delta(\textsc{every}_x, \textsc{some}_y)(\mathit{ape}(x), \mathit{berry}(y))(\mathit{pick}(x, y))$

This paves the way to natural representations of examples with other quantifiers in the NP containing *different* (discussed in Richter 2016: 617–618), as in (44), where the quantifier is TWO:

(44) Every ape picked two different berries. (Richter 2016: 617)

(45) $\Delta(\textsc{every}_x, \textsc{two}_y)(\mathit{ape}(x), \mathit{berry}(y))(\mathit{pick}(x, y))$

Representations such as (45) are human-readable versions of actual HPSG structures, so let me now be more precise about the nature of such structures. As common in LRS, I assume that full-fledged semantic representations are values of the LRS attribute defined on *sign* objects. Values of LRS are of sort *lrs* and contain some attributes with values of sort *me* (for "meaningful expression"), as shown in the fragment of the signature in (46).[5]

(46) A fragment of the signature assumed here:

```
top
  ...
  lrs EXCONT me
      INCONT me
      PARTS list(me)
  me TYPE type
    variable NUM-INDEX integer
    constant NUM-INDEX integer
    application FUNCTOR me
                ARG me
    abstraction VAR me
                BODY me
    equation ARG1 me
             ARG2 me
    negation ARG me
    l-const ARG1 me
            ARG2 me
      disjunction
      conjunction
      implication
      bi-implication
    gen-quantifier QUANT-RESTRS nelist(quant-restr)
                   SCOPE me
      mq
      lq LIFT lift
    lift
      res
      diff
```

[5]In the case of list values, the sorts of objects on such lists are informally indicated in the signatures given here (e.g., `nelist(quant-restr)`); in the full grammar, this information is encoded via appropriate constraints (as in (55)–(56) below).

```
    cnp
    cov
    ...
quant-restr VAR variable
            RESTR me
  every
  some
  no
  many
  ...
type
  atomic-type
    entity
    truth
  complex-type IN type
               OUT type
integer
  zero
  non-zero PRE integer
```

This fragment is based on that in Iordăchioaia 2010: ch.5, itself based on Sailer 2003: ch.3. The main difference is the definition of generalized quantifiers, *gen-quantifier*, which in Iordăchioaia 2010: 161 looks like this:

(47) The *gen-quantifier* fragment of the signature in Iordăchioaia 2010: ch.5:

```
gen-quantifier VAR list(variable)
               RESTR list(me)
               SCOPE me
  every
  some
  no
```

As no other polyadic lifts are considered in Iordăchioaia 2010: ch.5, this simple definition of *gen-quantifier* is sufficient for the representation of the resumptive lift: when two or more usual quantifiers are so lifted, the list of variables VAR and the corresponding list of restrictions RESTR are longer than one. For example, the representation in (33) (i.e., $\textsc{no}_{x,y}(student(x), book(y))(read(x,y)))$) is a shorthand for the following more explicit structure:[6]

[6]Bits in frames are shorthand representations of the underlying structures; for example $\boxed{x}$ may stand for $\begin{bmatrix} \textit{variable} \\ \textsc{num-index} \begin{bmatrix} \textit{non-zero} \\ \textsc{pre}\ \textit{zero} \end{bmatrix} \\ \textsc{type}\ \textit{entity} \end{bmatrix}$ (i.e., for $e$-typed variable number 1), etc.

(48) $\begin{bmatrix} no \\ \text{VAR } \langle \boxed{x}, \boxed{y} \rangle \\ \text{RESTR } \langle \boxed{student(x)}, \boxed{book(y)} \rangle \\ \text{SCOPE } \boxed{read(x,y)} \end{bmatrix}$

A constraint is needed to ensure that values of VAR and RESTR are lists of the same length.

By contrast, the signature in (46) makes it possible to represent various kinds of polyadic lifts, and the correspondence between quantifier constants, variables, and restrictions is conspicuous. For example, (28) – repeated below as (49) – is a shorthand for (50).

(49) $Cov(\text{MANY}_x, \text{MANY}_y)(philosopher(x), article(y))(write(x,y))$

(50) $\begin{bmatrix} lq \\ \text{LIFT } cov \\ \text{QUANT-RESTRS } \left\langle \begin{bmatrix} many \\ \text{VAR } \boxed{x} \\ \text{RESTR } \boxed{philosopher(x)} \end{bmatrix}, \begin{bmatrix} many \\ \text{VAR } \boxed{y} \\ \text{RESTR } \boxed{article(y)} \end{bmatrix} \right\rangle \\ \text{SCOPE } \boxed{write(x,y)} \end{bmatrix}$

The sort *lq* – lifted quantifier – is one of two subsorts of *gen-quantifier*, the other being *mq* – monadic quantifier. In the lexicon, *wiele* 'many' is underspecified as being of sort *gen-quantifier*, which can lead to a lifted representation of the kind exemplified by (50), or the usual monadic representation, as in (24) – repeated below as (51) – whose more explicit structure is shown in (52).

(51) $\text{MANY}_x(philosopher(x))(arrive(x))$

(52) $\begin{bmatrix} mq \\ \text{QUANT-RESTRS } \left\langle \begin{bmatrix} many \\ \text{VAR } \boxed{x} \\ \text{RESTR } \boxed{philosopher(x)} \end{bmatrix} \right\rangle \\ \text{SCOPE } \boxed{arrive(x)} \end{bmatrix}$

The two subsorts of *gen-quantifier* differ not only in the presence (on *lq*) or absence (on *mq*) of the LIFT attribute, but also in how many *quant-restr* objects (quantifiers with their restrictions but without the scope) may occur in the QUANT-RESTRS list: exactly one in the case of monadic quantifiers, but more than one in the case of lifted quantifiers:

(53) $mq \rightarrow [\text{ QUANT-RESTRS}|\text{REST } elist\ ]$

(54) $lq \rightarrow [\text{ QUANT-RESTRS}|\text{REST } nelist\ ]$

Most of the constraints on semantic representations defined in Iordăchioaia 2010: ch.5 carry over to the present setup, but the ones referring directly to the representation of quantifiers must be modified accordingly. In particular, the relevant complex term principle on *gen-quantifier* (Iordăchioaia 2010: 162) is now:

(55) $\textit{gen-quantifier} \rightarrow \left( \begin{bmatrix} \textsc{type}\ \textit{truth} \\ \textsc{quant-restrs}\ \boxed{1} \\ \textsc{scope}|\textsc{type}\ \textit{truth} \end{bmatrix} \wedge \texttt{quant-restr-list}(\boxed{1}) \right)$

(56) $\forall \boxed{1} (\texttt{quant-restr-list}(\boxed{1}) \leftrightarrow$
$(\boxed{1}\textit{elist} \vee$
$\exists \boxed{2} \exists \boxed{3} (\boxed{1} \begin{bmatrix} \textsc{first}\ \boxed{2}\textit{quant-restr} \\ \textsc{rest}\ \boxed{3} \end{bmatrix} \wedge \texttt{quant-restr-list}(\boxed{3}))))$

Note that *quant-restr* – the sort of objects in the QUANT-RESTRS list – is *not* a subsort of *me*, so it does not have a type as a whole. However, the restriction within it has the semantic type $t$:

(57) $\textit{quant-restr} \rightarrow \left[ \textsc{restr}|\textsc{type}\ \textit{truth} \right]$

In the next two sections we will see how to arrive at semantic representations such as (50).

# 4 Syntax of Coordination

There are various intuitions about the headedness of coordinate structures. One, dominant in HPSG, is that such structures are not headed at all. Another, still frequent in Chomskian linguistics even though it was convincingly refuted in Borsley 2005, is that they are headed by the conjunction. Yet another, expressed in various traditions including dependency grammars, is that they are multiheaded, i.e., that each conjunct is in some sense a head of the coordinate structure. Here, I adopt this last view, as it makes the statement of certain constraints easier. Technically, I assume the fragment of the signature in (58), together with constraints (59)–(60).

(58) A fragment of the signature assumed here:

```
phrase
  non-headed-ph DTRS nelist
  headed-ph HD-DTRS nelist
    multi-headed-ph
    singly-headed-ph NHD-DTRS nelist
      hd-subj-ph
      hd-comp-ph
      ...
```

(59) $\textit{singly-headed-ph} \rightarrow \left[ \textsc{hd-dtrs}|\textsc{rest}\ \textit{elist} \right]$

(60) $\textit{multi-headed-ph} \rightarrow \left[ \textsc{hd-dtrs}|\textsc{rest}\ \textit{nelist} \right]$

Coordinate structures are signs of sort *multi-headed-ph*, i.e., their only daughters attribute is HD-DTRS of length at least two. If it were assumed that only the same categories may be coordinated, then the Head Feature Principle (HFP) might be formalized as in (61), but for reasons that will become clear momentarily I assume the encoding of HFP in (62).

(61) HFP presupposing the Law of the Coordination of Likes (Williams 1981), i.e., not assumed here:

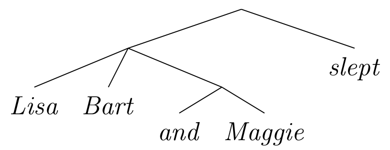
$$\begin{bmatrix} \text{SS}|\text{LOC}|\text{CAT}|\text{HEAD } \boxed{1} \\ \text{HD-DTRS } \langle \ldots, \begin{bmatrix} \text{SS}|\text{LOC}|\text{CAT}|\text{HEAD } \boxed{2} \end{bmatrix}, \ldots \rangle \end{bmatrix} \rightarrow \boxed{1} = \boxed{2}$$

(62) HFP assumed here:

$$\begin{bmatrix} \text{SS}|\text{LOC}|\text{CAT}|\text{HEAD } \boxed{1} \\ \text{HD-DTRS } \langle \begin{bmatrix} \text{SS}|\text{LOC}|\text{CAT}|\text{HEAD } \boxed{2} \end{bmatrix} \rangle \end{bmatrix} \rightarrow \boxed{1} = \boxed{2}$$

I assume the "almost flat" structure of coordination (Abeillé & Chaves 2021: §3), so that *Lisa, Bart, and Maggie slept* has the structure in (63).

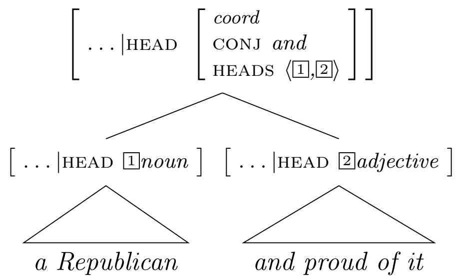
(63)




As in much of the HPSG literature, I treat conjunctions as markers attaching to the immediately following conjuncts (see Abeillé & Chaves 2021: §3.1 and references therein).

On the other hand I do not follow the linearization-based approach to the coordination of unlikes, but rather allow for the direct coordination of unlike grammatical categories, as argued, e.g., in Levine 2011 and Abeillé & Chaves 2021: §6 (cf. Patejuk & Przepiórkowski 2021). The only HPSG analysis of coordination that I am aware of which makes it possible to coordinate different categories is that sketched in Yatabe 2004 and formally substantiated in Przepiórkowski 2021b: §4, so I'll also assume it here. On that analysis the category of the coordinate structure is not that of the conjuncts, but rather a special category, call it *coord*, which encodes the kind of conjunction (CONJ) and the heads of all conjuncts (here HEADS, instead of Yatabe's 2004 ARGS).[7] For example, *a Republican and proud of it* (Sag et al. 1985: 117), i.e., a coordination of an NP and an AP, has the HEAD value shown in (64).

(64)




[7]Having such a special category is not an optimal solution, as it is subject to some of the criticisms in Borsley 2005, especially, that there are no predicates which would subcategorize for this category. A conceptually cleaner solution is to assume that coordinate structures do not have any syntactic category above the categories of its conjuncts, as proposed within LFG in Przepiórkowski & Patejuk 2021, but it is not clear to me how to implement this idea in HPSG.

## 5 HC at the Syntax–Semantics Interface

After laying out my assumptions about the semantic representation of polyadic quantifiers and about the syntax of coordination, it is high time to present – or rather sketch, for lack of space – the complete syntactico-semantic analysis of Hybrid Coordination. I will illustrate it with the simple – but attested[8] – example (65), with the intended representation in (66) (i.e., $sell(x, y)$ is true iff "they" will sell $x$ to $y$).

(65) Sprzedadzą wszystko i każdemu… (Polish)
sell.FUT.3PL all.ACC and everybody.DAT
'They'll sell everything and to everybody.'

(66) $Cov(\text{EVERY}_x, \text{EVERY}_y)(thing(x), person(y))(sell(x, y))$

The first piece of the puzzle is syntactic: how do hybrid coordinations come into being, how do they combine with the rest of the sentence? An answer is suggested by the common observation (e.g., in Gribanova 2009: 138) that, in the case of multiple *wh*-questions, *wh*-phrases may be coordinated in those languages that allow for multiple *wh*-fronting. Thus, in Polish both (67)–(68) are fine, while both literal English translations are not acceptable.

(67) Kto kiedy przyszedł? (Polish)
who when came
'Who came when?' (cf. *Who when came?)

(68) Kto i kiedy przyszedł? (Polish)
who and when came
'Who came and when?' (cf. *Who and when came?)

So in languages like Polish, there must be a rule or construction that makes it possible to realize all extracted *wh*-phrases in one go, as a coordinate structure. I generalize this postulate to all of HC, i.e., I assume that also in examples such as (65), which do not involve *wh*-phrases, all phrases ultimately realized as conjuncts are first extracted from their base positions (i.e., from the extended ARG-ST; Bouma et al. 2001) and placed in SLASH.[9] The bottom and middle of the dependency are unremarkable, but what needs to be added to the standard HPSG theory of unbounded dependencies is the possibility to realize a number of SLASH elements in one bulk, as a coordinate structure; in (69), *head-hc-filler-ph* is a subsort of *head-filler-ph*:

(69) *head-hc-filler-ph* $\rightarrow$

$$\begin{bmatrix} \text{NONLOCAL}|\text{SLASH}\ \{\boxed{2_1},\ldots,\boxed{2_m}\} \\ \text{HD-DTRS}\ \left\langle \begin{bmatrix}\text{NONLOCAL}|\text{SLASH}\ \{\boxed{1_1},\ldots,\boxed{1_n},\boxed{2_1},\ldots,\boxed{2_m}\}\end{bmatrix} \right\rangle \\ \text{NHD-DTRS}\ \left\langle \begin{bmatrix}\text{HD-DTRS}\ \left\langle \begin{bmatrix}\text{LOCAL}\ \boxed{1_1}\end{bmatrix},\ldots,\begin{bmatrix}\text{LOCAL}\ \boxed{1_n}\end{bmatrix} \right\rangle\end{bmatrix} \right\rangle \end{bmatrix}$$

(for some $n > 1, m \geq 0$)

[8] https://komediowy.pl/spektakl/gladiatorzy-sprzedazy-dzien-zycia-przedstawiciela-handlowego/

[9] In particular, unlike in Chaves & Paperno 2007, they are allowed to be dependents of different heads; see, e.g., Patejuk 2015: §5.2 and (2) above.

In words, in this kind of phrase, at least two SLASH elements are removed from the head daughter and realized as multiple heads within the non-head daughter; that is, the non-head daughter is a coordinate structure (on the assumption that only coordinate structures are of sort *multi-headed-ph* introduced in (58)).[10] This leads to the syntactic structure of (65) given in Figure 1.

For the syntax–semantic interface, I assume the usual principles of LRS, only some of which need to be adjusted. The intended values of attributes INCONT (internal content) and EXCONT (external content) are given in Figure 2. The values of PARTS are mostly omitted, as they are analogous to those in the usual LRS analyses of quantifiers. The only remarkable aspect of PARTS here is that the conjunction introduces the value of LIFT, namely, *cov* (rendered as *Cov* in the tree).

The representations in Figure 2 are simplified in various ways. For example, in the node for *wszystko* 'everything', the representation in (70) is a simplified version of (71), where – as above – framed representations hide more complex underlying structure.

(70) $\left[\begin{array}{l} \text{EXCONT } \boxed{1}\ldots\text{EVERY}_x\ldots(\ldots\boxed{2}\ldots)(\ldots) \\ \text{INCONT } \boxed{2}\,\mathit{thing}(x) \end{array}\right]$

(71) $\left[\begin{array}{l} \text{EXCONT } \boxed{1}\left[\begin{array}{l} \textit{gen-quantifier} \\ \text{QUANT-RESTRS } \boxed{0} \end{array}\right] \\ \text{INCONT } \boxed{2}\,\boxed{\mathit{thing}(x)} \\ \text{PARTS } \left\langle \boxed{1}, \boxed{1a}, \boxed{2}, \boxed{2a}\,\boxed{\mathit{thing}} \right\rangle \end{array}\right] \wedge \left[\begin{array}{l} \textit{every} \\ \text{VAR } \boxed{1a}\,\boxed{x} \\ \text{RESTR } \boxed{8} \end{array}\right] \in \boxed{0} \;\wedge\; \boxed{2} \triangleleft \boxed{8}$

The two basic LRS principles, the INCONT PRINCIPLE and the EXCONT PRINCIPLE, are standard:[11]

(72) INCONT PRINCIPLE
In each *lrs*, the INCONT value is an element of the PARTS list and a component of the EXCONT value.

(73) EXCONT PRINCIPLE
Clause 1:
In every phrase, the EXCONT value of the non-head daughter is an element of the non-head daughter's PARTS list.
Clause 2:
In every utterance, every subexpression of the EXCONT value of the utterance is an element of its PARTS list, and every element of the utterance's PARTS list is a subexpression of the EXCONT value.

Another basic principle, the LRS PROJECTION PRINCIPLE, needs to be modified slightly:

[10] This construction is subject to additional semantic and pragmatic constraints (regarding the similarity of the quantifiers expressed by the conjuncts and the information status of the coordinate structure), which I do not attempt to state here.

[11] Here and below I cite or modify the versions of these principles found in Iordăchioaia & Richter 2015 (mostly taken from Richter & Kallmeyer 2009).

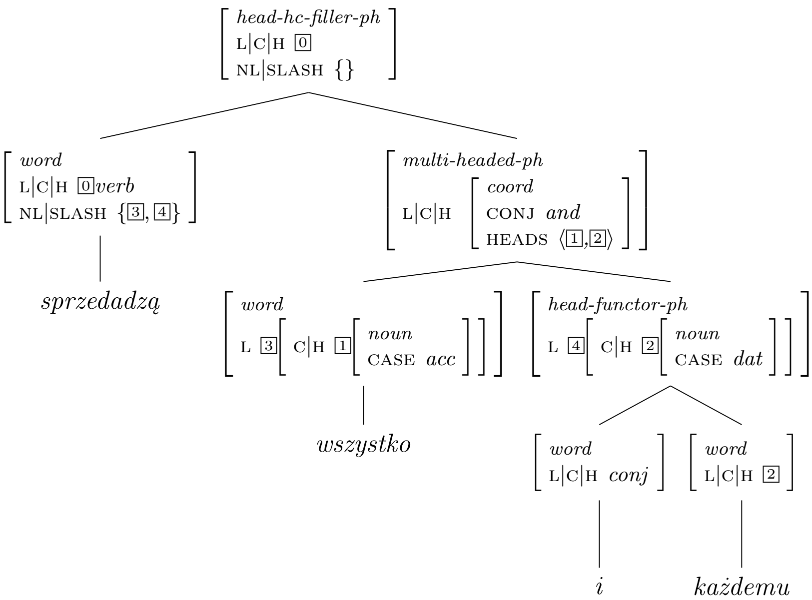



Figure 1: Syntactic structure of (65)

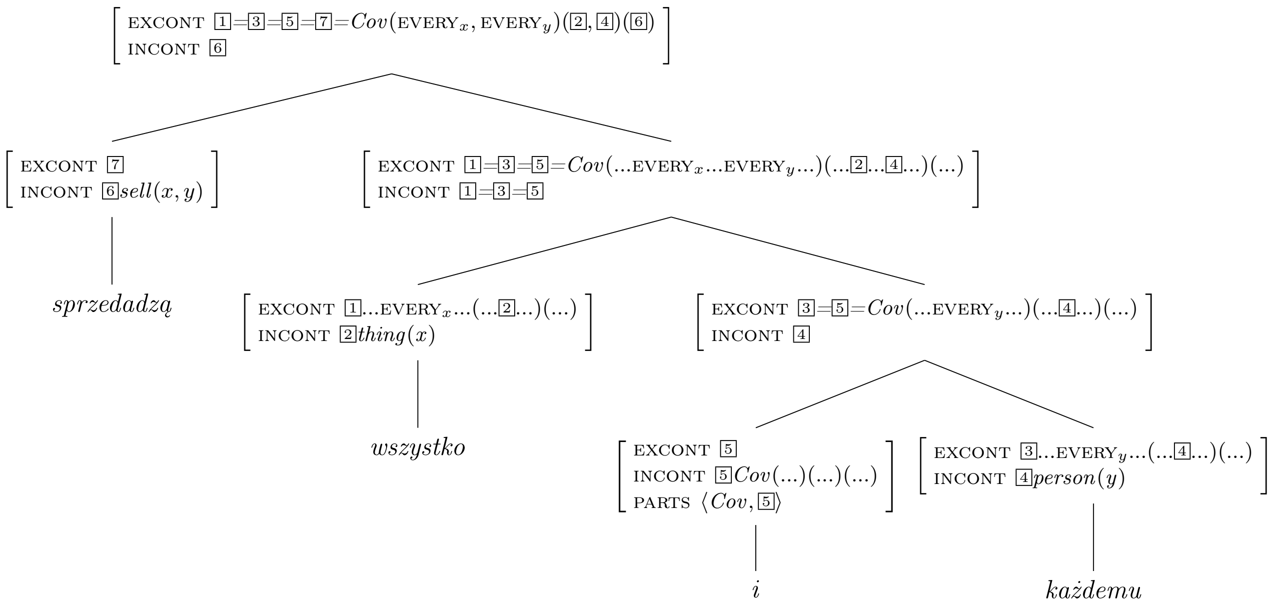



Figure 2: Values of LRS in Figure 1 (simplified)

(74) LRS Projection Principle
In each *phrase*,

1. the EXCONT values of each head and the mother are identical,
2. the INCONT values of the head and the mother are identical,
3. the PARTS value contains all and only the elements of the PARTS values of the daughters.

The slight modification concerns the EXCONT part, which mentions *each* head. This way, in the *multi-headed-ph* in Figure 1 representing *wszystko i każdemu* 'everything and to everybody', the EXCONT value of this phrase is equated with EXCONT values of both head daughters, in a step towards the creation of a polyadic quantifier. Note that a similar modification is impossible in the case of the INCONT part, as INCONT values of the two heads cannot be unified into a single representation. Rather, an additional clause the Semantics Principle is needed that equates EXCONT and INCONT in coordinate structures:[12]

(75) Semantics Principle, coordination clause
In *multi-headed-ph*, INCONT and EXCONT values are identical.

As formulated here, these principles apply to all multi-headed phrases, i.e., to all coordinate structures, not just to HC. This assumes that all coordinate structures may be analysed via the creation of a polyadic quantifier partially specified by all conjuncts – a hypothesis that I intend to explore in future work. But getting rid of this assumption is easy; it is sufficient to postulate a special subsort of *multi-headed-ph* specific to HC, say, *hc-ph*, and to formulate all relevant principles in terms of *hc-ph* rather than *multi-headed-ph*.

To be applicable to Slavic, the "quantifier–restriction" clause of the Semantics Principle (Clause 1 in Iordăchioaia & Richter 2015: 631) must be modified to reflect the fact that, in Slavic, quantifiers are not necessarily determiner non-heads, but may be expressed by adjective non-heads, or numeral or nominal heads. That is, that clause should rely less on the morphosyntax of the two constituents, and more on their semantics. However, I do not attempt such a reformulation here, and besides it is not needed in the case of example (65) and Figures 1 and 2, which feature type $\langle 1 \rangle$ quantifiers *wszystko* 'everything' and *każdemu* 'everybody', with the restriction already built-in.

What is at work in the case of the running example – at the level of *head-hc-filler-ph* – is the "quantifier–scope" clause (Clause 2 in Iordăchioaia & Richter 2015: 631); here is a modified version applicable to HC:

(76) Semantics Principle, quantifier–scope clause
If the non-head is an NP or a multi-headed phrase and its an EXCONT value is of sort *gen-quantifier*, then the INCONT value of the head is

[12] Instead of numbering particular clauses of the Semantics Principle, which is not mnemonic and may be inconsistent across different versions of this principle, I give them descriptive names, e.g., "coordination clause".

a component of SCOPE within the EXCONT value.

This version is slightly reformulated with respect to that in Iordăchioaia & Richter 2015: 631: it explicitly refers to *gen-quantifier* and SCOPE, i.e., it does not shy away from HPSG technicalities. But it is also extended by allowing the quantifier to be not only NP, but also a coordinate structure. This works for the example at hand, but – just as in the case of the "quantifier–restriction" clause discussed in the previous paragraph – it is not satisfactory, as it overtly relies on the morphosyntax of the construction. What seems to be missing here, and in LRS in general, is a more general and uniform rule of semantic composition, similar to the type-driven composition assumed (Klein & Sag 1985) in other semantic frameworks.

The final clause needed in the running example is this:

(77) SEMANTICS PRINCIPLE, functor–head clause
If the functor in *head-functor-ph* is a conjunction, then EXCONT values of this phrase and the conjunction are identical.

This way, the conjunction's $Cov(...)(...)(...)$ EXCONT is identified with the conjunct's $Cov(...\text{EVERY}_y...)(...\boxed{4}...)(...)$ EXCONT, thus making sure that the quantifier introduced by that conjunct takes part in the cover lift.

# 6 Conclusion

While there is abundance of syntactic and semantic work on coordination, hybrid coordination has been neglected so far: almost all of the literature only deals with syntax (and most of it only with coordinated *wh*-phrases), and the only worked out semantic analysis, that of Paperno 2012, is known not to make the right predictions. I hope to have somewhat ameliorated this situation by providing an account at the syntax–semantics interface that builds on both Paperno's (2012) account and HPSG work on polyadic quantification, but attempts to improve on both.

# References

Abeillé, Anne & Rui Chaves. 2021. Coordination. In Stefan Müller, Anne Abeillé, Robert D. Borsley & Jean-Pierre Koenig (eds.), *Head-driven Phrase Structure Grammar: The handbook*, Berlin: Language Science Press. https://langsci-press.org/catalog/book/259. Forthcoming.

Borsley, Robert D. 2005. Against ConjP. *Lingua* 115(4). 461–482.

Bouma, Gosse, Robert Malouf & Ivan A. Sag. 2001. Satisfying constraints on extraction and adjunction. *Natural Language and Linguistic Theory* 19(1). 1–65.

Browne, E. Wayles, III. 1972. Conjoined question words and a limitation of English surface structures. *Linguistic Inquiry* 3(2). 223–226.

Bîlbîie, Gabriela & Anna Gazdik. 2012. Wh-coordination in Hungarian and Romanian multiple questions. *Empirical Issues in Syntax and Semantics* 9. 19–36. http://www.cssp.cnrs.fr/eiss9/.

Chaves, Rui Pedro & Denis Paperno. 2007. On the Russian hybrid coordination construction. In Stefan Müller (ed.), *Proceedings of the HPSG 2007 conference*, 46–64. Stanford, CA: CSLI Publications.

Citko, Barbara & Martina Gračanin-Yüksek. 2013. Towards a new typology of coordinated *wh*-questions. *Journal of Linguistics* 49(1). 1–32.

Comorovski, Ileana. 1996. *Interrogative phrases and the syntax-semantics interface*. Dordrecht: Kluwer Academic Publishers.

Davidson, Donald. 1967. The logical form of action sentences. In Nicholas Rescher (ed.), *The logic of decision and action*, 81–95. Pittsburgh, PA: University of Pittsburgh Press.

Gračanin-Yüksek, Martina. 2007. *About sharing*. Cambridge, MA: Massachusetts Institute of Technology Ph.D. dissertation.

Gribanova, Vera. 2009. Structural adjecency and the typology of interrogative interpretations. *Linguistic Inquiry* 40(1). 133–154.

Haida, Andreas & Sophie Repp. 2011. Monoclausal question word coordinations across languages. In Suzi Lima, Kevin Mullin & Brian Smith (eds.), *NELS 39: Proceedings of the 39th annual meeting of the North East Linguistic Society*, 352–372.

Higginbotham, James & Robert May. 1981. Questions, quantifiers, and crossing. *The Linguistic Review* 1. 41–79.

Iordăchioaia, Gianina. 2010. *Negative Concord with negative quantifiers: A polyadic quantifier approach to Romanian Negative Concord*: Universität Tübingen Ph.D. dissertation.

Iordăchioaia, Gianina & Frank Richter. 2009. Negative concord in Romanian as polyadic quantification. In Stefan Müller (ed.), *Proceedings of the HPSG 2009 conference*, 150–170. Stanford, CA: CSLI Publications.

Iordăchioaia, Gianina & Frank Richter. 2015. Negative concord with polyadic quantifiers: The case of Romanian. *Natural Language and Linguistic Theory* 33. 607–658.

Kallas, Krystyna. 1993. *Składnia współczesnych polskich konstrukcji współrzędnych*. Toruń: Wydawnictwo Uniwersytetu Mikołaja Kopernika.

Kazenin, Konstantin I. 2001. On coordination of wh-phrases in Russian. Unpublished manuscript, University of Tübingen and Moscow State University, https://www.lingexp.uni-tuebingen.de/sfb441/b2/papers/whcord.pdf.

Keenan, Edward L. & Dag Westerståhl. 2011. Generalized quantifiers in linguistics and logic. In Johan van Benthem & Alice ter Meulen (eds.), *Handbook of logic and language*, 859–910. Amsterdam: Elsevier 2nd edn.

Klein, Ewan & Ivan A. Sag. 1985. Type-driven translation. *Linguistics and*

*Philosophy* 8(2). 163–201.

Levine, Robert D. 2011. Linearization and its discontents. In Stefan Müller (ed.), *Proceedings of the HPSG 2011 conference*, 126–146. Stanford, CA: CSLI Publications.

Lindström, Per. 1966. First-order predicate logic with generalized quantifiers. *Theoria* 32. 186–195.

Lipták, Anikó. 2003. Conjoined questions in Hungarian. In Cedric Boeckx & Kleanthes K. Grohmann (eds.), *Multiple* wh-*fronting*, 141–160. Amsterdam: John Benjamins.

Lipták, Anikó. 2011. Strategies of wh-coordination. *Linguistic Variation* 11. 149–188.

Mel'čuk, Igor. 1988. *Dependency syntax: Theory and practice*. Albany, NY: The SUNY Press.

Paperno, Denis. 2012. *Semantics and syntax of non-standard coordination*: University of California, Los Angeles Ph.D. dissertation.

Patejuk, Agnieszka. 2015. *Unlike coordination in Polish: An LFG account*. Cracow: Institute of Polish Language, Polish Academy of Sciences Ph.D. dissertation.

Patejuk, Agnieszka & Adam Przepiórkowski. 2012. Lexico-semantic coordination in Polish. In Miriam Butt & Tracy Holloway King (eds.), *The proceedings of the LFG'12 conference*, 461–478. Stanford, CA: CSLI Publications. http://cslipublications.stanford.edu/LFG/17/lfg12.html.

Patejuk, Agnieszka & Adam Przepiórkowski. 2019. Coordination of unlike grammatical functions. In Kim Gerdes & Sylvain Kahane (eds.), *Proceedings of the fifth international conference on Dependency Linguistics (DepLing, SyntaxFest 2019)*, 26–37. Association for Computational Linguistics. https://aclweb.org/anthology/W19-7705/.

Patejuk, Agnieszka & Adam Przepiórkowski. 2021. Category mismatches in coordination vindicated. *Linguistic Inquiry* doi:10.1162/ling_a_00438. Forthcoming.

Przepiórkowski, Adam. 2021a. Polyadic cover quantification in heterofunctional coordination. In preparation; to be submitted to the Proceedings of *Sinn und Bedeutung 26*.

Przepiórkowski, Adam. 2021b. Three improvements to the HPSG model theory. In the Proceedings of the *28th International Conference on HPSG*.

Przepiórkowski, Adam & Agnieszka Patejuk. 2014. Koordynacja leksykalno-semantyczna w systemie współczesnej polszczyzny (na materiale Narodowego Korpusu Języka Polskiego). *Język Polski* XCIV(2). 104–115.

Przepiórkowski, Adam & Agnieszka Patejuk. 2021. Coordinate structures without syntactic categories. In I Wayan Arka, Ash Asudeh & Tracy Holloway King (eds.), *Modular design of grammar: Linguistics on the edge*, 205–

220. Oxford: Oxford University Press. https://global.oup.com/academic/product/modular-design-of-grammar-9780192844842. Forthcoming.

Richter, Frank. 2016. Categorematic unreducible polyadic quantifiers in Lexical Resource Semantics. In Doug Arnold, Miriam Butt, Berthold Crysmann, Tracy Holloway King & Stefan Müller (eds.), *The proceedings of the joint 2016 conference on Head-driven Phrase Structure Grammar and Lexical Functional Grammar*, 599–619. Stanford, CA: CSLI Publications. http://web.stanford.edu/group/cslipublications/cslipublications/HPSG/2016/.

Richter, Frank & Laura Kallmeyer. 2009. Feature logic-based semantic composition: A comparison between LRS and LTAG. In Anders Søgaard & Petter Haugereid (eds.), *Typed feature structure grammars*, 32–92. Frankfurt am Main: Peter Lang.

Richter, Frank & Manfred Sailer. 2004. Basic concepts of Lexical Resource Semantics. In Arnold Beckmann & Norbert Preining (eds.), *ESSLLI 2003 – course material I*, vol. 5 Collegium Logicum, 87–143. Kurt Gödel Society Wien.

Robaldo, Livio. 2011. Distributivity, collectivity, and cumulativity in terms of (in)dependence and maximality. *Journal of Logic, Language and Information* 20. 233–271.

Sag, Ivan A., Gerald Gazdar, Thomas Wasow & Steven Weisler. 1985. Coordination and how to distinguish categories. *Natural Language and Linguistic Theory* 3. 117–171.

Sailer, Manfred. 2003. *Combinatorial semantics and idiomatic expressions in Head-driven Phrase Structure Grammar*: Universität Tübingen Ph.D. dissertation (defended in 2000).

Sailer, Manfred. 2015. Inverse linking and telescoping as polyadic quantification. In Eva Csipak & Hedde Zeijlstra (eds.), *Proceedings of Sinn und Bedeutung 19*, 535–552. Göttingen. https://semanticsarchive.net/Archive/TVlN2I2Z/sub19proc.pdf.

Sannikov, Vladimir Z. 1979–1980. Sočinitel'nye i sravnitel'nye konstrukcii: ix blizost', ix sintaksičeskoe predstavlenie I–II. *Wiener Slawistischer Almanach* 4–5. 413–432, 211–242.

Schwarzschild, Roger. 1996. *Pluralities*. Dordrecht: Springer-Verlag.

Skrabalova, Hana. 2007. Wh-questions with conjoined wh-words. In Mojmír Dočekal, Petr Karlik & Jana Zmrzlíková (eds.), *Czech in generative grammar*, 161–174. Munich: Lincom.

Williams, Edwin. 1981. Transformationless grammar. *Linguistic Inquiry* 12(4). 645–653.

Yatabe, Shûichi. 2004. A comprehensive theory of coordination of unlikes. In Stefan Müller (ed.), *Proceedings of the HPSG 2004 conference*, 335–355. Stanford, CA: CSLI Publications.

# Three improvements to the HPSG model theory

Adam Przepiórkowski
University of Warsaw / ICS Polish Academy of Sciences / University of Oxford

Proceedings of the 28th International Conference on
Head-Driven Phrase Structure Grammar

Online (Frankfurt/Main)

Stefan Müller, Nurit Melnik (Editors)

2021

Frankfurt/Main: University Library

pages 165–185

Keywords: RSRL, exhaustive models, rooted models, Höhle's Problem, unlike category coordination, HPSG

Przepiórkowski, Adam. 2021. Three improvements to the HPSG model theory. In Stefan Müller & Nurit Melnik (eds.), *Proceedings of the 28th International Conference on Head-Driven Phrase Structure Grammar, Online (Frankfurt/Main)*, 165–185. Frankfurt/Main: University Library. DOI: 10.21248/hpsg.2021.9.

**Abstract**

The aim of this paper is to propose three improvements to the HPSG model theory. The first is a solution to certain formal problems identified in Richter 2007. These problems are solved if HPSG models are rooted models of utterances and not exhaustive models of languages, as currently assumed. The proposed solution is compatible with all existing views on the nature of objects inhabiting models. The second improvement is a solution to "Höhle's Problem", i.e., the problem of massive spurious ambiguities in models of utterances. The third is a formalisation of Yatabe's (2004) analysis of the coordination of unlike categories, one that requires a second-order extension of the language for stating HPSG grammars.

# 1 Introduction

HPSG is unique amongst contemporary linguistic frameworks in having a well-developed model theory, most comprehensively presented in Richter 2004 (see Richter 2021 for an overview). Nevertheless, there are a number of problems that this model theory faces and there are some linguistic analyses that seem to call for an extension of that standard model theory.

In this paper, I propose three orthogonal improvements to the HPSG model theory of Richter 2004. Two of them address problems which are known and to some extent have been dealt with in the past. The first improvement, presented in Section 2 and Appendix A, deals with problems identified in Richter 2007, namely, the problems of HPSG models containing structures which are not linguistically motivated. The improvement consists in giving up the idea that models are exhaustive and allowing for rooted models.

The second proposal, presented in Section 3 and Appendix B, is not exactly an improvement of the model theory, but rather of the underyling grammars. It aims to solve what is sometimes (e.g., in Pollard 2001, 2014: 113) called "Höhle's Problem", i.e., the problem of massive spurious ambiguities in HPSG models, which are not intended – and not even suspected – by linguists writing their grammars. The solution consists in proposing certain constraints, assumed to be universal (i.e., parts of all grammars), which make sure that structures which look the same are token-identical. Such constraints have been proposed in the past, and what is new in the current proposal is a technique of exempting certain structures – especially, values of INDEX – from the scope of such constraints.

The third improvement extends the language in which HPSG theories are formulated in such a way that second-order statements are possible, i.e., in a way that makes it possible to refer not only to objects in the model but

[†]I am grateful for comments from Frank Richter and Manfred Sailer, as well as HPSG 2021 reviewers and the audiences of HPSG 2021 and the *Oberseminar Syntax and Semantics 2021* in Frankfurt. Needless to say, all remaining errors are mine alone.

also to their properties. In particular, such properties may be quantified over, may be values of variables, and as such may be arguments of relations. This extension seems to be needed to implement the account of unlike category coordination sketched in Yatabe 2004. This improvement is outlined in Section 4, where I also motivate it by briefly arguing that there is currently no viable HPSG alternative to Yatabe's (2004) analysis.

These three improvements are orthogonal in the sense that any of them may be adopted, without the need to adopt any of the others. Accordingly, each of the following three sections may be read independently of the others.

## 2 Non-Exhaustive Rooted Models

Since King 1999, HPSG models are assumed to be exhaustive (see Richter 2004, 2007; cf. Pollard 1999), i.e., contain all possible kinds of structures licensed by the grammar. For example, a single HPSG model of English will contain structures for all possible English utterances and words, as well as many partial structures satisfying the grammar (e.g., various *local* or *synsem* objects). This corresponds to the intuition that grammars describe whole languages, so each model should represent the whole language. However, there is another valid intuition, which is predominant outside of HPSG: that grammars describe possible utterances. This latter intuition leads to much smaller models: each model corresponds to a single utterance and only the collection of all models corresponds to the whole language.

By way of analogy, consider the artificial toy problem of describing all configurations of black and white objects such that each black object is related to at least one white object and vice versa (cf. Przepiórkowski 2021: § 4). The following first order formulae are a reasonable theory of such configurations:

(1) $\forall x.\, black(x) \leftrightarrow \neg white(x)$

(2) $\forall x \forall y.\, bw(x,y) \rightarrow black(x) \wedge white(y)$

(3) $\forall x.\, black(x) \rightarrow \exists y.\, white(y) \wedge bw(x,y)$

(4) $\forall x.\, white(x) \rightarrow \exists y.\, black(y) \wedge bw(y,x)$

Together they are saying that everything is either *black* or *white* (see (1)) and that there is a relation, *bw*, which holds between *black* things and *white* things (see (2)) such that every *black* thing is in this relation with some (at least one) *white* thing (see (3)) and every *white* thing is related to some (at least one) *black* thing (see (4)). There are models of this theory of any cardinality apart from 1 (including transfinite cardinalities): the empty model satisfies (1)–(4) and so does, e.g., any model which contains exactly one *white* thing and arbitrarily many (but at least one) *black* things appropriately related to it. Now imagine that, as in HPSG, models were required to be exhaustive, i.e., each model would have to contain all possible configurations of white and black objects. It is not clear what such models would contribute to our understanding of the described black and white configurations above the simpler non-exhaustive models, but it is clear that they would be dubious from the point of view of the standard (ZFC) set theory: such models would be too large to be sets.[1]

Also in the case of HPSG, exhaustive models lead to some serious problems, discussed in Richter 2007. One, dubbed *twin structures*, is that some parts of the model might simultaneously belong to two different utterances, which does not correspond to any empirical facts. Another, called *stranded structures*, is that models may contain structures smaller than utterances (e.g., certain structures rooted in *local* objects), including structures (called *stranded monster structures* in Richter 2007) which may never be parts of any utterances and which are intuitively clearly ill-formed. Richter 2007 retains the idea of exhaustive models and deals with these problems by imposing restrictions on HPSG signatures, to the effect that all sorts (including such formerly atomic sorts as *nom* or *sg*) are specified for the attribute EMBEDDED, whose value is an unembedded sign (*u_sign*):

(5) *top* EMBEDDED *u_sign*
    *sign* ...
        *e_sign* ...
        *u_sign* ...
    ...

Moreover, there is just one *u_sign* object – an unembedded sign – in each configuration of objects (see (6)) and all objects in a configuration are components of this unembedded sign (see (7)).

(6) UNIQUE U-SIGN CONDITION:
$\forall\boxed{1}\forall\boxed{2}((\boxed{1} \sim u\_sign \wedge \boxed{2} \sim u\_sign) \rightarrow \boxed{1} \approx \boxed{2})$

(7) U-SIGN COMPONENT CONDITION:
$\forall\boxed{1}\,(\boxed{1} \sim top \rightarrow \exists\boxed{2}\,(\boxed{2} \sim u\_sign \wedge \texttt{component}(\boxed{1},\boxed{2})))$

The combined effect of (5)–(7) is that each configuration of objects in an exhaustive model contains exactly one unembedded sign that all these objects are components of (i.e., are reachable from); this unembedded sign acts as the root of an utterance.

This solves the two problems identified in Richter 2007. There are no *twin structures*, as each object is a component of just a single *u_sign*. There are also no *stranded structures*, on the assumption that *u_sign* is appropriately constrained to the effect that its SLASH value is empty, its VALENCE lists are empty, etc. However, this solution comes at a considerable cost: not only are all structures massively cyclic (each object has the attribute EMBEDDED whose value is the utterance to which this object belongs), but there is also the conceptual problem of, say, the value of CASE containing the whole utterance

[1] In brief, they would contain configurations of arbitrarily large cardinality, so they themselves would not have any cardinality (as there is no maximal cardinality).

(given that, e.g., the sort *nom* is specified for the attribute EMBEDDED). In any case, this solution leads to very different structures than what HPSG linguists are used to.

Richter 2007: 102 claims that the problem of *stranded monster structures* arises because "[t]he grammars in the HPSG literature are not precise enough for their models to match the intentions of linguists". (This justifies the solution alluded to above, consisting in the modifications of the grammar rather than the model theory.) However, it would be unrealistic to expect of linguists to be aware of – and deal with – such technical model-theoretic problems. So a better diagnosis of the problems mentioned above is that they arise because the HPSG model theory does not sufficiently meet the needs of linguists, who only care about utterances and their components, and do not intend their grammars to say anything about, for example, arbitrary objects of sort *local* outside of utterances.

The crucial observation is that all the problems identified in Richter 2007 disappear when a leaner approach to modelling is adopted, upon which each model corresponds to a single utterance, as commonly assumed elsewhere. Specifically, I propose that HPSG models be *rooted* (*point generated*) in the sense of modal logic:[2] one object of the universe is singled out and it serves as the root of the model. This object may be referred to directly in HPSG descriptions via a special symbol, $r$.

In order to make sure that the distinguished object is really the root of the whole model, the following constraint must be present in each HPSG grammar, where `component` is defined in the standard way (e.g., Sailer 2003: 115–116):

(8) $\forall \boxed{1}\ \texttt{component}(\boxed{1}, r)$

This states that each object in the model is reachable from the distinguished object via some sequence of attributes.

One immediate advantage of this approach is that it makes it easy to state constraints on utterances. For example, the requirement that utterances have empty SLASH may be stated directly as in (9) (assuming that empty sets are modelled via objects of sort *eset*; Richter 2004: 281), without the need for technical boolean attributes such as ROOT (e.g., in Ginzburg & Sag 2000).

(9) $r$ NONLOCAL SLASH $\sim$ *eset*

Full technical details are given in Appendix A. Here let me only point out that this simple view of HPSG models as rooted models solves the problems addressed in Richter 2007. There are no *twin structures*, as each model corresponds to a single utterance, and there are no *stranded structures* (*monster* or not), as each structure is a part of an utterance. Unlike the proposal in Richter 2007, this solution does not require extensions of signatures and does not result in rather different models than what HPSG linguists are used to, ones that have the cyclicity-inducing EMBEDDED attribute defined

[2]See, e.g., Blackburn et al. 2010: 56, 107; cf. *singly generated* models in Pollard 1999.

on every sort.

On a more conceptual note, rooted non-exhaustive models proposed here are also compatible with all views on the nature of the objects residing in such models: they may be understood as abstract feature structures (Pollard & Sag 1994) or other mathematical idealisations of types of utterances (Pollard 1999), but they may also be understood as utterance tokens, as in King 1999. On the latter view, there is a tension between the idea that model objects are specific linguistic tokens and the idea that models are exhaustive, i.e., contain all configurations that the grammar predicts. Clearly, any realistic grammar predicts the grammaticality of certain utterance types that have never been – and never will be – actually uttered, i.e., utterance types for which there are no actual tokens. This forces King (1999) to assume "non-actual tokens", a concept that may be considered "contradictory and nonsensical" (Richter 2004: 119, citing Carl Pollard, p.c.). Giving up exhaustivity makes it possible to adopt King's (1999) view on the nature of model objects as utterance tokens.

Let me finally point out the affinity of the proposed solution with Pollard's (1999: §6) *singly generated models*. In both cases, one object in a model is distinguished as root, but Pollard (1999) does not require that this object be the root of an utterance (nor is it possible to refer to this object directly in the grammar). This makes the approach of Pollard 1999 – but not the approach proposed here – susceptible to some of the problems discussed in Richter 2007.

## 3 Höhle's Problem

Höhle's Problem is similar to the problems discussed in the previous section in the sense that it is concerned with the fact that there are configurations in models which are not expected by linguists, but it differs in that these configurations are not exactly wrong: rather, they are spurious and there are many, many more of them than desired. Let us illustrate the problem with the following sentence:

(10) She says she loves you.

From the linguistic point of view, there just two different analyses of this sentence: one in which INDEX values of the two pronouns *she* are token-identical, and one in which they are not.[3] That is, in the model of English, there are two configurations corresponding to (10), fragmentarily represented in Figure 1, which differ only in whether $\boxed{1} = \boxed{2}$ or $\boxed{1} \neq \boxed{2}$.

Let us concentrate on one of these, say, on the one in which the two pronouns *she* are not coindexed. The problem – Höhle's Problem – is that

[3]Typial HPSG representations of this sentence will also differ in values of GEND(er) and NUM(ber) within the INDEX value of the pronoun *you*, but – as discussed in Przepiórkowski 2021: § 3.3.2 – it is not clear whether having such ambiguities is desirable.

$$
\begin{bmatrix}
\textit{hd-subj-ph} & \\
\text{PHON } \langle \text{she, says, she, loves, you} \rangle & \\
\text{NHD-DTR} & \begin{bmatrix} \textit{word} & \\ \text{PHON } \langle \text{she} \rangle & \\ \text{SS}|\text{LOCAL} & \begin{bmatrix} \textit{local} & \\ \text{CAT} & \begin{bmatrix} \textit{category} & \\ \text{HEAD} & \begin{bmatrix} \textit{noun} \\ \text{CASE } \textit{nom} \end{bmatrix} \\ \text{VAL} & \begin{bmatrix} \textit{valence} \\ \text{SUBJ } \langle\, \rangle \\ \text{COMPS } \langle\, \rangle \end{bmatrix} \end{bmatrix} \\ \text{CONT} & \begin{bmatrix} \textit{ppro} & \\ \text{INDEX } \boxed{1} & \begin{bmatrix} \textit{ref} \\ \text{PERS } \textit{3} \\ \text{NUM } \textit{sg} \\ \text{GEND } \textit{f} \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix} \\
\text{HD-DTR}|\ldots|\text{NHD-DTR} & \begin{bmatrix} \textit{word} & \\ \text{PHON } \langle \text{she} \rangle & \\ \text{SS}|\text{LOCAL} & \begin{bmatrix} \textit{local} & \\ \text{CAT} & \begin{bmatrix} \textit{category} & \\ \text{HEAD} & \begin{bmatrix} \textit{noun} \\ \text{CASE } \textit{nom} \end{bmatrix} \\ \text{VAL} & \begin{bmatrix} \textit{valence} \\ \text{SUBJ } \langle\, \rangle \\ \text{COMPS } \langle\, \rangle \end{bmatrix} \end{bmatrix} \\ \text{CONT} & \begin{bmatrix} \textit{ppro} & \\ \text{INDEX } \boxed{2} & \begin{bmatrix} \textit{ref} \\ \text{PERS } \textit{3} \\ \text{NUM } \textit{sg} \\ \text{GEND } \textit{f} \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix}
\end{bmatrix}
$$

Figure 1: Fragments of an AVM representation of (10)

there are still many different configurations in the model corresponding to Figure 1 with $\boxed{1} \neq \boxed{2}$, which differ in ways that linguists do not suspect and certainly do not care about. For example, even if the two INDEX values are different objects, the values of any of the attributes within INDEX may be token-identical or not. One possibility is schematically shown in Figure 2, where the two INDEX values corresponding to the two pronouns *she* are different model objects of sort *ref* (objects 1 and 5), and GEND values are also different objects of sort *f* (objects 4 and 6), but the values of the two attributes PERS are the same object 2 of sort *3*, and the values of the two attributes NUM are the same object 3 of sort *sg*. It is easy to see that there are $2^3 = 8$ different configurations corresponding to two non-token-identical INDEX values of the two pronouns *she* in (10). But of course this is just the tip of the iceberg. In model configurations corresponding to the schematic representation in Figure 1, the two CAT values may be identical or not; if they are not, HEAD values might be the same object or not; and if they are not, CASE values may be token-identical or not. Similarly for VAL

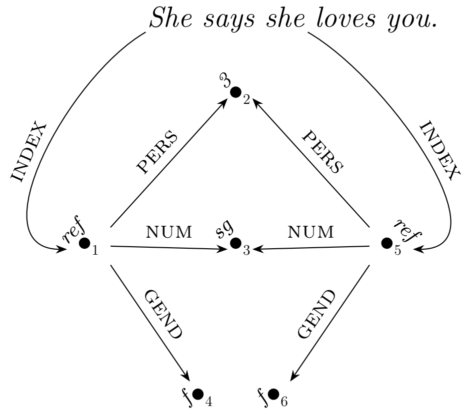



Figure 2: One of the eight different configurations of non-token-identical INDEX values of the two pronouns *she* in (10)

values, HEAD values of the two verbs, etc. Even if we ignore the multiple occurrences of empty lists in the structure, there are thousands of different model configurations corresponding to the sentence in (10) with the two feminine pronouns non-coindexed (and only eight times fewer when they are coindexed). As observed in Przepiórkowski 2021, adding to the equation the problem of which empty list values of various attributes (e.g., the two attributes SUBJ and the two attributes COMPS in Figure 1, among many others) are the same *elist* object and which are different *elist* objects, results in literally billions of different configurations where the linguist would expect just one.[4]

There are partial solutions of Höhle's Problem in the literature. Richter (2007: 102) proposes the Unique Empty List Condition in (11), which makes sure that all empty lists within an utterance are the same *elist* object.

(11) $\forall\boxed{1}\forall\boxed{2}\,((\boxed{1} \sim \mathit{elist} \land \boxed{2} \sim \mathit{elist}) \rightarrow \boxed{1} \approx \boxed{2})$

A comprehensive principle, which says roughly that structures that look the same are token-identical, is Sailer's (2003: 116) General Identity Principle (GIP) in (12), with the definition of the relation `are-copies` given in (13).

(12) $\forall\boxed{1}\forall\boxed{2}\,(\texttt{are-copies}(\boxed{1},\boxed{2}) \rightarrow \boxed{1} \approx \boxed{2})$

(13) $\forall\boxed{1}\forall\boxed{2}\ \texttt{are-copies}(\boxed{1},\boxed{2}) \leftrightarrow$

$$\left(\bigvee_{\sigma\in\mathcal{S}} (\boxed{1}\!\sim\!\sigma \land \boxed{2}\!\sim\!\sigma) \land \bigwedge_{\alpha\in\mathcal{A}} (\boxed{1}\alpha \approx \boxed{1}\alpha \rightarrow \texttt{are-copies}(\boxed{1}\alpha,\boxed{2}\alpha))\right)$$

[4]"Each word introduces three lists (values of PHON, VAL|SUBJ, and VAL|COMPS), and there are five words in this sentence, so there are 15 *elist* objects stemming from words alone. The number of different ways to partition a set of $n$ elements into equivalence classes is given by Bell numbers $B_n$, and $B_{15}$ = 1,382,958,545 (see https://oeis.org/A000110/list). This should be multiplied by the eight configurations of the two [INDEX values], etc." (Przepiórkowski 2021: fn. 44).

In (13), $\mathcal{S}$ stands for the set of species (i.e., maximally specific sorts) and $\mathcal{A}$ – for the set of attributes. What (13) is saying is that two objects $\boxed{1}$ and $\boxed{2}$ are copies if and only if they are of the same species $\sigma$ and, recursively, for any attribute $\alpha$ defined for that species, the values of $\alpha$ for $\boxed{1}$ and for $\boxed{2}$ are copies.

As stated here, GIP is too strong: it requires that INDEX values of the two pronouns *she* in (10) must be token-identical, i.e., it invalidates the analysis of (10) on which the two feminine pronouns are not coindexed. More generally, this GIP is incompatible with the standard HPSG binding theory, which requires that some same-looking INDEX values are not token-identical. For this reason, GIP is formulated in Sailer 2003 in such a way that it only applies to certain semantic representations, in a way that is compatible with the standard binding theory and preserves the ambiguity of (10). But this means that the problem of spurious ambiguities remains. What is required to solve Höhle's Problem is a way to constrain the scope of GIP more selectively, for example, a way to say that it must apply to all same-looking structures with the exception of INDEX values of sort *ref*.[5]

The rest of this section describes a relatively simple solution, one that is much more comprehensive than the Unique Empty List Condition in (11) or the General Identity Principle in (12) constrained to certain semantic representations, but still leaves the theoretical possibility of spurious ambiguities occurring in some very special cases. A fully general but more complex solution is presented in Appendix B.

The key observation in the simpler solution is that the definition of `are-copies` in (13) does not determine whether same-looking *cyclic* structures stand in this relation or not. I will demonstrate the correctness of this observation below. But if such same-looking structures are not in the `are-copies` relation, then GIP in (12) does not force them to be token-identical. This means that one way to make GIP fully general but still allow, say, for INDEX values of sort *ref* to escape GIP, is to make such INDEX values cyclic. This can be achieved by adding one more attribute to *ref*, let us call it INT for *intensional*,[6] as in the signature fragment in (14), and by making sure – via the constraint in (15) – that the value of INT is the object on which this attribute occurs, in effect creating a small cycle.

(14) *ref* GEND *gender*
NUM *number*
PERS *person*
INT *ref*

(15) Universal INTENSIONALITY PRINCIPLE:
$\forall \boxed{1} \forall \boxed{2} \, ( \boxed{1}\text{INT} \approx \boxed{2} \rightarrow \boxed{1} \approx \boxed{2} )$

[5]Other, less broadly accepted analyses which rely on some same-looking structures not being token identical, are Höhle's (1999: §2.4) architecture for phonology and Meurers's (1998: 326, fn. 42) approach to structural case assignment.

[6]Thanks to Frank Richter (p.c.) for suggesting this name.

With this modification in hand, let us see whether two INDEX values in (16) for the two occurrences of *she* – which intuitively look the same – are in the `are-copies` relation according to its definition (13).

$$(16)\quad \boxed{1}\begin{bmatrix} \textit{ref} \\ \text{PERS } \textit{3} \\ \text{NUM } \textit{sg} \\ \text{GEND } \textit{f} \\ \text{INT } \boxed{1} \end{bmatrix} \quad \stackrel{?}{\approx} \quad \boxed{2}\begin{bmatrix} \textit{ref} \\ \text{PERS } \textit{3} \\ \text{NUM } \textit{sg} \\ \text{GEND } \textit{f} \\ \text{INT } \boxed{2} \end{bmatrix}$$

According to this definition, $\boxed{1}$ and $\boxed{2}$ in (16) are in the `are-copies` relation iff 1) they are of same species (*yes* – both are of species *ref*), 2) the values of PERS are copies (*yes* – they are of the same species *3* and have no attributes), 3) the values of NUM are copies (*yes*), 4) the values of GEND are copies (*yes*), and 5) the values of INT are copies. That is, $\boxed{1}$ and $\boxed{2}$ *qua* values of INDEX are copies if and only if $\boxed{1}$ and $\boxed{2}$ *qua* values of INT are copies. In other words, the definition of `are-copies` does not determine whether $\boxed{1}$ and $\boxed{2}$ are copies. Since they do not have to be in the `are-copies` relation, they are not forced by GIP to be the same objects. That is, they are genuinely exempt from GIP, even though they look the same.

In summary, the proposed simpler solution to Höhle's Problem consists in 1) adopting Sailer's (2003: 116) General Identity Principle but without restricting its scope to semantic representations or any other specific configurations and in 2) making structures that should be exempt from GIP cyclic.

This is a much more general solution than the partial solutions mentioned above. It subsumes Richter's (2007: 102) Unique Empty List Condition in (11), as it makes not only empty lists but all attribute-less species unique, so that in any utterance there is only one *elist* object, at most one *nom* object, at most one *sg*, etc. It also subsumes GIP as understood in Sailer 2003, since it is applied there to configurations which are not cyclic. However, this solution is not completely general, as it makes *all* cyclic structures exempt from GIP. So, for example, in a grammar of English in which a determiner and a noun mutually select each other, there will typically be a cycle in each nominal phrase containing a determiner. In such a case, when the structures of two NPs look the same (e.g., *the guy* in the sentence *The guy's mother loves the guy's father*), some spurious ambiguities will occur despite GIP. A more elaborate solution that is fully general and does not rely on cyclicity is presented Appendix B.

## 4 Coordination of Unlikes: Second-Order HPSG

In order to handle examples such as (17) (from Bayer 1996: 585, fn. 7, (ii.c–d)), Yatabe (2004: 343) assumes a lexical entry for *emphasized* schematically represented in (18), with the category of the object specified disjunctively as an NP (nominal phrase; see *noun*) or a CP (complementiser phrase; *comp*).

(17) a. We emphasized [[Mr. Colson's many qualifications]$_{\text{NP}}$ and [that he had worked at the White House]$_{\text{CP}}$].

b. We emphasized [[that Mr. Colson had worked at the White House]$_{\text{CP}}$ and [his many other qualifications]$_{\text{NP}}$].

(18)
$$\begin{bmatrix} \text{PHON} \ \langle \text{emphasized} \rangle \\ \ldots\text{VALENCE} \begin{bmatrix} \text{SUBJ} \ \left\langle \begin{bmatrix} \ldots\text{HEAD} \ c(\begin{bmatrix} \textit{noun} \\ \text{CASE} \ \textit{nom} \end{bmatrix}) \end{bmatrix} \right\rangle \\ \text{COMPS} \ \langle [\ \ldots\text{HEAD} \ c(\textit{noun} \vee \textit{comp})\ ] \rangle \end{bmatrix} \end{bmatrix}$$

The key idea is the use of the distributive functor, $c$, defined in (19) (Yatabe 2004: 343, (12)):

(19) $\boxed{1} : c(\alpha) \;\equiv\; \boxed{1} : \alpha \;\vee\; (\boxed{1} : [\ \text{ARGS} \ \langle \boxed{a_1}, \ldots, \boxed{a_n} \rangle\ ] \wedge \boxed{a_1} : \alpha \wedge \ldots \wedge \boxed{a_n} : \alpha)$

Here $\alpha$ is a description, such as $\begin{bmatrix} \textit{noun} \\ \text{CASE} \ \textit{nom} \end{bmatrix}$ or $\textit{noun} \vee \textit{comp}$ in (18), and an object $\boxed{1}$ satisfies $c(\alpha)$ – written as $\boxed{1} : c(\alpha)$ – iff it either satisfies the description $\alpha$ directly (see the first disjunct in (19)), or if it is the HEAD value of a coordinate structure with conjuncts having HEAD values $\boxed{a_1}$, …, $\boxed{a_n}$ (see the second disjunct); in the latter case, each of $\boxed{a_1}$, …, $\boxed{a_n}$ must satisfy $\alpha$ independently.

The intention of (19) is clear, but it is far from clear how to formally encode it. That is, for each particular description $\alpha$ it is easy to define a unary relation corresponding to $c(\alpha)$ in (19). What is far from clear is how to define $c$ in its generality (i.e., in a way simulating (19)), as a binary relation between objects and arbitrary descriptions $\alpha$. The problem is that, in RSRL (Relational Speciate Re-entrant Language; Richter 2004), the language for formalising HPSG grammars, arguments of relations are objects, not descriptions.

I argue that this kind of analysis of unlike category coordination (UCC) is on the right track – to the extent that justifies making RSRL a second-order language, in which not only objects but also their properties may be quantified over.[7] While linearisation-based approaches to UCC were popular in HPSG in 2000s (e.g., Crysmann 2003, Beavers & Sag 2004, Chaves 2006, 2008), it is clear now that at least some cases of UCC must be analysed as direct coordination of smaller constituents, rather than as coordination of larger verbal constituents and subsequent ellipsis (see, e.g., Levine 2011: § 2.3, Dalrymple 2017, Abeillé & Chaves 2021: § 6, and Patejuk & Przepiórkowski 2021). Conceding this point, Chaves 2013 proposes to save the law of the coordination of likes (as it is sometimes called after Williams 1981) by reanalysing categories as constellations of some morphosyntactic features and moving troublesome distributive restrictions, such as those encoded in (18), to semantics. Unfortunately, this approach is untenable, given that CASE is one of the remaining categorial features in Chaves 2013 and that instances

[7] Second-order systems usually have higher computational complexity than their first-order equivalents, but given that already first-order RSRL is undecidable (Kepser 2004), second-order RSRL is in the same class as standard RSRL.

of unlike case coordination are well known (and have also been discussed within HPSG; see Przepiórkowski 1999: § 5.3.1 and Levy 2001: § 4). Hence, Yatabe's (2004) is the most convincing approach to UCC currently on the HPSG market and, given that the distributive functor $c$ is also explicitly invoked in recent work (Yatabe & Tam 2021: 74), there is an increasing need to make it formalisable.

This calls for extending the syntax and semantics of RSRL to handle second-order quantification. The modifications of the standard RSRL definitions are relatively straightforward:[8]

- signatures do not only specify arities of relation symbols, but also types of their arguments (each either $e$ or $et$);
- interpretations of relation symbols are trivially modified so that they satisfy such signatures (i.e., they are sets of tuples whose each element is an object or a set of objects, depending on the type specified in the signature);
- the set of variables, $\mathcal{VAR}$, is the disjoint sum of $\mathcal{VAR}_e$ (first-order variables) and $\mathcal{VAR}_{et}$ (second-order variables);
- variable assignments assign objects to elements of $\mathcal{VAR}_e$ and they assign sets of objects to elements of $\mathcal{VAR}_{et}$; the interpretation of quantifiers is extended to second-order variables correspondingly;
- apart from the usual first-order terms $\mathcal{T}_e^\Sigma$ (for the signature $\Sigma$), there are also second-order terms, $\mathcal{T}_{et}^\Sigma$, specified recursively simultaneously with the set of formulae, $\mathcal{D}^\Sigma$, as the disjoint sum of second-order variables ($\mathcal{VAR}_{et}$) and all formulae ($\mathcal{D}^\Sigma$);
- two clauses of the definition of formulae (Richter 2004: 165) are further modified so that:
  - the variables which are arguments of relation symbols are of the right type $e$ or $et$,
  - $\tau_1 \approx \tau_2$ is a formula if both terms are of the same type (i.e., both are $e$ or both are $et$);
- importantly, a new kind of formula is added: $\tau_1(\tau_2)$, where $\tau_1 \in \mathcal{T}_{et}^\Sigma$ and $\tau_2 \in \mathcal{T}_e^\Sigma$; this formula says that the description $\tau_1$ holds of the object $\tau_2$;
- more precisely, the interpretation of $\tau_1(\tau_2)$ is the set of all these objects of the universe $\mathsf{U}$ on which the interpretation of $\tau_2$ belongs to the interpretation of $\tau_1$; more formally: $D_{\mathsf{I}}^{ass}(\tau_1(\tau_2)) = \{u \in \mathsf{U} : T_{\mathsf{I}}^{ass}(\tau_2)(u) \in D_{\mathsf{I}}^{ass}(\tau_1)\}$.

Note that, apart from the extended interpretations of relation symbols, models are not affected by these changes: they are still collections of objects

[8]See Richter 2004: § 3.1.1 for the standard definitions and meanings of particular symbols. I simplify throughout by ignoring chains.

of particular species related via particular attributes.

Given these extensions, the lexical entry in (18) may be represented as in (20), with the definition of $c$ in (19) formalised via the relation $\mathtt{c}$ defined in (21).

(20) $$\begin{bmatrix} \text{PHON } \langle \text{emphasized} \rangle \\ \text{. . . VALENCE} \begin{bmatrix} \text{SUBJ } \langle [ \text{ . . . HEAD } \boxed{1} ] \rangle \\ \text{COMPS } \langle [ \text{ . . . HEAD } \boxed{2} ] \rangle \end{bmatrix} \end{bmatrix} \begin{array}{l} \wedge\ \alpha_1 \approx (: \sim noun \wedge : \text{CASE} \sim nom) \\ \wedge\ \alpha_2 \approx (: \sim noun \vee : \sim comp) \\ \wedge\ \mathtt{c}(\boxed{1}, \alpha_1) \wedge \mathtt{c}(\boxed{2}, \alpha_2) \end{array}$$

(21) $$\forall \boxed{1}_e \forall \alpha_{et} \ ( \mathtt{c}(\boxed{1}, \alpha) \ \leftrightarrow \ \alpha(\boxed{1}) \ \vee \\ \exists \boxed{a_1} \ldots \exists \boxed{a_n} \ ( \boxed{1} [ \text{ ARGS } \langle \boxed{a_1}, \ldots, \boxed{a_n} \rangle \ ] \wedge \\ \mathtt{c}(\boxed{a_1}, \alpha) \wedge \ldots \wedge \mathtt{c}(\boxed{a_n}, \alpha) \ ) \ )$$

The definition of relation $\mathtt{c}$ in (21) differs from Yatabe's (2004) definition of $c$ in (19) in being fully recursive, i.e., in taking into account nested (embedded) coordination, as in *Scooby-Doo or Tom and Jerry*.

As already pointed out above, this second-order extension of RSRL seems to be necessary to formalise Yatabe's (2004) analysis in its generality. What may be considered an advantage of this formalisation is that it also encodes the standard LFG approach to coordination, on which certain properties are distributive so that, when they are applied to a coordinate structure, they independently distribute to all conjuncts (see, e.g., Dalrymple & Kaplan 2000, Przepiórkowski & Patejuk 2012, and especially Przepiórkowski & Patejuk 2021). That it, the second-order extension proposed here makes it possible to formally define the notion of distributivity in coordination which is assumed in Lexical Functional Grammar as a primitive mechanism of that theory.

It must be noted, however, that an extensionally equivalent analysis – i.e., an analysis that results in exactly the same configurations in models – is possible that does not require such a second-order extension: instead of defining the second-order relation $\mathtt{c}$ whose second argument is an arbitrary description, it is possible to define a different first-order relation for each such description. For example, the lexical entry in (20) may be replaced with the lexical entry in (22), with relations `noun_and_nom` and `noun_or_comp` defined as in (23)–(24):

(22) $$\begin{bmatrix} \text{PHON } \langle \text{emphasized} \rangle \\ \text{. . . VALENCE} \begin{bmatrix} \text{SUBJ } \langle [ \text{ . . . HEAD } \boxed{1} ] \rangle \\ \text{COMPS } \langle [ \text{ . . . HEAD } \boxed{2} ] \rangle \end{bmatrix} \end{bmatrix} \begin{array}{l} \wedge\ \mathtt{noun\_and\_nom}(\boxed{1}) \\ \wedge\ \mathtt{noun\_or\_comp}(\boxed{2}) \end{array}$$

(23) $$\forall \boxed{1} \ ( \mathtt{noun\_and\_nom}(\boxed{1}) \ \leftrightarrow \ ( \ ( \boxed{1} \sim noun \wedge \boxed{1}\text{CASE} \sim nom ) \ \vee \\ \exists \boxed{a_1} \ldots \exists \boxed{a_n} \ ( \boxed{1} [ \text{ ARGS } \langle \boxed{a_1}, \ldots, \boxed{a_n} \rangle \ ] \wedge \\ \mathtt{noun\_and\_nom}(\boxed{a_1}) \wedge \ldots \wedge \mathtt{noun\_and\_nom}(\boxed{a_n}) \ ) \ ) \ )$$

(24) $$\forall \boxed{1} \ ( \mathtt{noun\_or\_comp}(\boxed{1}) \ \leftrightarrow \ ( \ ( \boxed{1} \sim noun \vee \boxed{1} \sim comp ) \ \vee \\ \exists \boxed{a_1} \ldots \exists \boxed{a_n} \ ( \boxed{1} [ \text{ ARGS } \langle \boxed{a_1}, \ldots, \boxed{a_n} \rangle \ ] \wedge \\ \mathtt{noun\_or\_comp}(\boxed{a_1}) \wedge \ldots \wedge \mathtt{noun\_or\_comp}(\boxed{a_n}) \ ) \ ) \ )$$

As different predicates impose different selectional restrictions and allow for different combinations of categories, many relations analogous to (23)–(24) would have to be defined in the grammar, all encoding essentially the same mechanism of distribution of selectional restrictions to all conjuncts in a coordinate structure. For this reason, an analysis in terms of a single general relation encoding such distributivity should be preferred, even if it calls for a second-order extension of RSRL.

## 5 Conclusion

While the extent to which the model theory of HPSG is developed is unparalleled, and – with the notable exception of Søgaard & Lange 2009 – there is practically no work on the formal foundations of HPSG after Richter 2007, it would be a mistake to assume that all problems are solved and all reasonable analyses may be formalised. The improvements proposed in this paper range from fundamental and conceptual (making models rooted and non-exhaustive, extending the underlying language to second-order) to purely technical (solving the long-standing Höhle's Problem). I hope that this paper will help rekindle some interest in the formal foundations of HPSG.

# Appendices

## A Non-Exhaustive Rooted Models – Technicalities

Here are the technical modifications to RSRL, as defined in Richter 2004: § 3.1.1, which are needed to implement the idea of rooted non-exhaustive models presented in Section 2. All definitions are simplified by ignoring complications related to chains.

I assume the standard notion of *signature* (Richter 2004: 156):

**Definition 1 (signature)** $\Sigma$ *is a signature iff*
$\Sigma$ *is a septuple* $\langle S, \sqsubseteq, S_{max}, A, F, R, Ar\rangle$,
$\langle S, \sqsubseteq\rangle$ *is a partial order,*
$S_{max} = \{\sigma \in S \mid$ *for each* $\sigma' \in S$, *if* $\sigma' \sqsubseteq \sigma$ *then* $\sigma = \sigma'\}$,
$A$ *is a set,*
$F$ *is a partial function from* $S \times A$ *to* $S$,
*for each* $\sigma_1 \in S$, *for each* $\sigma_2 \in S$, *for each* $\phi \in A$,
  *if* $F(\sigma_1, \phi)$ *is defined and* $\sigma_2 \sqsubseteq \sigma_1$
  *then* $F(\sigma_2, \phi)$ *is defined and* $F(\sigma_2, \phi) \sqsubseteq F(\sigma_1, \phi)$,
$R$ *is a finite set, and*
$Ar$ *is a total function from* $R$ *to the positive integers.*

On the other hand, I extend the notion of *terms* (Richter 2004: 162) by adding a special symbol, $r$, used to refer to the distinguished object in the universe of a interpretation (which will be defined below, in Definition 5):[9]

[9]In this and the following definitions, my extensions are underlined.

**Definition 2 (terms)** *For each signature* $\Sigma = \langle S, \sqsubseteq, S_{max}, A, F, R, Ar\rangle$, *the set of terms* $T^{\Sigma}$ *is the smallest set such that*
$\underline{r \in T^{\Sigma}}$,
$: \in T^{\Sigma}$,
*for each* $x \in V$, $x \in T^{\Sigma}$,
*for each* $\phi \in A$ *and each* $\tau \in T^{\Sigma}$, $\tau\phi \in T^{\Sigma}$.

The definition of *formulæ* is standard (Richter 2004: 165):

**Definition 3 (formulæ)** *For each signature* $\Sigma = \langle S, \sqsubseteq, S_{max}, A, F, R, Ar\rangle$, *the set of formulæ* $D^{\Sigma}$ *is the smallest set such that*
*for each* $\sigma \in S$, *for each* $\tau \in T^{\Sigma}$, $\tau \sim \sigma \in D^{\Sigma}$,
*for each* $\tau_1, \tau_2 \in T^{\Sigma}$, $\tau_1 \approx \tau_2 \in D^{\Sigma}$,
*for each* $\rho \in R$, *for each* $x_1, \ldots, x_{Ar(\rho)} \in V$, $\rho(x_1, \ldots, x_{Ar(\rho)}) \in D^{\Sigma}$,
*for each* $x \in V$, *for each* $\delta \in D^{\Sigma}$, $\exists x\delta \in D^{\Sigma}$, *(analogous for* $\forall$*)*
*for each* $\delta \in D^{\Sigma}$, $\neg\delta \in D^{\Sigma}$,
*for each* $\delta_1, \delta_2 \in D^{\Sigma}$, *and* $(\delta_1 \wedge \delta_2) \in D^{\Sigma}$. *(analogous for* $\vee, \rightarrow, \leftrightarrow$*)*

Additionally, the standard definition of *free variables* (Richter 2004: 166–167), $FV$, is trivially extended so that the term $r$ is variable-free: $FV(r) = \{\}$.

Also the definition of *descriptions* is standard (Richter 2004: 173):

**Definition 4 (descriptions)** *For each signature* $\Sigma$, *the set of descriptions* $D_0^{\Sigma} = \left\{\delta \in D^{\Sigma} | FV(\delta) = \{\}\right\}$.

The definition of *interpretation* is extended from a quadruple $\langle \mathsf{U}, \mathsf{S}, \mathsf{A}, \mathsf{R}\rangle$ (Richter 2004: 157–158) to a quintuple $\langle \mathsf{U}, \mathsf{r}, \mathsf{S}, \mathsf{A}, \mathsf{R}\rangle$, where $\mathsf{U}$, $\mathsf{S}$, $\mathsf{A}$, and $\mathsf{R}$ are defined in the standard way (i.e., as the universe, assignment of species to objects, interpretation of attributes, and interpretation of relation symbols, respectively), and $\mathsf{r} \in \mathsf{U}$ is the distinguished object:

**Definition 5 (interpretation)** *For each signature*
$\Sigma = \langle S, \sqsubseteq, S_{max}, A, F, R, Ar\rangle$, $\mathsf{I} = \langle \mathsf{U}, \underline{\mathsf{r}}, \mathsf{S}, \mathsf{A}, \mathsf{R}\rangle$ *is an* $\Sigma$ *interpretation iff*
$\mathsf{U}$ *is a set,*
$\underline{\mathsf{r} \in \mathsf{U}}$,
$\mathsf{S}$ *is a total function from* $\mathsf{U}$ *to* $S_{max}$,
$\mathsf{A}$ *is a total function from* $A$ *to the set of partial functions from* $\mathsf{U}$ *to* $\mathsf{U}$,
*for each* $\phi \in A$ *and each* $u \in \mathsf{U}$
*if* $\mathsf{A}(\phi)(u)$ *is defined*
*then* $F(\mathsf{S}(u), \phi)$ *is defined, and* $\mathsf{S}(\mathsf{A}(\phi)(u)) \sqsubseteq F(\mathsf{S}(u), \phi)$, *and*
*for each* $\phi \in A$ *and each* $u \in \mathsf{U}$,
*if* $F(\mathsf{S}(u), \phi)$ *is defined then* $\mathsf{A}(\phi)(u)$ *is defined,*
$\mathsf{R}$ *is a total function from* $R$ *to the power set of* $\bigcup\limits_{n \in \mathbb{N}} \mathsf{U}^n$, *and*
*for each* $\rho \in R$, $\mathsf{R}(\rho) \subseteq \mathsf{U}^{Ar(\rho)}$.

The definition of *variable assignments* (Richter 2004: 161–162) is standard, while the definition of *term interpretation* (Richter 2004: 162–163) is extended so that the interpretation of the term $r$ is the distinguished object $\mathsf{r}$:

**Definition 6 (term interpretation)** *For each signature* $\Sigma = \langle S, \sqsubseteq, S_{max}, A, F, R, Ar \rangle$, *for each* $\Sigma$ *interpretation* $\mathsf{I} = \langle \mathsf{U}, \mathsf{r}, \mathsf{S}, \mathsf{A}, \mathsf{R} \rangle$, *for each* $g \in \mathsf{G}_\mathsf{I}$, *the term interpretation* $\mathsf{T}^g_\mathsf{I}$ *is the total function from* $T^\Sigma$ *to the set of partial functions from* $\mathsf{U}$ *to* $\mathsf{U}$ *such that for each* $u \in \mathsf{U}$,

$\underline{\mathsf{T}^g_\mathsf{I}(r)(u) \text{ is defined and } \mathsf{T}^g_\mathsf{I}(r)(u) = \mathsf{r},}$

$\mathsf{T}^g_\mathsf{I}(:)(u)$ *is defined and* $\mathsf{T}^g_\mathsf{I}(:)(u) = u$,

*for each* $x \in V$, $\mathsf{T}^g_\mathsf{I}(x)(u)$ *is defined and* $\mathsf{T}^g_\mathsf{I}(x)(u) = g(x)$,

*for each* $\tau \in T^\Sigma$, *for each* $\phi \in A$,

$\mathsf{T}^g_\mathsf{I}(\tau\phi)(u)$ *is defined iff* $\mathsf{T}^g_\mathsf{I}(\tau)(u)$ *is defined and* $\mathsf{A}(\phi)(\mathsf{T}^g_\mathsf{I}(\tau)(u))$ *is defined, and*

*if* $\mathsf{T}^g_\mathsf{I}(\tau\phi)(u)$ *is defined then* $\mathsf{T}^g_\mathsf{I}(\tau\phi)(u) = \mathsf{A}(\phi)(\mathsf{T}^g_\mathsf{I}(\tau)(u))$.

The definition of *formula denotation* (Richter 2004: 168–169) can be simplified: given that the whole universe in any interpretation corresponds to a single utterance, quantification may now by defined in the same way as in first-order logic, as quantification over the whole universe, rather than as quantification over components. The practical effect of this modification is the same as in the setup of Richter 2007, where quantification evaluated at any object scopes over the whole utterance to which this object belongs.

**Definition 7 (formula denotation)** *For each signature* $\Sigma = \langle S, \sqsubseteq, S_{max}, A, F, R, Ar \rangle$, *for each* $\Sigma$ *interpretation* $\mathsf{I} = \langle \mathsf{U}, \mathsf{r}, \mathsf{S}, \mathsf{A}, \mathsf{R} \rangle$, *for each* $g \in \mathsf{G}_\mathsf{I}$, *the formula denotation function* $\mathsf{D}^g_\mathsf{I}$ *is the total function from* $D^\Sigma$ *to the power set of* $\mathsf{U}$ *such that*

*for each* $\tau \in T^\Sigma$, *for each* $\sigma \in S$,

$$\mathsf{D}^g_\mathsf{I}(\tau \sim \sigma) = \left\{ u \in \mathsf{U} \;\middle|\; \begin{array}{l} \mathsf{T}^g_\mathsf{I}(\tau)(u) \textit{ is defined, and} \\ \mathsf{S}\left(\mathsf{T}^g_\mathsf{I}(\tau)(u)\right) \sqsubseteq \sigma \end{array} \right\},$$

*for each* $\tau_1, \tau_2 \in T^\Sigma$,

$$\mathsf{D}^g_\mathsf{I}(\tau_1 \approx \tau_2) = \left\{ u \in \mathsf{U} \;\middle|\; \begin{array}{l} \mathsf{T}^g_\mathsf{I}(\tau_1)(u) \textit{ is defined,} \\ \mathsf{T}^g_\mathsf{I}(\tau_2)(u) \textit{ is defined, and} \\ \mathsf{T}^g_\mathsf{I}(\tau_1)(u) = \mathsf{T}^g_\mathsf{I}(\tau_2)(u) \end{array} \right\},$$

*for each* $\rho \in R$, *for each* $x_1, \ldots, x_{Ar(\rho)} \in V$,

$$\mathsf{D}^g_\mathsf{I}\left(\rho(x_1, \ldots, x_{Ar(\rho)})\right) = \left\{ u \in \mathsf{U} \;\middle|\; \left\langle g(x_1), \ldots, g(x_{Ar(\rho)}) \right\rangle \in \mathsf{R}(\rho) \right\},$$

*for each* $x \in V$, *for each* $\delta \in D^\Sigma$,

$$\mathsf{D}^g_\mathsf{I}(\exists x \delta) = \left\{ u \in \mathsf{U} \;\middle|\; \begin{array}{l} \underline{\textit{for some } u' \in \mathsf{U}} \\ u \in \mathsf{D}^{g[x \mapsto u']}_\mathsf{I}(\delta) \end{array} \right\},$$

*for each* $x \in V$, *for each* $\delta \in D^\Sigma$,

$$\mathsf{D}^g_\mathsf{I}(\forall x \delta) = \left\{ u \in \mathsf{U} \;\middle|\; \begin{array}{l} \underline{\textit{for each } u' \in \mathsf{U}} \\ u \in \mathsf{D}^{g[x \mapsto u']}_\mathsf{I}(\delta) \end{array} \right\},$$

*for each* $\delta \in D^\Sigma$, $\mathsf{D}^g_\mathsf{I}(\neg\delta) = \mathsf{U} \backslash \mathsf{D}^g_\mathsf{I}(\delta)$,

*for each* $\delta_1, \delta_2 \in D^\Sigma$, $\mathsf{D}^g_\mathsf{I}((\delta_1 \wedge \delta_2)) = \mathsf{D}^g_\mathsf{I}(\delta_1) \cap \mathsf{D}^g_\mathsf{I}(\delta_2)$
*for each* $\delta_1, \delta_2 \in D^\Sigma$, $\mathsf{D}^g_\mathsf{I}((\delta_1 \vee \delta_2)) = \mathsf{D}^g_\mathsf{I}(\delta_1) \cup \mathsf{D}^g_\mathsf{I}(\delta_2)$
*for each* $\delta_1, \delta_2 \in D^\Sigma$, $\mathsf{D}^g_\mathsf{I}((\delta_1 \rightarrow \delta_2)) = \big(\mathsf{U}\backslash \mathsf{D}^g_\mathsf{I}(\delta_1)\big) \cup \mathsf{D}^g_\mathsf{I}(\delta_2)$, *and*
*for each* $\delta_1, \delta_2 \in D^\Sigma$,
$\mathsf{D}^g_\mathsf{I}((\delta_1 \leftrightarrow \delta_2)) = ((\mathsf{U}\backslash \mathsf{D}^g_\mathsf{I}(\delta_1)) \cap (\mathsf{U}\backslash \mathsf{D}^g_\mathsf{I}(\delta_2))) \cup (\mathsf{D}^g_\mathsf{I}(\delta_1) \cap \mathsf{D}^g_\mathsf{I}(\delta_2))$.

Finally, the definition of *description denotation* is standard (Richter 2004: 177):

**Definition 8 (description denotation)** *For each signature* $\Sigma$*, for each* $\Sigma$ *interpretation* $\mathsf{I} = \langle \mathsf{U}, \mathsf{r}, \mathsf{S}, \mathsf{A}, \mathsf{R} \rangle$*, the description denotation function* $\mathsf{D}_\mathsf{I}$ *is the total function from* $D^\Sigma_0$ *to the power set of* $\mathsf{U}$ *such that*
$\mathsf{D}_\mathsf{I}(\delta) = \left\{ u \in \mathsf{U} \,\middle|\, \textit{for each } g \in \mathsf{G}_\mathsf{I},\ u \in \mathsf{D}^g_\mathsf{I}(\delta) \right\}$.

Also standard are the definitions of *grammar* and *model* (Richter 2004: 178–179), and it is not necessary (nor desirable) to define *exhaustive models* (Richter 2004: 179–180).

# B Höhle's Problem – Comprehensive Solution

The comprehensive solution Höhle's Problem is similar to the simpler solution in Section 3 in the sense that it relies on the General Identity Principle in (12) and makes certain structures exempt from GIP by making them "escape" the definition of `are-copies`. But the structures that are exempt from GIP should be defined explicitly, rather than assuming that all cyclic structures are exempt. So the first step is to redefine `are-copies` in such a way that also cyclic structures which look the same are token identical, thus closing the loophole on which the simpler solution relies, and the second step is to explicitly define a new loophole allowing certain structures to "escape" the redefined `are-copies`.

In the first step, the relation `are-copies` is redefined so that it is sensitive to cycles. For this to work, it must have two more arguments which serve as the memory of objects through which the "currently examined" objects were reached. For example, the two new arguments are empty lists in the "top-level call" `are-copies`$(\langle\,\rangle, \boxed{1}, \langle\,\rangle, \boxed{2})$, which is used in the modified GIP in (25).

(25) $\forall\boxed{1}\forall\boxed{2}\,(\texttt{are-copies}(\langle\,\rangle, \boxed{1}, \langle\,\rangle, \boxed{2}) \rightarrow \boxed{1} \approx \boxed{2})$

However, when the sequences of objects visited on the paths to $\boxed{1}$ and $\boxed{2}$ are not empty, as for example in `are-copies`$(\langle\boxed{1_3}, \boxed{1_2}, \boxed{1_1}\rangle, \boxed{1}, \langle\boxed{2_3}, \boxed{2_2}, \boxed{2_1}\rangle, \boxed{2})$, it is possible that $\boxed{1}$ and $\boxed{2}$ are already in such sequences, i.e., it is possible that they have already been examined; e.g., in the example at hand, it might be the case that $\boxed{1} = \boxed{1_2}$ and $\boxed{2} = \boxed{2_2}$, i.e., that there are cycles $\boxed{1_2} \rightleftarrows \boxed{1_3}$ (i.e., $\boxed{1} \rightleftarrows \boxed{1_3}$) and $\boxed{2_2} \rightleftarrows \boxed{2_3}$ (i.e., $\boxed{2} \rightleftarrows \boxed{2_3}$). If so, it does not make sense to ask whether $\boxed{1}$ and $\boxed{2}$ are copies, as this question was already asked about them (i.e., about $\boxed{1_2}$ and $\boxed{2_2}$) before; if all the other conditions on $\boxed{1}$ and $\boxed{2}$ being copies are satisfied, then it should be assumed that $\boxed{1}$ and $\boxed{2}$ indeed are copies. An ancillary relation, `member2`, is used to discover such cycles:

(26) $\texttt{member2}(\boxed{1}, \langle\boxed{\text{L1}h}|\boxed{\text{L1}t}\rangle, \boxed{2}, \langle\boxed{\text{L2}h}|\boxed{\text{L2}t}\rangle) \leftrightarrow$
$(\boxed{1} \approx \boxed{\text{L1}h} \wedge \boxed{2} \approx \boxed{\text{L2}h}) \vee \texttt{member2}(\boxed{1}, \boxed{\text{L1}t}, \boxed{2}, \boxed{\text{L2}t})$

In the running example, $\texttt{member2}(\boxed{1}, \langle\boxed{1_3}, \boxed{1_2}, \boxed{1_1}\rangle, \boxed{2}, \langle\boxed{2_3}, \boxed{2_2}, \boxed{2_1}\rangle)$ is true only when $\boxed{1}$ and $\boxed{2}$ are *parallel* members of the two corresponding lists, i.e., either $\boxed{1} = \boxed{1_1}$ and $\boxed{2} = \boxed{2_1}$, or $\boxed{1} = \boxed{1_2}$ and $\boxed{2} = \boxed{2_2}$, $\boxed{1} = \boxed{1_3}$ and $\boxed{2} = \boxed{2_3}$ (but not, e.g., when only $\boxed{1} = \boxed{1_2}$ and $\boxed{2} = \boxed{2_3}$). This makes sure that if cycles are discovered, they are of the same length in both structures.

With this ancillary relation in hand, the new `are-copies` relation, which closes the cyclicity loophole, is defined as in (27):

(27) $\forall\boxed{1}\forall\boxed{2}\ \texttt{are-copies}(\boxed{\text{L1}}, \boxed{1}, \boxed{\text{L2}}, \boxed{2}) \leftrightarrow$

$$\texttt{member2}(\boxed{1}, \boxed{\text{L1}}, \boxed{2}, \boxed{\text{L2}}) \vee$$
$$\bigvee_{\sigma\in\mathcal{S}} (\boxed{1}\sim\sigma \wedge \boxed{2}\sim\sigma) \wedge$$
$$\bigwedge_{\alpha\in\mathcal{A}} (\boxed{1}\alpha \approx \boxed{1}\alpha \rightarrow \texttt{are-copies}(\langle\boxed{1}|\boxed{\text{L1}}\rangle, \boxed{1}\alpha, \langle\boxed{2}|\boxed{\text{L2}}\rangle, \boxed{2}\alpha))$$

According to this definition, if $\boxed{1}$ and $\boxed{2}$ form parallel cycles, they are potential copies, and otherwise `are-copies` behaves as before: it checks the identity of species and whether values of all corresponding attributes are copies.

The combination of the new GIP in (25) and the new `are-copies` in (27) is exceptionless, so it is too strong – it is incompatible with the standard binding theory and the works mentioned in fn. 5. The following modified definition of `are-copies` makes it possible to specify exceptions: any objects satisfying the relation `int`, e.g., objects of sort *ref* (see (28)), will be exempted from GIP:

(28) $\forall\boxed{1}\ \texttt{int}(\boxed{1}) \leftrightarrow \boxed{1}\sim \mathit{ref}$

(29) $\forall\boxed{1}\forall\boxed{2}\ \texttt{are-copies}(\boxed{\text{L1}}, \boxed{1}, \boxed{\text{L2}}, \boxed{2}) \leftrightarrow$

$$\texttt{member2}(\boxed{1}, \boxed{\text{L1}}, \boxed{2}, \boxed{\text{L2}}) \vee$$
$$\bigvee_{\sigma\in\mathcal{S}} (\boxed{1}\sim\sigma \wedge \boxed{2}\sim\sigma) \wedge$$
$$\bigwedge_{\alpha\in\mathcal{A}} (\boxed{1}\alpha \approx \boxed{1}\alpha \rightarrow \texttt{are-copies}(\langle\boxed{1}|\boxed{\text{L1}}\rangle, \boxed{1}\alpha, \langle\boxed{2}|\boxed{\text{L2}}\rangle, \boxed{2}\alpha)) \wedge$$
$$(\texttt{int}(\boxed{1}) \rightarrow \texttt{are-copies}(\boxed{\text{L1}}, \boxed{1}, \boxed{\text{L2}}, \boxed{2}))$$

The way this works is, in short, as follows: if there are no parallel cycles (so $\texttt{member2}(\boxed{1}, \boxed{\text{L1}}, \boxed{2}, \boxed{\text{L2}})$ in the second line of (28) is false) and the usual conditions on what it means to be copies in the third and fourth line are satisfied, so $\boxed{1}$ and $\boxed{2}$ look the same, then either $\boxed{1}$ and $\boxed{2}$ are not specified as intensional ($\texttt{int}(\boxed{1})$ is false), in which case $\boxed{1}$ and $\boxed{2}$ are in the `are-copies` relation, or they are specified as intensional ($\texttt{int}(\boxed{1})$ is true), in which case the above definition says that $\texttt{are-copies}(\boxed{\text{L1}}, \boxed{1}, \boxed{\text{L2}}, \boxed{2})$ (in the first line) is true iff $\texttt{are-copies}(\boxed{\text{L1}}, \boxed{1}, \boxed{\text{L2}}, \boxed{2})$ (in the last line) is true, so it is undetermined whether $\boxed{1}$ and $\boxed{2}$ are copies and, hence, they are not in the scope of GIP.

## References


Abeillé, Anne & Rui Chaves. 2021. Coordination. In Müller et al. (2021). https://langsci-press.org/catalog/book/259. Forthcoming.

Bayer, Samuel. 1996. The coordination of unlike categories. *Language* 72(3). 579–616.

Beavers, John & Ivan A. Sag. 2004. Coordinate ellipsis and apparent non-constituent coordination. In Müller (2004) 48–69. http://csli-publications.stanford.edu/HPSG/2004/.

Blackburn, Patrick, Maarten de Rijke & Yde Venema. 2010. *Modal logic*. Cambridge: Cambridge University Press. Fourth printing (with corrections).

Chaves, Rui P. 2006. Coordination of unlikes without unlike categories. In Stefan Müller (ed.), *Proceedings of the HPSG 2006 conference*, 102–122. Stanford, CA: CSLI Publications.

Chaves, Rui P. 2008. Linearization-based word-part ellipsis. *Linguistics and Philosophy* 31. 261–307.

Chaves, Rui P. 2013. Grammatical alignments and the gradience of lexical categories. In Philip Hofmeister & Elisabeth Norcliffe (eds.), *The core and the periphery: Data-driven perspectives on syntax inspired by Ivan A. Sag*, 167–220. Stanford, CA: CSLI Publications.

Crysmann, Berthold. 2003. An asymmetric theory of peripheral sharing in HPSG: Conjunction reduction and coordination of unlikes. In Gerhard Jäger, Paola Monachesi, Gerald Penn & Shuly Wintner (eds.), *Proceedings of Formal Grammar 2003*, 47–62. http://cs.haifa.ac.il/~shuly/fg03/.

Dalrymple, Mary. 2017. Unlike phrase structure category coordination. In Victoria Rosén & Koenraad De Smedt (eds.), *The very model of a modern linguist*, vol. 8 Bergen Language and Linguistics Studies, 33–55. Bergen: University of Bergen Library. doi:http://dx.doi.org/10.15845/bells.v8i1. https://bells.uib.no/index.php/bells/issue/view/249.

Dalrymple, Mary & Ronald M. Kaplan. 2000. Feature indeterminacy and feature resolution. *Language* 76(4). 759–798.

Ginzburg, Jonathan & Ivan A. Sag. 2000. *Interrogative investigations: The form, meaning and use of English interrogatives.* Stanford, CA: CSLI Publications.

Höhle, Tilman N. 1999. An architecture for phonology. In Robert D. Borsley & Adam Przepiórkowski (eds.), *Slavic in Head-driven Phrase Structure*

*Grammar*, 61–90. Stanford, CA: CSLI Publications. http://csli-publications.stanford.edu/site/1575861747.shtml. Reprinted in Müller et al. 2019.

Kepser, Stephan. 2004. On the complexity of RSRL. In Lawrence S. Moss & Richard T. Oehrle (eds.), *Proceedings of the joint meeting of the 6th Conference on Formal Grammar and the 7th Conference on Mathematics of Language (10–12 august 2001, helsinki, finland)*, 146–162.

King, Paul John. 1999. Towards truth in HPSG. In Valia Kordoni (ed.), *Tübingen studies in Head-driven Phrase Structure Grammar* Arbeitspapiere des Sonderforschungsbereichs 340, Bericht Nr. 132, 301–352. Tübingen: Universität Tübingen.

Levine, Robert D. 2011. Linearization and its discontents. In Stefan Müller (ed.), *Proceedings of the HPSG 2011 conference*, 126–146. Stanford, CA: CSLI Publications.

Levy, Roger. 2001. Feature indeterminacy and the coordination of unlikes in a totally well-typed HPSG. Unpublished manuscript, http://idiom.ucsd.edu/~rlevy/papers/feature-indet.pdf.

Meurers, Walt Detmar. 1998. Raising spirits (and assigning them case). Handout for a talk delivered during the Groningen-Tübingen Kolloquium, Tübingen, 27th November 1998.

Müller, Stefan (ed.). 2004. *Proceedings of the 11th International Conference on Head-Driven Phrase Structure Grammar, Center for Computational Linguistics, Katholieke Universiteit Leuven*. Stanford, CA: CSLI Publications. http://csli-publications.stanford.edu/HPSG/2004/.

Müller, Stefan, Anne Abeillé, Robert D. Borsley & Jean-Pierre Koenig (eds.). 2021. *Head-driven Phrase Structure Grammar: The handbook*. Berlin: Language Science Press. https://langsci-press.org/catalog/book/259. Forthcoming.

Müller, Stefan, Marga Reis & Frank Richter (eds.). 2019. *Beiträge zur deutschen Grammatik: Gesammelte Schriften von Tilman N. Höhle*. Berlin: Language Science Press.

Patejuk, Agnieszka & Adam Przepiórkowski. 2021. Category mismatches in coordination vindicated. *Linguistic Inquiry* doi:10.1162/ling_a_00438. Forthcoming.

Pollard, Carl. 1999. Strong generative capacity in HPSG. In Gert Webelhuth, Jean-Pierre Koenig & Andreas Kathol (eds.), *Lexical and constructional aspects of linguistic explanation*, 281–297. Stanford, CA: CSLI Publications.

Pollard, Carl. 2001. Cleaning the HPSG garage: Some problems and some proposals. Unpublished manuscript, Ohio State University; http://utkl.ff.cuni.cz/~rosen/public/cp_garage.ps.

Pollard, Carl. 2014. Type-logical HPSG. In Gerhard Jäger, Paola Monachesi, Gerald Penn & Shuly Wintner (eds.), *Proceedings of Formal Grammar 2004*, 111–128. CSLI Publications. https://web.stanford.edu/group/

cslipublications/cslipublications/FG/2004/fg-2004-paper08.pdf.

Pollard, Carl & Ivan A. Sag. 1994. *Head-driven Phrase Structure Grammar*. Chicago, IL: Chicago University Press / CSLI Publications.

Przepiórkowski, Adam. 1999. *Case assignment and the complement-adjunct dichotomy: A non-configurational constraint-based approach*: Universität Tübingen Ph.D. dissertation.

Przepiórkowski, Adam. 2021. LFG and Head-driven Phrase Structure Grammar. In Mary Dalrymple (ed.), *Handbook of Lexical Functional Grammar*, Berlin: Language Science Press. https://langsci-press.org/catalog/book/312. Forthcoming.

Przepiórkowski, Adam & Agnieszka Patejuk. 2012. On case assignment and the coordination of unlikes: The limits of distributive features. In Miriam Butt & Tracy Holloway King (eds.), *The proceedings of the LFG'12 conference*, 479–489. Stanford, CA: CSLI Publications. http://cslipublications.stanford.edu/LFG/17/lfg12.html.

Przepiórkowski, Adam & Agnieszka Patejuk. 2021. Coordinate structures without syntactic categories. In I Wayan Arka, Ash Asudeh & Tracy Holloway King (eds.), *Modular design of grammar: Linguistics on the edge*, 205–220. Oxford: Oxford University Press. https://global.oup.com/academic/product/modular-design-of-grammar-9780192844842. Forthcoming.

Richter, Frank. 2004. *A mathematical formalism for linguistic theories with an application in Head-driven Phrase Structure Grammar*: Universität Tübingen Ph.D. dissertation (defended in 2000).

Richter, Frank. 2007. Closer to the truth: A new model theory for HPSG. In James Rogers & Stephan Kepser (eds.), *Model-theoretic syntax at 10*, 99–108.

Richter, Frank. 2021. Formal background. In Müller et al. (2021). https://langsci-press.org/catalog/book/259. Forthcoming.

Sailer, Manfred. 2003. *Combinatorial semantics and idiomatic expressions in Head-driven Phrase Structure Grammar*: Universität Tübingen Ph.D. dissertation (defended in 2000).

Søgaard, Anders & Martin Lange. 2009. Polyadic dynamic logics for HPSG parsing. *Journal of Logic, Language and Information* 18. 159–198.

Williams, Edwin. 1981. Transformationless grammar. *Linguistic Inquiry* 12(4). 645–653.

Yatabe, Shûichi. 2004. A comprehensive theory of coordination of unlikes. In Müller (2004) 335–355. http://csli-publications.stanford.edu/HPSG/2004/.

Yatabe, Shûichi & Wai Lok Tam. 2021. In defense of an HPSG-based theory of non-constituent coordination: A reply to Kubota and Levine. *Linguistics and Philosophy* 44. 1–77.

# Gluing idioms back together: A phraseo-combinatorial analysis

Manfred Sailer
Goethe-University Frankfurt a.M.

Sascha Bargmann
Goethe-University Frankfurt a.M.

Proceedings of the 28th International Conference on
Head-Driven Phrase Structure Grammar

Online (Frankfurt/Main)

Stefan Müller, Nurit Melnik (Editors)

2021

Frankfurt/Main: University Library

pages 186–204

Keywords: decomposability, idiom, lexical rule, syntactic flexibility, phrasal lexical entry

Sailer, Manfred & Sascha Bargmann. 2021. Gluing idioms back together: A phraseo-combinatorial analysis. In Stefan Müller & Nurit Melnik (eds.), *Proceedings of the 28th International Conference on Head-Driven Phrase Structure Grammar, Online (Frankfurt/Main)*, 186–204. Frankfurt/Main: University Library. DOI: 10.21248/hpsg.2021.10.

**Abstract**

The formal analysis of idioms has been oscillating between approaches that emphasize the unit-like character of idioms and approaches that focus on the autonomy of the idioms' parts. In this paper, we summarize the main arguments for and against these two positions to then propose an account that tries to capture and combine the insights and advantages of both types of analysis. The resulting theory is heavily influenced by the approach taken in Riehemann (2001).

# 1 Introduction

Idioms like *kick the bucket* 'die' in (1) or *pull strings* 'use connections' in (2) have mostly been analyzed as either fixed phrases that are coupled with the idiom's meaning as a whole (henceforth *phrasal accounts*) or as two or more separate idiomatic parts that combine according to the conventional rules of combinatorics and that each contribute their own meaning to the meaning of the idiom as a whole (henceforth *combinatorial accounts*).

(1) Our gold fish *kicked the bucket* last night.

(2) My boss *pulled strings* to get his current job.

Whereas phrasal accounts emphasize the unit-like character of idioms, combinatorial accounts focus on the (relative) autonomy of the idioms' parts. In this paper, we summarize the main arguments for and against these two positions to then propose an analysis that tries to capture and combine the insights and advantages of both types of analysis.

# 2 Phrasal versus combinatorial approaches

Early generative approaches, like Chomsky (1965), consider all idioms lexical units with internal structure; idioms are taken to be part of the lexicon but more complex than single words. Most subsequent approaches to idioms take a (much) more differentiated position.

On the basis of their empirical observation that not all idioms behave like monolithic units, but many of them actually show a certain degree of syntactic flexibility, Wasow et al. (1983) and Nunberg et al. (1994) argue that idioms come in at least two versions: (i) idiomatic phrases (IPs) and (ii) idiomatically combining expressions (ICEs).

IPs are semantically non-decomposable idioms that are analyzed as fixed phrases stored in the lexicon in the form of one single monolithic entry, which is

†We thank the reviewers and the participants of HPSG 2021 for their comments, in particular Emily Bender, Jamie Findlay, Paul Kay, Nurit Melnik, and Adam Przepiórkowski. We are grateful to Pascal Hohmann for help with LaTeX. All errors are ours.

directly coupled with the idiomatic meaning. A typical and often used example of an IP is the idiom *kick the bucket*, whose interpretation is 'die'.

ICEs, on the other hand, are semantically decomposable idioms that are analyzed as consisting of two or more separate word-level lexical entries that each contribute only a part of the idiom and of its meaning. Typical and often used examples of ICEs are *pull strings* 'use connections' (where *pull* is interpreted as 'use' and *strings* as 'connections') and *spill beans* 'divulge information' (where *spill* is interpreted as 'divulge' and *beans* as 'information').

The basic insight in Wasow et al. (1983) and Nunberg et al. (1994) is that semantic decomposability correlates with syntactic flexibility: Semantically decomposable idioms can undergo syntactic processes such as passivization, topicalization, or the insertion of adjuncts, whereas semantically non-decomposable idioms cannot – see (3), where "$" indicates the unavailability of an idiomatic reading.

(3) a. The beans were spilled by Pat. (Nunberg et al., 1994, 510)
  b. $ The bucket was kicked by Pat. (Nunberg et al., 1994, 508)

Semantically decomposable idioms motivated a combinatorial analysis in GPSG (Gazdar et al., 1985). This has been carried over to HPSG in Krenn & Erbach (1994), Sailer (2003), and Soehn (2009).

Kay et al. (2015) and Bargmann & Sailer (2018) then point to empirical evidence against the syntactic fixedness of non-decomposable idioms. For example, passivization of non-decomposable idioms is not blocked in principle but interacts in a predictable way with the discourse constraints on passive in a given language, as in (4).

(4) When you are dead, you don't have to worry about death anymore.
  ...The bucket will be kicked. (Bargmann & Sailer, 2018, 21)

Bargmann & Sailer (2018) account for the passivizability of *kick the bucket* in (4) in the following way: First, the subject of an English passive clause must be given or inferable from the preceding context (Kuno & Takami, 2004, 127). Second, the idiomatic noun phrase *the bucket* refers to a dying event. Since dying is given in the context, passivization is possible.

In the light of such observations, Kay et al. (2015) and Bargmann & Sailer (2018) analyze all idioms with a regular syntactic structure – decomposable or not – in a combinatorial way. This leads to an ICE-style analysis for idioms such as *kick the bucket* and restricts a phrasal analysis to expressions such as *kingdom come* 'paradise'.

Findlay (2019) points out two big challenges for combinatorial analyses: (i) The idiomatic versions of the words need to be prevented from occurring independently of the idiom (henceforth *collocational challenge*), and (ii) there is a new lexical entry for each (idiomatic) word in each idiom (henceforth *lexical* *explosion challenge*). Findlay (2019) then suggests a phrasal analysis of idioms in a tree-grammar-based version of LFG.

A hallmark of phrasal analyses is that an idiom's parts are licensed directly and exclusively through the idiom's phrasal entry. Compared to combinatorial analyses, this has three advantages: (i) An idiom's parts are automatically prevented from occurring independently of the idiom, which leads to a confinement of idiom parts and avoids the collocational challenge. (ii) There is no need for individual lexical entries for individual idiomatic words, which avoids a lexical proliferation or "explosion" and hence ensures a leaner lexicon. (iii) It captures the intuition that idioms are lexical units.

However, phrasal analyses do not seem to be the appropriate analytic tool for some syntactic and/or textual constellations. We will consider three relevant cases here. The first problem is posed by the occurrence of idiom parts in relative clauses, see (5).

(5) a. The strings$_k$ [$_{RC}$ that Pat pulled __$_k$] got Chris the job. (Nunberg et al., 1994, 510)

b. John never pulled the strings$_k$ [$_{RC}$ that his mother told him should be pulled __$_k$]. (Henk v. Riemsdijk's example)

If the relative clause contains only the idiomatic verb, here *pull*, it is unclear how a phrasal account can connect the verb with the idiomatic noun, here *strings*. Example (5b) is particularly challenging, as there is only one occurrence of the idiomatic noun *strings* but two occurrences of the idiomatic verb *pull*. According to the combinatorial analysis in Webelhuth et al. (2018, 257), *pull* is licensed in the relative clauses in (5) via the semantics of *strings$_k$*, which is present via the gap __$_k$.

The second problematic constellation for phrasal accounts is exemplified in (6). Just as in (5b), there is one occurrence of the idiomatic noun *beans* that is related to two distinct occurrences of the idiomatic verb *spill*. It is not clear how this could be reconciled with a phrasal account, as the noun *beans* would have to be part of two distinct instances of the idiomatic phrase *spill beans* simultaneously.

(6) The beans [$_{VP}$ [$_{VP}$ have not been spilled yet], but [$_{VP}$ will be spilled very soon]].

In the combinatorial approach in Webelhuth et al. (2018), an occurrence of the idiomatic verb *spill* is licensed via the semantics of the idiomatic noun *beans*. Since *beans* is the head of the subject of the conjoined verb phrases, this single occurrence of the noun is sufficient to license two occurrences of the idiomatic verb *spill*.

The third challenge for phrasal accounts that we would like to discuss involves the pronominalization of idiom parts, as in (7).

(7) Eventually she spilled all the beans$_k$. But it took her a few days to spill them$_k$ all. (Riehemann, 2001, 207)

In the *but*-clause in (7), the idiomatic verb *spill* combines with the pronoun *them* rather than an overt realization of the noun *beans*. This is only possible if the antecedent of the pronoun is a noun phrase whose head is idiomatic *beans*. This condition is hard to integrate into a phrasal analysis.

A combinatorial approach does not necessarily face this problem. According to Webelhuth et al. (2018, 251–252, 256), a pronoun shares relevant parts of its semantics with its antecedent. In our case, this means that the pronoun *them* in the *but*-clause has the semantics of idiomatic *beans*. Consequently, idiomatic *spill* is licensed in the *but*-clause.

This brief discussion shows that phrasal accounts naturally capture the confinement of idiom parts and allow for a leaner lexicon. Both of these are rather conceptual arguments. A combinatorial account, on the other hand, seems to be the better fit when it comes to the actual phenomena, like idioms in relative clauses, parts of idioms occurring twice, and idiom parts being pronominalized.[1]

## 3 Riehemann's approach

In Riehemann (2001), all idioms are phrases that consist of two or more words of which at least one is an idiomatic word. Such an idiomatic word differs from its non-idiomatic counterpart in exactly two aspects: (i) It has a different meaning (figurative or empty), and (ii) it does not have an individual entry in the lexicon, as it is obligatorily part of the idiom it belongs to and, as a consequence, has no status of its own. Apart from these two differences, an idiomatic word is identical to its literal counterpart, i.e. the former shares the latter's phonology, morphology, and syntax.

In order to ensure this overlap between idiomatic words and their non-idiomatic counterparts, Riehemann (2001) establishes a relation between them. Using *asymmetric default unification* "$\overset{<}{\sqcap}$" (Lascarides & Copestake, 1999, 69), she has an idiomatic word adopt all the characteristics of its literal counterpart that are not specified within the idiomatic word. The only characteristic that she specifies in idiomatic words is their semantics. See Fig. 1 for a sketch of Riehemann's encoding of *spill beans*.

Riehemann (2001) keeps the words that occur in a phrase (any phrase, not just idiomatic ones) in an unordered repository that she tellingly calls WORDS.

[1] In addition to these empirical problems of phrasal approaches, the underlying formalism of HPSG makes it impossible to express a genuinely phrasal analysis. The reason for this lies in HPSG's notion of *locality*. Every linguistic object needs to satisfy all constraints of the grammar (Richter, 2019). For idioms, this means that every idiomatic word must be licensed by the grammar all by itself. In other words, if an idiom such as *kick the bucket* is assigned an internal structure, every node in this structure needs to be licensed by the grammar as well.

$$
\begin{bmatrix}
\textit{spill\_beans\_idiom\_phrase} \\
\textsc{c-wds}\ \left\{
\begin{array}{l}
\begin{bmatrix}
\textit{i-word} \\
\ldots\textsc{liszt}\ \left\langle \begin{bmatrix} \textit{i\_spill\_rel} \\ \textsc{und}\ \boxed{1} \end{bmatrix} \right\rangle
\end{bmatrix}
\overset{<}{\sqcap}
\begin{bmatrix}
\textit{spill} \\
\ldots\textsc{liszt}\ \left\langle \begin{bmatrix} \textit{\_spill\_rel} \end{bmatrix} \right\rangle
\end{bmatrix}, \\
\begin{bmatrix}
\textit{i-word} \\
\ldots\textsc{liszt}\ \left\langle \begin{bmatrix} \textit{i\_bean\_rel} \\ \textsc{inst}\ \boxed{1} \end{bmatrix} \right\rangle
\end{bmatrix}
\overset{<}{\sqcap}
\begin{bmatrix}
\textit{bean} \\
\ldots\textsc{liszt}\ \left\langle \begin{bmatrix} \textit{\_bean\_rel} \end{bmatrix} \right\rangle
\end{bmatrix}
\end{array}
\right\}
\end{bmatrix}
$$

Figure 1: Description of the idiom *spill beans* in Riehemann (2001, 192)

The words in the WORDS repository are identical (including their subcategorization requirements) to the terminal nodes of the syntactic tree of the phrase. In a phrase that consists of or contains an idiom, the words are not only stored in WORDS but also divided up into two different sub-repositories of WORDS: CONSTRUCTIONAL-WORDS (C-WORDS) and OTHER-WORDS (O-WORDS). C-WORDS contains all and only the words that are part of the idiom.

Due to the fact that Riehemann (2001) defines idioms as phrases that consist of two or more words of which at least one is an idiomatic word, there must be two or more words in C-WORDS and at least one of them must be idiomatic. O-WORDS is the complementary repository to C-WORDS and, therefore, contains all and only the words that are *not* part of the idiom, which are always non-idiomatic. The reason why Riehemann (2001) allows for non-idiomatic words in her idiomatic phrases (and hence in C-WORDS) are idioms in which at least one of the words has its literal meaning, as in *miss the boat* 'miss out'. Since C-WORDS and O-WORDS are the only sub-repositories of WORDS, the union of their members results in the members of WORDS again.

At the level of the complete utterance, a 'head count' is carried out to ensure that all and only those idiomatic words are present that originated in C-WORDS. This guarantees that idiomatic words only appear when licensed by an idiom phrase, so that no idiom is incomplete. If a part of an idiom is present at the level of the complete utterance, the other parts have to be present as well and stand in the appropriate semantic relationship. The way the mechanism is built, it requires a one-to-one correspondence of idiomatic words in the structure and idiomatic words on phrasal C-WORDS lists.

Compared to combinatorial accounts, Riehemann's phrasal account offers the general advantages of phrasal analyses mentioned above: There is no need for individual lexical entries of the idiomatic uses of words, and there is a central place in which the idiom is defined as a whole. At the same time, the approach is subject to two empirical problems of such accounts. The pronominalization of idiom parts as in (7), is one of these cases. For example, in (7), the WORDS list of the sentence contains the idiomatic word *spill* and the pronoun *them*. However, it is plausible that the pronoun *them* differs from the literal word *beans* in more than just the semantics. Consequently, the pronoun cannot asymmetrically default-unify with the literal word *beans*. This means that there cannot be the required two idiomatic words on the C-WORDS list.

The second problem is exemplified by data such as (6): There are two occurrences of the word *spill*, but only one of the word *beans*. The mechanism for checking the occurrence of the correct C-WORDS does not allow this.

In addition to these empirical problems, the technical realization of the underlying idea is not fully satisfactory. First, the WORDS mechanism is not used for anything other than the licensing of idioms. Second, the mechanism of asymmetric default unification is equally not part of the core machinery of HPSG.

To summarize, Riehemann's approach tries to capture the flexibility of combinatorial approaches with the conceptual advantages of phrasal accounts. For this reason, we will take her analysis as our basis and propose modifications to solve its problems.

# 4 A new phraseo-combinatorial analysis

The proposal that we will present in this section conserves the basic ideas of Riehemann (2001) but expresses them in a different way. First, we will encode Riehemann's "$\underset{\sqcap}{<}$" as a lexical rule. Second, we will replace the WORDS mechanism with a constraint on idiomatic phrases and a collocational restriction on idiomatic words. Third, we follow Webelhuth et al. (2018) in assuming that the completeness requirement on idioms is semantic rather than syntactic, let alone phrasal. We will present the ingredients of our analysis step by step – in a simplified version in Section 4.1, and in a refined version in Section 4.2.

Throughout the paper, we are largely agnostic with regard to the type of semantic approach to be assumed. We only need to assume that there is a semantic constant that is associated with a particular reading of a word. This constant would be the value of the RELN attribute in Pollard & Sag (1994), of MAIN in Richter & Sailer (2004), or of LID in Sag (2012). In this paper, we will simply call this attribute RELN.

## 4.1 Basic version of the analysis

Riehemann establishes a relation between a literal and an idiomatic version of words that occur in idioms in terms of her asymmetric default unification. We will express Riehemann's idea as an *object-level lexical rule* à la Meurers (2001). This is a well-defined and commonly recognized mechanism. It is a natural choice for us, as there is a clear connection between the two mechanisms: A lexical rule expresses the differences between its input and its output, with the assumption that anything not specified is taken over. Similarly, Riehemann's operator is intended as saying that the literal use of a word and its idiomatic use share all properties except of those explicitly specified by the idiom.

$$
\begin{array}{ll}
\textit{word} \longrightarrow & \\
\quad (L_1 \wedge \left[\text{STORE } \langle\rangle\right]) \vee \ldots \vee (L_n \wedge \left[\text{STORE } \langle\rangle\right]) & \text{(simple words)} \\
\quad \vee \boxed{1} \left[\text{STORE } \left\langle \begin{bmatrix} \textit{lex-rule} \\ \text{OUT } \boxed{1} \end{bmatrix} \right\rangle \right] & \text{(derived words)}
\end{array}
$$

Figure 2: The Word Principle from Meurers (2001, 176)

$$
\textit{i-word-lr} \longrightarrow \begin{bmatrix} \text{IN} & \left[\text{SYNS}|\text{LOC} \left[\text{CONT } \boxed{1}\right]\right] \\ \text{OUT} & \left[\text{SYNS}|\text{LOC} \left[\text{CONT } \boxed{2}\right]\right] \end{bmatrix} \quad \& \ \boxed{1} \neq \boxed{2}
$$

Figure 3: Constraint on the sort *i-word-lexical-rule* (*i-word-lr*; 1st version)

Meurers (2001) introduces a sort *lexical-rule* with two attributes, IN and OUT, both of which take a *word* object as their value. Such *lexical-rule* objects occur inside words. Meurers (2001) defines an attribute STORE on the sort *word*. The value of this attribute is a list, which is empty in the case of a simple word. For derived words, the STORE value contains the *lexical-rule* object which licenses the derived word. This is expressed by identifying the derived word with the output of the lexical rule, i.e., with the OUT value. Meurer's version of the Word Principle is given in Fig. 2.

For our cases, we introduce a special lexical rule for idiom components. We assume a sort *idiomatic-word-lexical-rule* (*i-word-lr*), which is a subsort of *lexical-rule*. A first version of this lexical rule is given in Fig. 3. The input of the lexical rule specifies the literal version of an idiom component. The output of the rule specifies the properties of the idiom-specific use of the same word. The way the rule is stated, it only requires that the input and the output differ with respect to their CONT, i.e., that the idiomatic word differs in meaning from its non-idiomatic base. In the example, we use *spill-id* and *bean-id* for the meaning of *spill* and *bean* as they occur in this idiom.

The next ingredient of our theory is a phrasal constraint that actually defines an idiom. Again, we follow the basic ideas from Riehemann (2001). We assume that each phrase has an additional attribute C(ONSTRUCTION)-W(OR)DS. The value of this attribute is a list of *i-word-lexical-rule* and *word* objects. It contains the specification of an *i-word-lr* for each idiomatic word, and of a *word* for each literal word that is an obligatory component of the idiom.[2]

Ordinary phrases have an empty C-WDS list. We provide the phrasal specification for the idiom *spill beans* in Fig. 4. Note its striking similarity to Riehemann's analysis, as given above in Fig. 1.

We introduce a *Lexicon of idiomatic expressions*, given in Fig. 5. This is a constraint on phrases with a non-empty C-WDS list. The consequent of the con-

[2]We will not discuss idioms containing words in their literal meaning, such as *miss the boat*. Nonetheless, we will formulate our constraints in a way compatible with these cases.

$$\begin{bmatrix} \textit{phrase} & \\ \text{C-WDS} & \left\langle \begin{bmatrix} \textit{i-word-lexical-rule} & \\ \text{IN} & \begin{bmatrix}\text{CONT}|\text{RELN} & \textit{spill}\end{bmatrix} \\ \text{OUT} & \begin{bmatrix}\text{CONT} & \begin{bmatrix}\text{RELN} & \textit{spill-id}\\ \text{UND} & \boxed{1}\end{bmatrix}\end{bmatrix}\end{bmatrix}, \begin{bmatrix} \textit{i-word-lexical-rule} & \\ \text{IN} & \begin{bmatrix}\text{CONT}|\text{RELN} & \textit{bean}\end{bmatrix} \\ \text{OUT} & \begin{bmatrix}\text{CONT} & \begin{bmatrix}\text{RELN} & \textit{bean-id}\\ \text{INST} & \boxed{1}\end{bmatrix}\end{bmatrix}\end{bmatrix} \right\rangle \end{bmatrix}$$

Figure 4: Sketch of the description of the idiomatic phrase *spill beans*

straint is a disjunction of descriptions of the idiomatic expression of the language. The individual entries of the idioms are heavily simplified in the figure. Each of them will look like the example in Fig. 4. Any phrase with a non-empty C-WDS list must satisfy one of the disjuncts in Fig. 5, i.e., must be an instantiation of an idiom.

So far, we have seen how to write the specification of the properties of an idiom. What is missing is how this will be put to work in a sentence. To do this, we need two constraints: First, a constraint that guarantees that whenever a particular idiomatic phrase is used, it dominates all words that constitute this idiom. Second, whenever an idiomatic word is used, it must be dominated by a corresponding idiomatic phrase.

The first of these constraints can be expressed straightforwardly. We provide a first version of it in (8). It enforces that an idiomatic phrase dominates the words that constitute the idiom. These can be words in their literal meaning or in their idiom-specific use – i.e. the words in the OUT value of an *i-word-lr* object.

(8) Idiom Completeness Constraint (first version):
A phrase with a non-empty C-WORDS list must dominate words identical with the elements on its C-WORDS list or their OUT values.

We need some additional mechanism for the second constraint. As this constraint is concerned with the distribution of lexical elements, we adopt a version of the HPSG collocation theory, presented in Richter & Sailer (2003) for bound words, in Richter & Soehn (2006) for negative polarity items, and in Soehn (2009) additionally for external allomorphy (such as the *a/an* alternation). This theory is assumed as a prerequisite in a number of existing HPSG analyses of idioms, such as Sailer (2003), Soehn (2006), or Webelhuth et al.

$$
\begin{bmatrix} \textit{phrase} \\ \textsc{c-wds} \;\; \textit{nelist} \end{bmatrix} \longrightarrow
\left( \begin{array}{l}
\begin{bmatrix} \textsc{c-wds} \; \left\langle \begin{bmatrix} \textit{i-word-lr} \\ \textsc{in} \ldots \textsc{reln} \;\; \textit{spill} \end{bmatrix}, \begin{bmatrix} \textsc{in} \ldots \textsc{reln} \;\; \textit{bean} \end{bmatrix} \right\rangle \end{bmatrix} \\
\vee \\
\begin{bmatrix} \textsc{c-wds} \; \left\langle \begin{bmatrix} \textit{i-word-lr} \\ \textsc{in} \ldots \textsc{reln} \;\; \textit{kick} \end{bmatrix}, \begin{bmatrix} \textit{i-word-lr} \\ \textsc{in} \ldots \textsc{reln} \;\; \textit{bucket} \end{bmatrix} \right\rangle \end{bmatrix} \\
\vee \\
\begin{bmatrix} \textsc{c-wds} \; \left\langle \begin{bmatrix} \textit{word} \\ \ldots \textsc{reln} \;\; \textit{miss} \end{bmatrix}, \begin{bmatrix} \textit{i-word-lr} \\ \textsc{in} \ldots \textsc{reln} \;\; \textit{boat} \end{bmatrix} \right\rangle \end{bmatrix} \\
\vee \\
\ldots
\end{array} \right)
$$

Figure 5: Lexicon of idiomatic expressions

$$
\textit{i-word-lr} \longrightarrow \boxed{3}
\begin{bmatrix}
\textsc{in} & \begin{bmatrix} \textsc{syns} \begin{bmatrix} \textsc{loc} \mid \textsc{cont} \; \boxed{1} \end{bmatrix} \end{bmatrix} \\
\textsc{out} & \begin{bmatrix} \textsc{syns} \begin{bmatrix} \textsc{loc} \mid \textsc{cont} \; \boxed{2} \end{bmatrix} \\ \textsc{coll} \left\langle \begin{bmatrix} \textsc{c-words} \left\langle \ldots, \boxed{3}, \ldots \right\rangle \end{bmatrix} \right\rangle \end{bmatrix}
\end{bmatrix}
\quad \& \; \boxed{1} \neq \boxed{2}
$$

Figure 6: Constraint on the sort *i-word-lr* (final version, with collocation)

(2018). Consequently, we do not introduce additional machinery by using it.

In its simplest version, the collocation theory consists of a list-values attribute COLL, which is defined on lexical items. The elements of this list are *sign* objects. Finally, there is a constraint that a lexical item can only occur in a structure in which it is dominated by each of the elements on its COLL list.

In collocational approaches to idioms such as the ones just mentioned, an idiomatic word is collocationally restricted to co-occur with the other words that belong to the idiom. In our approach, the output of the *i-word-lr* needs to be collocationally restricted to occur within a phrase that licenses the idiom. In other words, the output of the *i-word-lr* is collocationally restricted to a phrase that has this instantiation of the lexical rule on its C-WORDS list. This is expressed in the revised version of the constraint on the sort *i-word-lr* in Fig. 6.

The Idiom Completeness Constaint in (8) and the revised version of the *i-word-lr* in Fig. 6 have the desired effect: First, if there is an idiomatic phrase, it must dominate words that correspond to the OUT values of the elements in

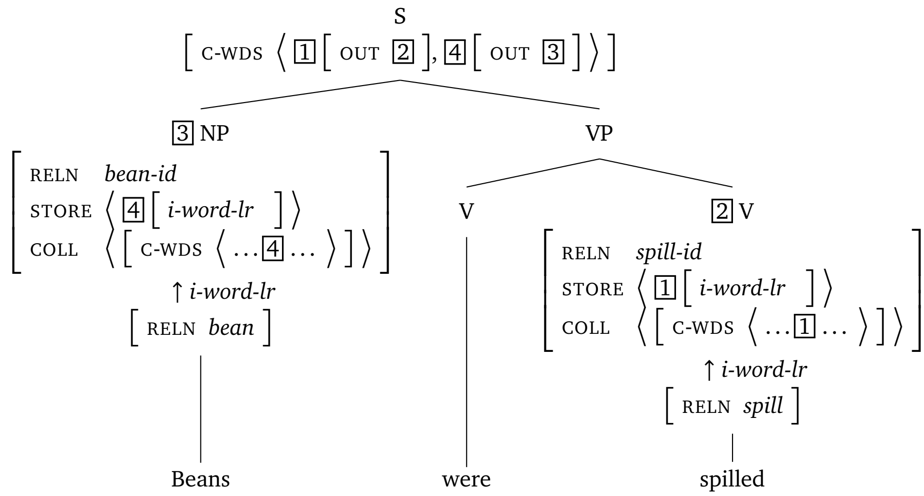



Figure 7: Sketch of the analysis of sentence (9b)

the phrase's C-WDS list. Second, if there is an idiomatic word, it requires the presence of an idiom on whose C-WDS list it is.

Even in this preliminary form, our approach allows us to capture some basic properties of idioms. The idiom *spill beans* is syntactically relatively flexible. As shown in (9), the idiom can occur in a active as well as in a passive form. We sketch our analysis of the passive example in Fig. 7.

(9) a. Alex spilled the beans.
    b. Beans were spilled.

The sentence in (9b) contains instances of the two idiomatic words *beans* and *spilled*. As indicated in the structure in Fig. 7 by "↑" these words are the output of an application of the *i-word-lr*. Consequently, they have a collocational requirement that they must be dominated by some phrase on whose C-WDS list these idiomatic words are found. This triggers the occurrence of the phrase, specified in Fig. 4. It is, therefore, guaranteed that whenever there is an idiomatic word, it enforces the presence of a disjunct from the lexicon of idiomatic expressions in Fig. 5. On the other hand, once there is a phrase with a non-empty C-WDS list in a structure, the Idiom Completeness Constraint from has the effect that this phrase must dominate all words that are relevant for a particular idiom.

The ungrammatical example (10) contains only one part of the idiom. Our theory correctly excludes this sentence under an idiomatic reading.

(10) $ Alex told me the beans. ≠ 'Alex told me the secrets.'

If the word *beans* is used idiomatically, it must be dominated by a phrase which has on its C-WDS list two *i-words-lr* objects, one for the idiomatic version of *beans* and one for the idiomatic version of *spill*. This phrase, then, must dominate words identical to the OUT values of its C-WDS elements. In this particular sentence, however, the idiomatic use of the word *spill* is missing.

The basic version of our phraseo-combinatorial approach has all the basic components: It is combinatorial in that idiomatic words have exactly the properties stipulated for them in corresponding purely combinatorial approaches. We have chosen a collocational variant of a combinatorial approach rather than the selection-based one of Kay et al. (2015) and Michaelis (2019). Our approach is phrasal in that there are no lexical entries for those idiomatic words but a single specification of the idiom as a whole in terms of a phrasal specification. This specification, however, does not constrain the type of phrase but only the idiomatic words that it must dominate. It is at the phrasal level that the mapping from the literal to the idiomatic word is constrained.

## 4.2 Final version of the analysis

The basic version of our account presented in Section 4.1 does not yet capture the full syntactic and semantic flexibility that we discussed in Section 2. In particular, the insight that the completeness requirement of an idiom is semantic in nature is not yet encoded. To implement this insight, we will loosen the co-occurrence constraints in the Idiom Completeness Constraint to the relevant parts of the semantic representation.

The need for such a refinement can be illustrated with examples such as (7), repeated for convenience in (11). Here, one of the obligatory parts of the idiom is realized by a pronoun, *them*, rather than by a noun phrase containing the idiomatic word *beans*.

(11) Eventually she spilled all the beans$_k$. But it took her a few days to spill them$_k$ all.

We can adopt the solution in Webelhuth et al. (2018): The idiomatic phrase only requires the occurrence of a word with the relevant idiomatic content, i.e. with the relation *beans-id*. This is expressed in the final version of the Idiom Completeness Constraint in (12).

(12) Idiom Completeness Constraint (final version):
For each phrase *p* and for each object *o* on *p*'s C-WORDS list,
*p* dominates a sign whose CONT|RELN value is identical with *o*'s
CONT|RELN value or its OUT|...|CONT|RELN value.

In the critical example (11), the antecedent of the pronoun *them* is the noun phrase *the beans* from the previous sentence. We assume with Webelhuth et al. (2018) that the basic content is among the things shared between an anaphorically used pronoun and its antecedent. This includes enough information to fulfill the completeness requirement of the idiom. Adapting this to the present

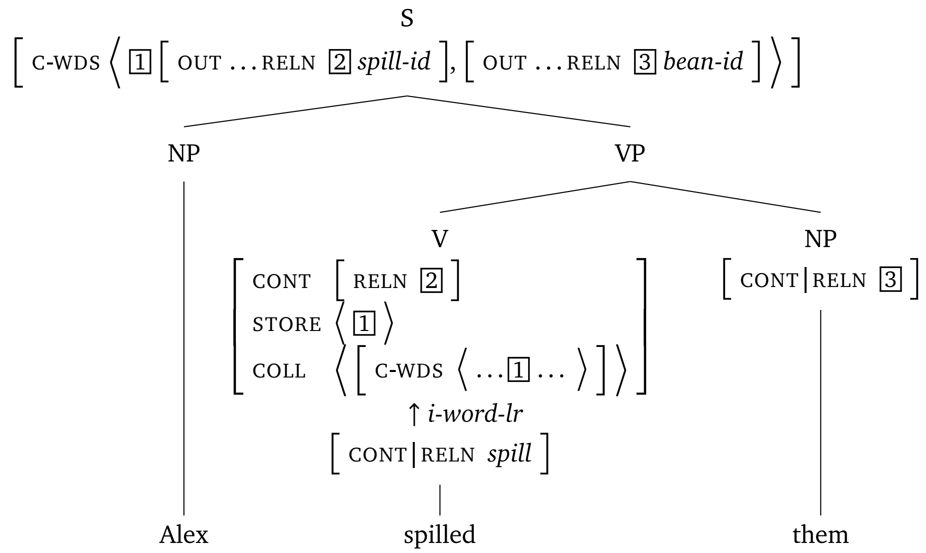



Figure 8: Sketch of the analysis of the sentence *Alex spilled them.*

architecture, we assume that the RELN value of the pronoun is identical with that of its antecedent. This is sufficient to satisfy the Idiom Completeness Constraint in its final version in (12) – though it was not enough to satisfy the earlier form of this constraint in (8).

We provide an analysis of a simple sentence with a pronominalized idiom part, *Alex spilled them*, in Fig. 8. The idiomatic word *spilled* is licensed as it is dominated by a phrase in which the particular mapping from non-idiomatic *spill* to its idiom-specific version is specified. The pronoun *them* is not idiomatic and, as such, has no idiom-specific distributional requirements. It has, however, certain restrictions as a discourse anaphora. These include that parts of its semantics, in particular its RELN value, are identical with those of its antecedent. The top node in the tree is the idiomatic phrase. It satisfies the Idiom Completeness Constraint because it dominates signs with the RELN values required in the outputs of the *i-word-lr* objects of the idiomatic phrase's C-WDS list – namely the idiomatic word *spilled* and the discourse anaphoric pronoun *them*.

The remaining problem for the current version is that a single idiomatic phrase should be able to license several occurrences of an idiomatic word. We saw a relevant example above in (6), repeated as (13).

(13) The beans [$_{VP}$ [$_{VP}$ have not been spilled yet], but [$_{VP}$ will be spilled very soon]].

This sentence contains two occurrences of the word *spill*. They cannot both be identical with the verbal element on the phrase's C-WDS list. For this reason we need to allow for multiple occurrences of idiom parts on the C-WDS list. To achieve this, we introduce some underspecification in the description of idiomatic phrases. The required change is shown schematically in (14). The phrasal description in Fig. 4 has the form given in (14a), with just two *i-word-lr* objects $\rho_1$ and $\rho_2$ on its C-WDS list. We modify this in the way specified in (14b), i.e., by adding a meta-description operator $\Delta$ which is defined below the AVM.

(14) a. Phrasal constraint with fully specified C-WDS list:

$$\begin{bmatrix} \textit{phrase} \\ \text{C-WDS} \ \langle \rho_1, \ldots \rho_n \rangle \end{bmatrix}$$

b. Phrasal constraint with underspecified C-WDS list:

$$\begin{bmatrix} \textit{phrase} \\ \text{C-WDS} \ \Delta\big(\langle \rho_1, \ldots \rho_n \rangle\big) \end{bmatrix}$$

where for each list $L$, $\Delta(\langle \rho_1, \ldots, \rho_n \rangle)$ describes $L$ iff for each element $e$ of $L$, there is a list $L_e$ of elements of $L$ such that $e$ is on $L_e$ and $L_e$ is described by $\langle \rho_1, \ldots, \rho_n \rangle$.

We implement this change in all definitions of idiomatic phrases such as the one in Fig. 4, i.e., we introduce the operator $\Delta$ in the description of the value of the C-WDS list. This underspecified version allows us to account for sentence (13). The corresponding structure of a simplified version of this sentence is given in Fig. 9.

The top node in Fig. 9 is the relevant idiomatic phrase. It contains two instances of the lexical rule that licenses the idiomatic word *spill*. This constellation is licensed by the underspecified version of Fig. 4. The C-WDS list of the phrase is the relevant list $L$ from the definition. For each of its elements, we can find the necessary subparts: For the first element, $\boxed{1}$, the list $\langle \boxed{1}, \boxed{5} \rangle$ satisfies the original description. For the second element, $\boxed{3}$, the relevant list is $\langle \boxed{3}, \boxed{5} \rangle$. Finally, either list is a possibility for the third element of the list, $\boxed{5}$. This shows that the C-WDS list of the top node in Fig. 9 satisfies our modified description of the idiomatic phrase.

The resulting structure also satisfies all other constraints introduced in this paper. For each of the idiomatic words, there is an element on the phrase's C-WDS list that is identical to the word's STORE value, i.e., the COLL requirements of the idiomatic words are satisfied. The overall phrase meets the Idiom Completeness Constraint from (12) as well: For each of its elements there is a word in the phrase whose semantics is identical to that specified in the phrase's C-WDS list.

We should briefly turn to the examples of idioms in relative clauses from (5), repeated in (15). In (15a), the idiomatic phrase would be some phrase dominating idiomatic *strings* and the relative clause. This phrase contains the *i-word-lr* object on its C-WDS list that license idiomatic *strings* and idiomatic *pull*. This satisfies the collocational constraint of the idiomatic words. As the gap in the relative clause and the noun *string* have an identical index, the linking requirement of the phrase is satisfied, which is the same as for *spill beans* in

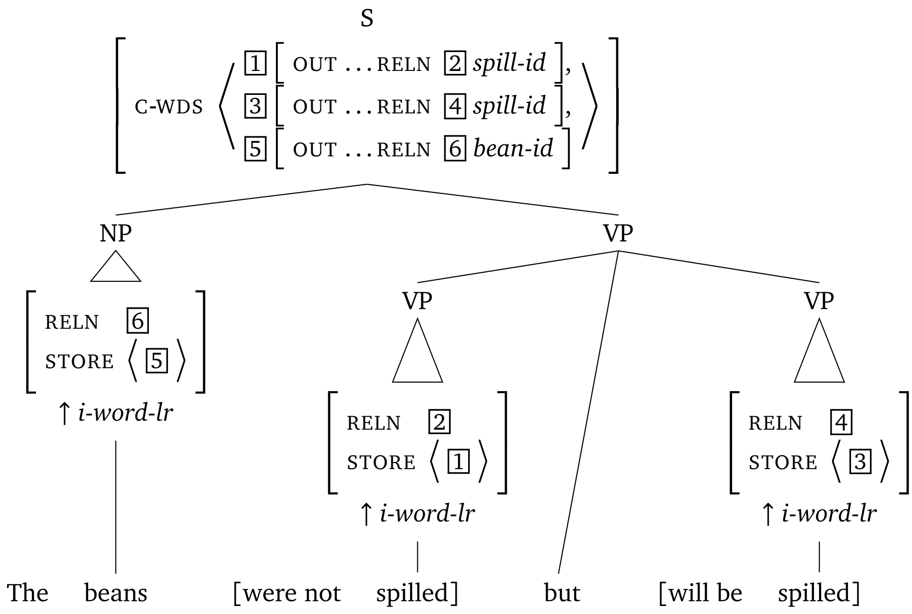



Figure 9: Sketch of the analysis of a simplified version of sentence (13)

Fig. 4. Finally, by dominating the two idiomatic words, the phrase satisfies the Idiom Completeness Constraint.

(15) a. The strings$_k$ [$_{RC}$ that Pat pulled __$_k$] got Chris the job.
 b. John never pulled the strings$_k$ [$_{RC}$ that his mother told him should be pulled __$_k$].

The case in (15b) is only slightly more complex. The idiomatic phrase can be the matrix verb phrase. It contains two occurrences of idiomatic *pull* and one occurrence of idiomatic *strings*. Consequently, it is a variant of the case illustrated in (13) and in Fig. 9. The matrix occurrence of *pull* and the noun *strings* satisfy the phrasal description just as the two idiomatic words in Fig. 7. The occurrence of idiomatic *spill* inside the relative clause and the noun *strings* satisfy the description in the same way they do in sentence (15a).

We can briefly summarize our implementation of Riehemann's analysis before closing this section. A grammar writer can specify an idiom as a description of a phrase with a non-empty C-WORDS list. In this specification, idiomatic words are related to their non-idiomatic base. There is no need to add lexical entries for those idiomatic words. Consequently, the idiom can be defined in one central spot, as a disjunct in a constraint on phrases with a non-empty C-WORDS list. In the analysis of a sentence, however, the idiomatic words combine just as ordinary words, which gives us the full flexibility of combinatorial accounts of idioms.

In this section, the leanness of our approach for integrating idioms into an HPSG grammar may have been lost in the technical details: embedding lexical rules inside a list-valued feature on a phrase, making use of a collocation mechanism, and, finally, even adding a layer of underspecification to the C-WORDS lists. It is important to take these points as what they are: a technical implementation that is fully defined and that can simply be taken for granted.

## 5 Conclusion

In this paper, we took a resuming view on the formal research on idioms, in particular within HPSG and related frameworks, focusing mainly on the divide between phrasal and combinatorial approaches. We noted a number of empirical advantages of combinatorial accounts over phrasal accounts, which is reflected in the dominance of combinatorial approaches in recent HPSG and SBCG analyses. On the other hand, such approaches seem conceptually problematic as they disregard the unit-like nature of idioms. Riehemann (2001) had already tried to mediate between these two positions, but her approach could not fully achieve this goal. Taking her insights and her analysis as our starting point, we propose a new phraseo-combinatorial approach that can be seen as a re-implementation of Riehemann's original ideas, extended to cover a wider range of data.

The resulting implementation is admittedly rather technical in its details. If one accepts the proposed constraints and the proposed lexical rule as part of the grammar, our approach allows for a straightforward encoding of idioms. It is combinatorial, but avoids separate lexical entries for uses of words inside idioms ("lexical explosion"). Instead, we can represent each idiom as a single, holistic unit. At the same time, we do not bind the characterization of an idiom to a particular constituent structure, but rather to the co-occurrence of lexical items with a particular meaning.

Let us briefly point to a potential extension of our theory. Egan (2008) discusses data as those in (16), which require the simultaneous presence of the idiomatic and the literal reading of the words constituting an idiom.[3]

(16) The strings we've been pulling to keep you out of prison are fraying badly. (Egan, 2008, 391)

To our knowledge, none of the other approaches that we have mentioned in this paper so far, be they phrasal or combinatorial, provide simultaneous access to the literal and the idiomatic reading. Findlay et al. (2019) is a first attempt towards a systematic understanding of the data. We have to leave an analysis

[3]Data on so-called *conjunction modification* such as *He bit his thirst-swollen tongue* (Ernst, 1981, 59) clearly are another case in which the literal and the idiomatic meaning of an expression are simultaneously used in the interpretation. They are discussed in detail in Bargmann et al. (2021).

of these data for future research. However, our approach could be a promising starting point as we assume the presence of both the literal and the idiomatic use of a word in the structure.

## References


Bargmann, Sascha, Berit Gehrke & Frank Richter. 2021. Modification of literal meanings in semantically non-decomposable idioms. In Berthold Crysmann & Manfred Sailer (eds.), *One-to-many relations in morphology, syntax, and semantics*, 245–279. Berlin: Language Science Press. doi:10.5281/zenodo.4729808.

Bargmann, Sascha & Manfred Sailer. 2018. The syntactic flexibility of semantically non-decomposable idioms. In Manfred Sailer & Stella Markantonatou (eds.), *Multiword expressions: Insights from a multi-lingual perspective*, 1–29. Berlin: Language Science Press. doi:10.5281/zenodo.1182587.

Chomsky, Noam. 1965. *Aspects of the theory of syntax*. Cambridge, Massachusetts: MIT Press.

Egan, Andy. 2008. Pretense for the complete idiom. *Noûs* 42(3). 381–409.

Ernst, Thomas. 1981. Grist for the linguistic mill: Idioms and 'extra' adjectives. *Journal of Linguistic Research* 1(3). 51–68.

Findlay, Jamie Y. 2019. *Multiword expressions and the lexicon*: University of Oxford dissertation. http://users.ox.ac.uk/~sjoh2787/findlay-thesis.pdf.

Findlay, Jamie Y., Sascha Bargmann & Manfred Sailer. 2019. Why the butterflies in your stomach can have big wings: combining formal and cognitive theories to explain productive extensions of idioms. Presentation at Europhras 2019, Santiago de Compostella.

Gazdar, Gerald, Ewan Klein, Geoffrey Pullum & Ivan Sag. 1985. *Generalized Phrase Structure Grammar*. Cambridge, Massachusetts: Harvard University Press.

Kay, Paul, Ivan A. Sag & Dan Flickinger. 2015. A lexical theory of phrasal idioms. Manuscript. www1.icsi.berkeley.edu/~kay/idiom-pdflatex.11-13-15.pdf.

Krenn, Brigitte & Gregor Erbach. 1994. Idioms and support verb constructions. In John Nerbonne, Klaus Netter & Carl Pollard (eds.), *German in Head-Driven Phrase Structure Grammar*, 365–396. Stanford: CSLI Publications.

Kuno, Susumu & Ken-ichi Takami. 2004. *Functional constraints in grammar: On the unergative-unaccusative distinction*. Amsterdam and Philadelphia: Benjamins.

Lascarides, Alex & Ann Copestake. 1999. Default representation in constraint-based frameworks. *Computational Linguistics* 25. 55–105.

Meurers, Walt Detmar. 2001. On expressing lexical generalizations in HPSG. *Nordic Journal of Linguistics* 24(2). 161–217. doi:10.1080/033258601753358605. Special issue on 'The Lexicon in Linguistic Theory'.

Michaelis, Laura A. 2019. Constructions are patterns and so are fixed expressions. In Beatrix Busse & Ruth Moehlig-Falke (eds.), *Patterns in language and linguistics: New perspectives on a ubiquitous concept*, vol. 104 Topics in Linguistics, 193–220. Berlin: Mouton de Gruyter.

Nunberg, Geoffrey, Ivan A. Sag & Thomas Wasow. 1994. Idioms. *Language* 70(3). 491–538.

Pollard, Carl & Ivan A. Sag. 1994. *Head-Driven Phrase Structure Grammar*. Chicago and London: University of Chicago Press.

Richter, Frank. 2019. Formal background. In Stefan Müller, Anne Abeillé, Robert D. Borsley & Jean-Pierre Koenig (eds.), *Head-Driven Phrase Structure Grammar: The handbook*, Berlin: Language Science Press. https://hpsg.hu-berlin.de/Projects/HPSG-handbook/PDFs/formal-background.pdf. Prepublished version.

Richter, Frank & Manfred Sailer. 2003. Cranberry words in formal grammar. In Claire Beyssade, Olivier Bonami, Patricia Cabredo Hofherr & Francis Corblin (eds.), *Empirical issues in formal syntax and semantics*, vol. 4, 155–171. Paris: Presses Universitaires de Paris-Sorbonne.

Richter, Frank & Manfred Sailer. 2004. Basic concepts of Lexical Resource Semantics. In Arne Beckmann & Norbert Preining (eds.), *ESSLLI 2003: Course material I*, vol. 5 Collegium Logicum, 87–143. Vienna: Kurt Gödel Society Wien.

Richter, Frank & Jan-Philipp Soehn. 2006. *Braucht niemanden zu scheren*: A survey of NPI licensing in German. In Stefan Müller (ed.), *Proceedings of the 13th International Conference on Head-Driven Phrase Structure Grammar, Varna 2006*, 421–440. http://cslipublications.stanford.edu/HPSG/2006/richter-soehn.pdf.

Riehemann, Susanne Z. 2001. *A constructional approach to idioms and word formation*: Stanford University dissertation.

Sag, Ivan A. 2012. Sign-Based Construction Grammar: An informal synopsis. In Hans C. Boas & Ivan A. Sag (eds.), *Sign-Based Construction Grammar*, 69–202. Stanford: CSLI Publications.

Sailer, Manfred. 2003. Combinatorial semantics and idiomatic expressions in Head-Driven Phrase Structure Grammar. Phil. Dissertation (2000). Arbeitspapiere des SFB 340. 161 Universität Tübingen. https://publikationen.uni-tuebingen.de/xmlui/handle/10900/46191.

Soehn, Jan-Philipp. 2006. *Über Bärendienste und erstaunte Bauklötze. Idiome ohne freie Lesart in der HPSG*. Frankfurt am Main: Peter Lang. Ph.D. thesis, Friedrich-Schiller-Universität Jena.

Soehn, Jan-Philipp. 2009. Lexical licensing in formal grammar. http://nbn-resolving.de/urn:nbn:de:bsz:21-opus-42035.

Wasow, Thomas, Ivan A. Sag & Geoffrey Nunberg. 1983. Idioms: An interim report. In S. Hattori & K. Inoue (eds.), *Proceedings of the XIIIth International Congress of Linguistics*, 102–115.

Webelhuth, Gert, Sascha Bargmann & Christopher Götze. 2018. Idioms as evidence for the proper analysis of relative clauses. In Manfred Krifka, Rainer Ludwig & Mathias Schenner (eds.), *Reconstruction effects in relative clauses*, 225–262. Berlin and Boston: de Gruyter.

# Case alternation in lexicalized grammar

Symon Stevens-Guille
The Ohio State University

Elena Vaikšnoraitė
The Ohio State University

Proceedings of the 28th International Conference on
Head-Driven Phrase Structure Grammar

Online (Frankfurt/Main)

Stefan Müller, Nurit Melnik (Editors)

2021

Frankfurt/Main: University Library

pages 205–219

Keywords: HPSG, HTLCG, case alternation

Stevens-Guille, Symon & Elena Vaikšnoraitė. 2021. Case alternation in lexicalized grammar. In Stefan Müller & Nurit Melnik (eds.), *Proceedings of the 28th International Conference on Head-Driven Phrase Structure Grammar, Online (Frankfurt/Main)*, 205–219. Frankfurt/Main: University Library. DOI: 10.21248/hpsg.2021.11.

**Abstract**

In this paper, we propose to extend the Przepiórkowski's 2000 analysis of Long Distance Genitive of Negation to the same phenomenon in Lithuanian. We discuss the features that have their origin in Categorial Grammar. We then develop a novel analysis of the case alternation in Categorial Grammar incorporating features of the HPSG analysis. The two accounts show a surprising convergence in basic assumptions and predictions.

# 1 Introduction

This paper presents two analyses of genitive-accusative case alternation in Lithuanian in two lexicalist grammars: Head-driven Phrase Structure Grammar (HPSG) and Hybrid Type Logical Categorial Grammar (HTLCG). In Lithuanian, a direct object of a transitive verb is canonically accusative case marked. In the presence of verbal negation *ne*, the same argument surfaces with genitive case marking instead of accusative. This phenomenon in Balto-Slavic linguistics is called the Genitive of Negation.

(1) a. Vaiva nusipirko knyg-ą / *knyg-os.
Vaiva.NOM buy.PST.3 book-ACC book-GEN
'Vaiva bought a book.'

b. Vaiva ne-nusipirko *knyg-ą / knyg-os.
Vaiva.NOM neg-buy.PST.3 book-ACC book-GEN
'Vaiva didn't buy a book.'

Developing an empirically adequate and theoretically sound analysis of this case alternation has long animated linguists working on Balto-Slavic languages. In this paper, we propose that an analysis of Polish Genitive of Negation by Przepiórkowski (2000) can be extended to Lithuanian. Przepiórkowski's 2000 analysis is implemented in HPSG. We show that the HPSG analysis extends to Lithuanian. We highlight those components in the analysis that are historically related to developments in Categorial Grammar (CG). Subsequently, we propose an account in a contemporary Categorial Grammar, emphasizing the components of the account that are inspired by HPSG. The upshot we argue is a convergence between proof-theoretic and model-theoretic syntactic accounts, which suggests the potential for a renewed exchange of ideas between HPSG and CG communities.

In Section 2, we introduce the basic facts about Genitive of Negation in Lithuanian. In 3, we briefly summarize Przepiórkowski's 2000 analysis of Genitive of Negation in Polish and show how it can capture the Lithuanian data. Then we introduce Hybrid Type Logical Categorial Grammar (HTLCG) and propose an account of the data. Subsequently, we show how limitations in the CG analysis can be rectified by borrowing concepts from HPSG. Section 4 concludes the paper.

## 2 Genitive of Negation in Lithuanian

In this section we describe Genitive of Negation in Lithuanian. Genitive of Negation in Lithuanian is said to be obligatory. All normally accusative case marked objects obligatorily occur in the genitive in the presence of verbal negation, which in Lithuanian is realized as a prefix *ne*. Non-accusative case marked objects do not participate in the case alternation as shown in 2. For example, the verb *džiaugtis* 'to rejoice' selects for an instrumental case-marked NP. In the presence of verbal negation case-marking on *pergale* 'victory' does not change.

(2) a. Vaiva džiaugėsi pergal-e / *pergal-ės.
Vaiva.NOM rejoice.PST.3 victory-INST victory-GEN
'Vaiva rejoiced in victory.'

b. Vaiva ne-sidžiaugė pergal-e / *pergal-ės.
Vaiva.NOM neg-rejoice.PST.3 victory-INST victory-GEN
'Vaiva didn't rejoice in victory.'

Genitive of Negation is clause-bound as shown in 3.

(3) Vaiva ne-sakė, kad nusipirko knyg-ą / *knyg-os.
Vaiva.NOM neg-say.PST.3 that buy.PST.3 book-ACC book-GEN
'Vaiva didn't say that she bought a book.'

While Genitive of Negation is clause-bound, it is not limited to local contexts. In Long Distance Genitive of Negation, an argument of an infinitival verb occurs in the genitive when the selecting verb is negated. A sentence containing a subject control verb is used as an example in 4.

(4) a. ? Vaiva ne-pažadėjo nupirkti šit-ą knyg-ą.
Vaiva.nom neg-promise.pst.3 buy.inf this-acc book-acc
'Vaiva didn't promise to buy this book.'

b. Vaiva ne-pažadėjo nupirkti šit-os knyg-os.
Vaiva.nom neg-promise.pst.3 buy.inf this-gen book-gen
'Vaiva didn't promise to buy this book.'

While Local Genitive of Negation is obligatory, Long Distance Genitive of Negation is often optional. There is at present a dearth of information concerning the factors that influence the choice of case (though see Arkadiev 2016).

Long Distance Genitive of Negation can in principle affect multiple direct objects. In 5, negation on the matrix verb *ne-išmokė* 'didn't teach' triggers genitive case on its direct object vaikų 'children' and also on the embedded object of the infinitival verb *tvoros* 'fence'.

(5) Tėvai ne-išmokė vaik-ų / *vaik-us dažyti
parent.NOM NEG−teach.PST3 children-GEN children-ACC paint.inf
tvor-os / ?tvor-ą.
fence-GEN fence-ACC
'Parents did not teach their children to paint the fence.' (Arkadiev, 2016, 86)

An emprically adequate analysis of Genitive of Negation in Lithuanian thus needs to capture the following three empirical generalizations:

(6) Empirical generalizations
   a. Local Genitive of Negation is obligatory
   b. Long distance Genitive of Negation is optional
   c. Long distance Genitive of Negation can trigger genitive case on multiple (non-)local arguments

# 3 Analyses

In this section, we introduce two analyses of the Genitive of Negation aiming to capture the empirical generalizations in 6.

## 3.1 Przepiórkowski (2000)'s analysis in HPSG

We propose that Przepiórkowski (2000)'s analysis of Genitive of Negation in Polish can be extended to Lithuanian. This result is expected given that Lithuanian patterns with Polish in that local Genitive of Negation is obligatory.

We adopt Przepiórkowski (2000)'s case division and case type hierarchy, which we present in 7. Notice that according to these assumptions, Polish and consequently Lithuanian has three structural cases: nominative, accusative and genitive.

(7) Case division:
   a. Structural cases: snom, sacc, sgen
   b. Lexical cases: lacc, lgen, ldat, lins, lloc

Lexical entries of predicates are assumed to distinguish between a structural argument and a lexical argument as shown in the toy lexicon in 8.

(8) a. *nupirkti* 'to buy': [AGR-ST ⟨NP[str], NP[str] ⟩ ]
   b. *didžiuotis* 'to be proud of': [AGR-ST ⟨NP[STR], NP[LINS]⟩]

Structural case is resolved to a particular morphological case by the (simplified) set of constraints in 9 and 10.

(9) $[\text{NEG}-,\text{ARG-ST}[\boxed{1}_{nelist} \oplus \langle[\text{CASE } str]\rangle \oplus \boxed{2}_{list}]] \rightarrow$
$[\text{ARG-ST}[\boxed{1} \oplus \langle[\text{CASE } acc]\rangle \oplus \boxed{2}]]$

(10) $[\text{NEG+},\text{ARG-ST}[\boxed{1}_{nelist} \oplus \langle[\text{CASE } str]\rangle \oplus \boxed{2}_{list}]] \rightarrow$
$[\text{ARG-ST}[\boxed{1} \oplus \langle[\text{CASE } gen]\rangle \oplus \boxed{2}]]$

The rule in (9) ensures that the structural case is resolved to accusative when the NP is selected by something with the neg− property. More precisely, it states that for any non negated verbal category its non-initial structural argument must bear accusative case. The rule in (10) ensures that the structural case is resolved to genitive when the NP is selected by something with the NEG+ property. These sets of assumptions provide a simple analysis of Local Genitive of Negation as shown in Figure 1.

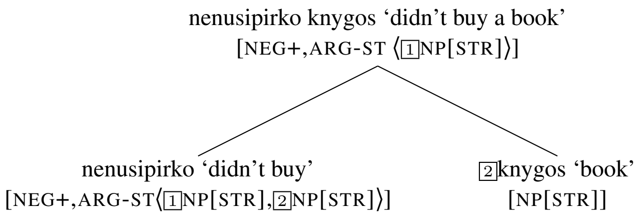



Figure 1: Local Genitive of Negation in sentence 1 in HPSG

Now turning to the optional Long Distance Genitive of Negation. Accusative case in the infinitival complement is accounted for straightforwardly as shown in Figure 2.

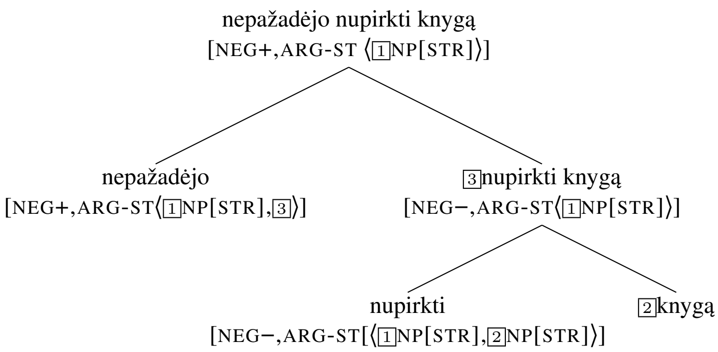



Figure 2: Local accusative in the infinitival complement in HPSG

To acccount for the genitive case in the infinitival complement further assumptions need to be made. In Przepiórkowski's 2000 analysis, the verb cluster consisting of a verb and its infinitival complement are analyzed in terms of argument inheritance. In other words, there is object raising to the complement of a complex predicate. In Figure 3, while *nupirkti* 'to buy' selects an NP to form an infinitive, the complement of *nepažadėjo* 'didn't promise' is only required to be headed by an infinitive missing a subject and including a (possibly empty) list of complements. When *nepažadėjo* 'didn't promise' selects the infintive *matyti* it subsequently inherits the selection of *tom-o* by inheriting the list of complements of the infinitive.

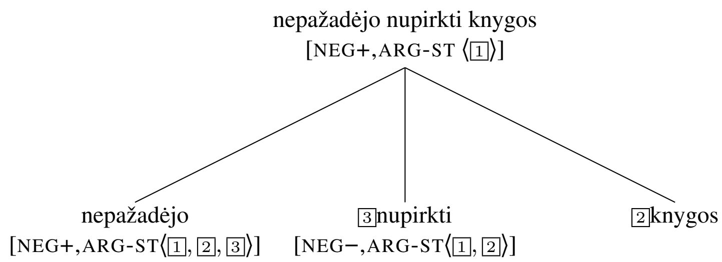



Figure 3: Long Distance Genitive of Negation in HPSG

Since in principle multiple arguments can raise, this analysis captures the fact that Long distance Genitive can trigger genitive case on multiple (non-)local arguments.

Przepiórkowski (2000)'s analysis thus captures all the empirical generalizations listed in 6.

## 3.2 HTLCG

HTLCG (Kubota, 2014; Moot & Stevens-Guille, 2019, 2020; Kubota & Levine, 2020) is a lexical theory of grammar based on linear logic (Girard, 1987). HTLCG differs from the standard Lambek Categorial Grammar $\mathbb{L}$ (Moortgat, 1997) in dividing syntax between the 'pheno' and 'tecto' components–roughly word order and argument structure. Moreover, it distinguishes directed and undirected implication. A sentence is generated by the grammar if and only if there is a proof of the proposition S(entence) with the premises corresponding to the lexical entries.

HTLCG lexical entries consist of tuples of pheno term, tecto type and semantic term. The tecto type reduces to a linear logic formula, the type of which can be recovered in the linear lambda calculus by the Curry-Howard Correspondence. Both the pheno and semantic components of the rules therefore correspond to inferences in the linear lambda calculus, reduction of which yields propositions in some target logic.[1] The target logic of our semantics is just first order logic. The target language of our pheno is likewise just a logic over strings or structures. The logic underlying the grammar is studied in depth in (Moot & Stevens-Guille, 2019, 2020).

Unlike earlier work in HTLCG, we import the universal quantifier from first order multiplicative linear logic (MILL1) into the logic of HTLCG. While the first order extension slightly complicates the underlying logic, we will mostly forego discussion of matters of logic, restricting ourselves to presenting the theory for which the quantifier is invoked.[2]

[1]Note however that since types from $\mathbb{L}$ correspond to terms of type *s*(tring) or *s*tructure, the directed implication introduction rule, unlike the the undirected implication introduction rule, doesn't correspond to introducing a function in the pheno.

[2]We are not the first to employ MILL1 to extend $\mathbb{L}$. Moot & Piazza (2001) show how MILL1 can be used to account for a wide variety of phenomena that are otherwise difficult to account for

In the first order version of HTLCG, case is uniformly represented by an argument of N or NP which expones it. We provide a lexicon in Table 1.

| pheno | tecto | semantics |
| --- | --- | --- |
| $saruno^s$ | NP(gen) | $saruno^e$ |
| $vaiva^s$ | NP(nom) | $vaiva^e$ |
| $nori^s$ | (NP(nom)\S)/(NP(nom)\INF) | $\lambda P^{e \to t} x^e.want(x, P(x))$ |
| $pamatyti^s$ | (NP(nom)\INF)/NP(acc) | $\lambda x^e y^e.see(y, x)$ |
| $pamate^s$ | (NP(nom)\S)/NP(acc) | $\lambda x^e y^e.see(y, x)$ |

Table 1: HTLCG Lexicon.

We first introduce the directed fragment of HTLCG in Gentzen-style natural deduction, which is a pheno-decorated version of the directed implications of $\mathbb{L}$ with the addition of the distinction between Lex and Id, on which see (Moot & Stevens-Guille, 2019, 2020). These rules are shown in Figure 3.2.

$$\frac{}{p^s : w \vdash M ; A}\text{Lex} \qquad \frac{}{x^\alpha : A \vdash x^\alpha : A}\text{Id}$$

$$\frac{\Gamma \vdash M^s ; B/A \qquad \Delta \vdash N^s ; A}{\Gamma, \Delta \vdash (M + N)^s : B}/E \qquad \frac{\Delta \vdash N^s : A \qquad \Gamma \vdash M^s : A\backslash B}{\Delta, \Gamma \vdash (N + M)^s : B}\backslash E$$

$$\frac{\Gamma, p^s : A \vdash (M + p)^s : B}{\Gamma \vdash M^s : B/A}/I \qquad \frac{p^s : A, \Gamma \vdash (p + M)^s : B}{\Gamma \vdash M^s : A\backslash B}\backslash I$$

Figure 4: Gentzen-Style ND Inference Rules for directed HTLCG

We will omit the left side of the the Lex rule in the proofs to follow, since it is required just for technical reasons. In the syntactic proofs we will implicitly reduce the pheno terms. In the semantic term reductions we will perform $\beta$ reduction on the fly, too, but mark it explicitly in the rule.

To get a sense of how the grammar works, we provide the syntactic proof of *Vaiva pamatė Šarunął* ‘Vaiva saw Sarunas’ in Figure 5 followed by the corresponding semantic proof in Figure 6. These proofs suffice to show how word order and case is determined in the theory; the semantic proof mirrors the syntactic proof,

in $\mathbb{L}$. In fact, adding the quantifiers of MILL1 to multiplicative linear logic doesn't change the complexity of deciding provability from the multiplicative propositional fragment: deciding MILL1 is NP-complete. One further point is that the Curry-Howard Correspondence for quantifiers is dependent types. In the interests of keeping exposition of the logic to a minimum we therefore suppress the rules for ∀, rolling uses of the elimination rule (which is the only rule we use) into some uses of the implication elimination rule (effectively implementing universal modus ponens). But nothing prevents us from constructing the proofs without suppressed rules.

$$\dfrac{\dfrac{}{\vdash vaiva^{e} \,;\, NP(nom)}\,\text{Lex} \qquad \dfrac{\dfrac{}{\vdash pamate^{s} \,;\, (NP(nom)\backslash S)/NP(acc)}\,\text{Lex} \qquad \dfrac{}{\vdash saruna^{s} \,;\, NP(acc)}\,\text{Lex}}{\vdash pamate + saruna \,;\, NP(nom)\backslash S}\,/E}{\vdash vaiva + pamate + saruna \,;\, S}\,\backslash E$$

Figure 5: Lithuanian transitive in HTLCG

$$\dfrac{\dfrac{}{\vdash vaiva^{e}}\,\text{Lex} \qquad \dfrac{\dfrac{}{\vdash \lambda x^{e} y^{e}.see(y,x)}\,\text{Lex} \qquad \dfrac{}{\vdash saruna^{e}}\,\text{Lex}}{\vdash \lambda y^{e}.see(y, saruna)}\,app,\beta}{\vdash see(vaiva, saruna)}\,app,\beta$$

Figure 6: Semantic term for Lithuanian Transitive in HTLCG.

with the leaves of the tree corresponding to the semantic and syntactic content of the lexical items.

### 3.2.1 Negation

The centerpiece of our theory of Genitive of Negation is the lexical entry for negation. The lexical entry scheme for negation, like for conjunction and disjunction, is polymorphic.

(11) $\lambda t^{(s\to)_n s} q^{s} ... q_n^{s}.ne + t(q...q_n)$;
$\forall x.T[x := f(x)] \upharpoonright T$;
$\lambda P^{e\to(e\to)_n t} z^{e} ... z_n^{e} x^{e}.\neg P(x, z...z_n)$

Here T is a meta-variable in the style of Steedman (2000) over:

(12) {NP(nom)\S$^{int}$, (NP(nom)\S)$\upharpoonright$E, (NP(nom)\INF)$\upharpoonright$E}

E is a meta-variable over:

(13) {NP(x), NP(x)$\upharpoonright$NP(x)$_1$...$\upharpoonright$NP(x)$_{n\geq 1}$}

It is worth noting that the since the number of recursively embedded clauses to a negated verb is bounded in practice (if not in principle) and since this bound limits the number of NPs which could be 'raised' to be selected by the complement of *ne*, one could dispense with the ∀ completely, simply enumerating the set of possible lexical entries.

The most important part of the entry for *ne* is the axiom restricting *f*:

(14) $\forall x.(x \neq acc \to f(x) = x) \wedge (x = acc \to f(x) = gen)$

The axiom ensures the function *f* is the identity function on every input but acc, for which it returns gen.

$$\dfrac{\dfrac{}{\vdash vaiva^{s}}\,\text{Lex} \qquad \dfrac{\dfrac{}{\vdash nori^{s} \,;\, (NP(nom)\backslash S)/(NP(nom)\backslash INF)}\,\text{Lex} \qquad \dfrac{\dfrac{}{\vdash pamatyti^{s} \,;\, (NP(nom)\backslash INF)/NP(acc)}\,\text{Lex} \qquad \dfrac{}{\vdash saruna^{s} \,;\, NP(acc)}\,\text{Lex}}{\vdash pamatyti + saruna \,;\, NP(nom)\backslash inf}\,/E}{\vdash nori + pamatyti + saruna \,;\, VP}\,/E}{\vdash vaiva + nori + pamatyti + saruna \,;\, S}\,\backslash E$$

Figure 7: Embedded acc from *matyti* in HTLCG

$$\dfrac{\dfrac{}{\vdash vaiva}\,\text{Lex} \qquad \dfrac{\dfrac{}{\vdash \lambda P^{e\to t}x^{e}.want(x, P(x))}\,\text{Lex} \qquad \dfrac{\dfrac{}{\vdash \lambda x^{e}y^{e}.see(y, x)}\,\text{Lex} \qquad \dfrac{}{\vdash sarunas^{e}}\,\text{Lex}}{\vdash \lambda y^{e}.see(y, sarunas)}\,app, \beta}{\vdash \lambda x^{e}.want(x, see(x, sarunas))}\,app, \beta}{\vdash want(vaiva, see(vaiva, sarunas))}\,app, \beta$$

Figure 8: Semantic term for Figure 7.

Before seeing how *ne* contributes to solving (long) GN, we derive the embedded accussative of a complex predicate in which *ne* isn't present. Complex predicates are modelled in the spirit of Kubota (2014)'s account of Japanese complex predicates in CG. In the proofs in Figure 7 and Figure 8 the embedded infinitive is selected by the higher verb *nori*, which supplies the embedded verb with its subject in the semantics; the case of the embedded object is determined entirely by the embedded verb.

### 3.2.2 Full HTLCG

Full HTLCG is obtained by adding the following connective $\upharpoonright$ and its inference rules in Figure 9. We can add the rule for ∀E and the derived rule of universal modus ponens, too, but in keeping with our earlier comments, we suppress these rules and their exposition for space.

$$\dfrac{\Gamma \vdash M^{\alpha\to\beta} \,;\, A \upharpoonright B \qquad \Delta \vdash N^{\alpha} \,;\, B}{\Gamma, \Delta \vdash (MN)^{\beta} \,:\, A}\,\upharpoonright E$$

$$\dfrac{\Gamma, x^{\alpha} \,:\, A \vdash M^{\beta} \,:\, B}{\Gamma \vdash (\lambda x.M)^{\alpha\to\beta} \,:\, B \upharpoonright A}\,\upharpoonright I$$

Figure 9: ND for $\upharpoonright$.

Given the foregoing rules, we can now derive the Genitive of Negation. We first present the syntactic proof of local Genitive of Negation in Figure 10. The semantic proof corresponding to the syntactic proof in Figure 10 is found in 11. Note that, in the interests of intelligibility, we suppress the tecto types in some Lex rules, since these can be recovered from the tectos which combine with them–the tecto types are further present in the Figure 1. We suppress corresponding terms in the

$$\dfrac{\dfrac{}{\vdash vaiva^s \,;\, NP(nom)}\,\text{Lex} \qquad \dfrac{\dfrac{\dfrac{}{\vdash ne^{s\to s\to s}}\,\text{Lex} \qquad \dfrac{\dfrac{\dfrac{}{\vdash pamate^s \,;\, (NP(nom)\backslash S)/NP(acc)}\,\text{Lex} \qquad \dfrac{}{y^s \,;\, NP(acc) \vdash y^s \,;\, NP(acc)}\,\text{Id}}{y^s \,;\, NP(acc) \vdash pamate + y \,;\, NP(nom)\backslash S}\,/E}{\vdash \lambda y^s.pamate + y \,;\, (NP(nom)\backslash S) \upharpoonright NP(acc)}\,\upharpoonright I}{\vdash \lambda t^s.ne + pamate + t \,;\, (NP(nom)\backslash S) \upharpoonright NP(gen)}\,\forall \upharpoonright E \qquad \dfrac{}{\vdash saruno^s \,;\, NP(gen)}\,\text{Lex}}{\vdash ne + pamate + saruno \,;\, NP(nom)\backslash S}\,\upharpoonright E}{\vdash vaiva + ne + pamate + saruno \,;\, S}\,\backslash E$$

Figure 10: Gen from *ne-pamatė* ‘didn’t see’ in HTLCG

$$\dfrac{\dfrac{}{\vdash vaiva^e}\,\text{Lex} \qquad \dfrac{\dfrac{\dfrac{}{\vdash \lambda P^{e\to e\to s} y^e x^e.\neg(P(x,y))}\,\text{Lex} \qquad \dfrac{\dfrac{\dfrac{}{\vdash \lambda y^e x^e.see(x,y)}\,\text{Lex} \qquad \dfrac{}{z^e \vdash z^e}\,\text{Id}}{z^e \vdash \lambda x^e.see(x,z)S}\,app,\beta}{\vdash \lambda z^e x^e.see(x,z)}\,abs}{\vdash \lambda y^e x^e.\neg(see(x,y))}\,app,\beta \qquad \dfrac{}{\vdash saruno^e}\,\text{Lex}}{\vdash \lambda x^e.\neg(see(x,saruno))}\,app,\beta}{\vdash \neg(see(vaiva,saruno))}\,app,\beta$$

Figure 11: Semantic term for Figure 10

semantic proofs, simply writing the word which denotes the term and its type. The important step of the proof is $\forall \upharpoonright E$, the conclusion of which converts the $NP(acc)$ argument of the verb complex to $NP(gen)$, thereby licensing composition with the ‘raised’ genitive object.

With the extended version of HTLCG, we now step through the proof of long Genitive of Negation in *Vaiva nenori pamatyti Šarūno* ‘Vaiva doesn’t want to see Sarunas’. Figure 12 shows the syntactic proof of long Genitive of Negation by raising of the embedded object to the negated verb complex. The corresponding semantic proof of the syntactic proof in Figure 12 is represented in Figure 13.

## 3.3 Interim conclusions

Lithuanian Genitive of Negation can be given an off-the-shelf analysis in HPSG by adopting the theory developed for Polish Genitive of Negation in Przepiórkowski (2000). The HPSG theory makes significant use of function composition, which is a theorem of HTLCG. Function composition underlies the HPSG account of complex predicates, where complex predicates are the source of long GN. We have

$$\dfrac{\dfrac{}{\vdash vaiva^s}\,\text{Lex} \qquad \dfrac{\dfrac{\dfrac{}{\vdash ne^{s\to s\to s}}\,\text{Lex} \qquad \dfrac{\dfrac{\dfrac{}{\vdash nori^s}\,\text{Lex} \qquad \dfrac{\dfrac{}{\vdash pamatyti^s}\,\text{Lex} \qquad \dfrac{}{u^s \,;\, NP(acc) \vdash u^s \,;\, NP(acc)}\,\text{Id}}{u^s \,;\, NP(acc) \vdash pamatyti + u \,;\, NP(nom)\backslash inf}\,/E}{u^s \,;\, NP(acc) \vdash nori + pamatyti + u \,;\, NP(nom)\backslash S}\,/E}{\vdash \lambda u^s.nori + pamatyti + u \,;\, (NP(nom)\backslash S) \upharpoonright NP(acc)}\,\upharpoonright I}{\vdash \lambda q^s.ne + nori + pamatyti + q \,;\, (NP(nom)\backslash S) \upharpoonright NP(gen)}\,\forall, \upharpoonright E \qquad \vdash saruno^s}{\vdash ne + nori + pamatyti + saruno \,;\, NP(nom)\backslash S}\,\upharpoonright E}{\vdash vaiva + ne + nori + pamatyti + saruno \,;\, S}\,\backslash E$$

Figure 12: Gen from *ne-nori* in HTLCG

$$
\dfrac{\dfrac{}{\vdash vaiva^{e}}\,\text{Lex} \qquad \dfrac{\dfrac{\dfrac{}{\vdash \lambda P^{e\to e\to t} z^{e} x^{e}.\neg(P(z,x))}\,\text{Lex} \qquad \dfrac{\dfrac{\dfrac{}{\vdash \lambda P^{e\to t} x^{e}.want(x, P(x))}\,\text{Lex} \qquad \dfrac{\dfrac{}{\vdash \lambda x^{e} y^{e}.see(y,x)}\,\text{Lex} \qquad \dfrac{}{z \vdash z}\,\text{Id}}{z \vdash \lambda y^{e}.see(y,z)}\,app,\beta}{z \vdash \lambda x^{e}.want(x, see(x,z))}\,app,\beta}{\vdash \lambda z^{e} x^{e}.want(x, see(x,z))}\,abs}{\vdash \lambda z^{e} x^{e}.\neg want(x, see(x,z))}\,app,\beta \qquad \dfrac{}{\vdash saruno^{e}}\,\text{Lex}}{\vdash \lambda x^{e}.\neg want(x, see(x, saruno))}\,app,\beta}{\vdash \neg want(vaiva, see(vaiva, saruno))S}\,app,\beta
$$

Figure 13: Semantic term for Figure 12

developed an HTLCG account in which complex predicates are the source of long Genitive of Negation too. This points to a convergence between the two theories.

The HTLCG account is successful in capturing Lithuanian Genitive of Negation due to the presumptions that $(N)P$ can be modelled in terms of a property of case.[3] The property view of categories is underdeveloped in the CG literature, perhaps in part due to there being no standard account of features (Kubota, 2021). But the property view could be extended to properties of sequences of arguments corresponding to features in HPSG; in fact we will shortly argue that further features borrowed from HPSG improve the HTLCG account. Perhaps the use of features in the present work will spur renewed interest in incorporating concepts from HPSG–which surely enjoys the most developed account of features among rigorous grammar formalisms–into CG.

Despite the proposed convergence between HPSG and HTLCG, both accounts of (long) GN, without further restrictions, overgenerate.

The following schemes represent optional embedded acc/gen:

(15) NP(nom) ne-V NP(gen) inf NP(acc)

(16) NP(nom) ne-V NP(gen) inf NP(gen)

The HTLCG theory derives this scheme. However, by virtue of deriving the scheme above, which involves uniform licensing of $\upharpoonright$I, the theory erroneously derives the following scheme:

(17) NP(nom) ne-V NP(acc) X.

Where X is schematic for one of the following:

(18) NP(obl)

(19) NP(y) INF NP({acc, gen})

(20) INF NP({acc, gen})

(21) NP(y) INF NP({acc, gen}) NP(obl)

(22) INF NP({acc, gen}) NP(obl)

[3]It should be obvious that agreement could be modelled by means of the property view of categories too.

The schemes are derived due to the fact that the NP being selected by the *ne*-V complex doesn't need to be the NP adjacent to the *ne*-V complex; it could be some embedded NP with case of any type. However, this issue can be resolved by incorporating a feature from the HPSG account.

Before proceeding to fixing the HTLCG account, we note some limits of both the HPSG and HTLCG accounts. Both accounts predict that embedded acc and gen are in free variation. For Lithuanian this predicts unattested acc, since in some environments embedded gen is overwhelmingly preferred (Arkadiev, 2016).

More difficult for the HPSG account is the following erroneous scheme:[4]

(23) NP(nom) V ne-INF NP(acc)

This scheme is erroneouly generated by building V *ne*-INF into a complex predicate and 'raising' the embedded NP, which will then get acc from V.
Przepiórkowski (2000) noticed this issue and correctly ruled it out by restricting raising to [NEG−] environments. Thus, if the lower verb is [NEG+], the embedded object is forced to be resolved with respect to *ne*-INF. This restriction is implemented by invoking raising features:

(24) $[\text{NEG+}, \text{ARG-ST}[\langle\boxed{0}\rangle \oplus \boxed{1}]] \rightarrow \boxed{1} = \text{list}[\text{XP}^{-}]$

In brief, the head with the property [NEG+] requires its arguments (except the first) to be of the form $\text{XP}^{-}$ where the feature - means the argument is raised no further.

Moreover, raising features prevent case resolution mismatch between an embedded verb and the head which selects it to form a negated complex predicate. The resulting resolution principles then get the following form:

(25) $[\text{NEG-}, \text{ARG-ST}[\boxed{1}_{nelist} \oplus \langle[\text{CASE } str]^{-}\rangle \oplus \boxed{2}_{list}]] \rightarrow [\text{ARG-ST}[\boxed{1} \oplus \langle[\text{CASE } acc]\rangle \oplus \boxed{2}]]$

(26) $[\text{NEG+}, \text{ARG-ST}[\boxed{1}_{nelist} \oplus \langle[\text{CASE } str]^{-}\rangle \oplus \boxed{2}_{list}]] \rightarrow [\text{ARG-ST}[\boxed{1} \oplus \langle[\text{CASE } gen]\rangle \oplus \boxed{2}]]$

Witko (2008) objects to these techniques. According to him, Przepiorkowski's use of clitic climbing data to justify the prohibition on raising from negated VPs isn't robust. However, it is worth noting that Witkos develops these arguments from the position of the Minimalist Program; in his own framework every dependency, whether long or local, produced by 'agree' or 'merge', is due to features. Consequently, Witkos's criticism is pyrrhic, since his own theory relies on non-standard distinctions between complete and incomplete (double) probes and features including +MULTIPLE, which just serve to instruct probes to multiple agree.

Witkos's features do not seem superior to raising features, which are, moreover, common to Minimalist syntax in the form of feature deficiencies. Indeed, Witkos

[4]This scheme is not produced by HTLCG since in HTLCG ne requires its complement–here INF–to be missing some object.

uses such feature deficiencies to license multiple probes in long GN.[5] While we concur with Przepiórkowski (2000) that his prohibition on raising doesn't seem to follow from other principles, we do not consider this too troubling; though we do consider whether it could be reduced to some other property of the grammar a research topic worth studying.

Before closing this section, it is worth noting a confound with the data. Despite the robust judgement that local Genitive of Negation is required, recent corpus work shows that some dialects of Lithuanian don't uniformly enforce local Genitive of Negation (Kozhanov, 2017). Consequently, the problems of over-generation could be tempered by restricting attention to particular dialects of Lithuanian. Modelling the dialects studied by Kozhanov would require generating acc even in local Genitive of Negation environments. In the present work we restrict attention to just those dialects in which local Genitive of Negation is required.

### 3.4 Revised HTLCG theory

The entire overgeneration paradigm of HTLCG is eliminated if, following Przepiórkowski (2000), raising features are introduced. Then we can invoke the following principles concerning the selection restrictions of types of predicates:

(27) Every non-oblique NP selected by the finite verb includes the argument $-$ for 'doesn't raise'.

(28) Every non-oblique NP selected by the infinitive, except possibly the subject cf. (Przepiórkowski, 2000, p.151), includes the argument + for 'can raise'.

Given the foregoing principles, we provide the following new definition for *ne*:

(29)
$$\begin{aligned}&\lambda t^{(s\to)_n s} q^s ... q_n^s . ne + t(q...q_n);\\ &\forall x.T[x := f(x)] \upharpoonright T;\\ &\lambda P^{e\to(e\to)_n t} z^e ... z_n^e x^e . \neg P(x, z...z_n)\end{aligned}$$

Here T is the following:

(30) $\{$NP(nom,$-$)\S$^{int}$, (NP(nom,$-$)\S)$\upharpoonright$E, (NP(nom,$-$)\INF)$\upharpoonright$NP(x,+)$\}$

E is the following:

(31) $\{$NP(x,$-$), NP(x,$-$)$\upharpoonright$NP(x,+)$_1$...$\upharpoonright$NP(x,+)$_{n\geq 1}\}$

[5] It is only by the embedded infinitive missing its case feature that long Genitive of Negation is produced. When the embedded infinitive is provided this feature by the lexicon, long Genitive of Negation is blocked (Witko, 2008, fn.38). Moreover, blocking long Genitive of Negation requires the higher probe to be $-$MULTIPLE. Witkos must further provide further evidence for the existence of the parameter he presumes concerning whether languages license multiple probing–without such evidence there is no principled reason why the multiple probing technology he invokes is present in Polish or seemingly restricted to the genitive dependency.

The distribution for (long) Genitive of Negation given by this version of *ne* is i) finite GN, ii) finite Genitive of Negation with embedded long GN, iii) infinitive Genitive of Negation with the higher verb selecting *ne*-INF. This suffices to predict the correct distribution of GN: it cannot cross sentence boundaries; long Genitive of Negation is possible; multiple Genitive of Negation is possible.[6]

## 4 Conclusion

We have exemplified the pattern of (long) Genitive of Negation in Lithuanian, providing two accounts of the phenemenon. Since the HPSG account we employ is developed for Polish, the applicability of the account to Lithuanian provides further evidence for the robustness of Przepiórkowski (2000)'s theory of case. While Lithuanian and Polish are both Balto-Slavic languages, their respective positions in different subfamilies raise questions concerning the processes that produced such similar phenomena. The immediate sister languages of Polish have only optional GN, while Latvian, one of the few other Baltic languages, employs Genitive of Negation pretty much exclusively in emphatic contexts (Arkadiev, 2016).[7] In future work we hope to discuss the cross-linguistic typology of Genitive of Negation in greater depth.

The accounts we develop here suggest a surprising convergence between HPSG and HTLCG. This convergence muddies the distinction sometimes made between model-theoretic and proof-theoretic grammar formalisms. We argue that the distinction between these perspectives, while surely useful, can obscure the similarity between the respective practices of constructing grammar fragments. Components of the HPSG account of (long) Genitive of Negation borrow from categorial grammar, while the HTLCG account proposed here very explicitly borrows from the HPSG account.

We close with an open problem: the raising features of both HPSG and, by extension, HTLCG are somewhat unsatisfactory–we have not at present found a way to motivate them or the principles which depend on them on purely empirical grounds. Future work will explore whether these features are dispensable, whether they go proxy for some property of the languages not yet noticed, or whether they just reflect the highly specific distribution of GN.

## References

Arkadiev, Peter. 2016. Long-distance genitive of negation in Lithuanian. In *Argument realization in Baltic*, 37–81. Amsterdam: John Benjamins.

[6]We have not discussed how to treat the negation over infinitives which embed infinitives, but this distribution is quite difficult to judge and currently underdocumented.

[7]Slovene is the closest Slavic language we know of which patterns with Polish in Genitive of Negation distribution, while Arkadiev suggests Latgalian, another Baltic language, patterns with Lithuanian in Genitive of Negation distribution (Arkadiev, 2016).

Girard, Jean-Yves. 1987. Linear logic. *Theoretical computer science* 50(1). 1–101.

Kozhanov, K. 2017. Studying variation in case marking: The genitive of negation in aukštaitian dialects of lithuanian. *Baltic Linguistics* 8. 97–114.

Kubota, Yusuke. 2014. The logic of complex predicates. *Natural Language & Linguistic Theory* 32(4). 1145–1204.

Kubota, Yusuke. 2021. HPSG and Categorial Grammar. In Stefan Müller, Anne Abeillé, Robert D. Borsley & Jean-Pierre Koenig (eds.), *Head-Driven Phrase Structure Grammar: The handbook* Empirically Oriented Theoretical Morphology and Syntax, Berlin: Language Science Press.

Kubota, Yusuke & Robert D Levine. 2020. *Type-logical syntax*. Cambridge, MA: MIT Press.

Moortgat, Michael. 1997. Categorial type logics. In Johan van Benthem & Alice ter Meulen (eds.), *Handbook of logic and language*, 93–177. Amsterdam: North-Holland.

Moot, Richard & Mario Piazza. 2001. Linguistic applications of first order intuitionistic linear logic. *Journal of Logic, Language and Information* 10(2). 211–232.

Moot, Richard & Symon Stevens-Guille. 2020. Logical foundations for Hybrid Type-Logical Grammars. *arXiv preprint arXiv:2009.10387* .

Moot, Richard & Symon Jory Stevens-Guille. 2019. Proof-theoretic aspects of Hybrid Type-Logical Grammars. In Raffaella Bernardi, Greg Kobele & Sylvain Pogodalla (eds.), *Formal grammar*, 84–100. Berlin, Heidelberg: Springer.

Przepiórkowski, Adam. 2000. Long distance genitive of negation in Polish. *Journal of Slavic Linguistics* 8(1/2). 119–158.

Steedman, Mark. 2000. *The syntactic process*. Cambridge, MA: MIT press.

Witko, Jacek. 2008. Genitive of negation in Polish and single-cycle derivations. *Journal of Slavic Linguistics* 16(2). 247–287.

# The disunity of Principle B Effects

Giuseppe Varaschin
Universidade Federal de Santa Catarina

Proceedings of the 28th International Conference on
Head-Driven Phrase Structure Grammar

Online (Frankfurt/Main)

Stefan Müller, Nurit Melnik (Editors)

2021

Frankfurt/Main: University Library

pages 220–240

Keywords: Principle B, anaphora, HPSG, Binding Theory, pronouns

Varaschin, Giuseppe. 2021. The disunity of Principle B Effects. In Stefan Müller & Nurit Melnik (eds.), *Proceedings of the 28th International Conference on Head-Driven Phrase Structure Grammar, Online (Frankfurt/Main)*, 220–240. Frankfurt/Main: University Library. DOI: 10.21248/hpsg.2021.12.

**Abstract**

It is a typologically well-attested generalization that simple personal pronouns are avoided when the purpose is to signal semantic identity between coarguments of a predicate (Faltz, 1985; Comrie, 1999; Levinson, 2000; Haspelmath, 2008, forthcoming; Volkova & Reuland, 2014). Many linguists assume what I call the Unified View, where these pronoun disjointness effects come out as a byproduct of a single syntactic constraint, generally known as Principle B of the Binding Theory (Chomsky, 1981, 1986; Pollard & Sag, 1994; Manning & Sag, 1998; Pollard, 2005; Müller, 2021). This paper argues that the Unified View is mistaken because it is both too weak and too strong. As an alternative, I propose that pronoun disjointness effects stem from a conspiracy of three distinct factors – none of which is a syntactic universal: (i) a preference for expressing identity with coindexation rather than anchoring distinct indices to the same referent (Reinhart, 1983); (ii) a language-specific variant of HPSG's Principle B; and (iii) a constraint on the morphosyntactic encoding of reflexive relations (Faltz, 1985; Reinhart & Reuland, 1993; König & Siemund, 2000).

# 1 Introduction

It is a typologically well-attested generalization that languages that have dedicated reflexives and personal pronouns (p-pronouns) consistently avoid the latter when the purpose is to signal semantic identity between coarguments of a predicate (Faltz, 1985; Comrie, 1999; Levinson, 2000; Huang, 2000; Haspelmath, 2008, forthcoming; Volkova & Reuland, 2014; Varaschin, 2021). Let us call these patterns Pronoun Disjointness Effects (PDEs). The examples in (1) illustrate the phenomenon in English:

(1) a. *Susan$_1$ praised her$_1$.
b. *Marta$_1$ voted for her$_1$.
c. *Every actor$_1$ talks about him$_1$ all the time.
d. *No actress$_1$ seems to defend her$_1$.
e. *Joanne$_1$ forgot to include her$_1$ in the guest list.

HPSG follows Mainstream Generative Grammar (MGG) in the assumption that PDEs receive an explanation in terms of Principle B of the Binding Theory. The following is a standard statement of Principle B, where the concept of BINDING is understood as implying coindexation and some notion of syntactic rank (e.g. c-command) (Chomsky, 1981; Pollard & Sag, 1994).

(2) PRINCIPLE B: A p-pronoun is not bound in a local syntactic domain.

[†]I am grateful to Stefan Müller, Peter Sells, Peter Culicover, Philip Miller, Bob Levine and the members of the Synners discussion group at OSU for discussions concerning the topics addressed in this paper. I would also like to thank the reviewers and participants of the 2021 HPSG conference for their helpful feedback. All remaining errors are my own.

However, in addition, many practitioners of MGG also seem to accept what I call the UNIFIED VIEW: the assumption that something like Principle B is both UNIVERSAL and SUFFICIENT to explain the full range of PDEs found across languages (Chomsky 1981, 1995; Fiengo & May 1994, i.a.).[1]

HPSG, in turn, has been largely silent about the validity of the Unified View. This paper attempts to break the silence by arguing that the Unified View should not be adopted within HPSG, given that it is both TOO WEAK (i.e. it fails to predict real PDEs) and TOO STRONG (i.e. it predicts PDEs where there are none). As an alternative, I propose that PDEs stem from a conspiracy of three distinct factors – none of which is a syntactic universal:

(i) A preference for expressing semantic identity between NPs with coindexation rather than by anchoring distinct indices to the same referent.

(ii) A language-specific variant of HPSG's Principle B.

(iii) A constraint on the morphosyntactic encoding of reflexive relations (Faltz, 1985; Reinhart & Reuland, 1993; Comrie, 1999).

The paper is organized as follows. Section 2 argues that the Unified View is too weak by presenting a class of well-known PDEs that Principle B fails to predict. Section 3 sketches what an HPSG account of such cases might look like in the form of a principle called Coindexing Preference. Section 4 discusses some of the reasons why the Unified View may be considered too strong – in particular, the fact that it fails to account for languages like Brazilian Portuguese, Middle English, Frisian and French, where the binding of p-pronouns seems to depend on semantic properties of predicates, rather than on a purely syntactic notion of locality. Section 5 argues that such languages can be accounted for within HPSG by depriving Principle B of its universal status and positing a separate constraint which is sensitive to the semantics sorts of the relations encoded by particular words.

## 2 The Unified View is too weak

The Unified View is TOO WEAK because Principle B, however we decide to state it, inevitably fails to predict semantic disjointness in cases where disjointness is clearly enforced. If Principle B is formulated as a restriction against local coreference for p-pronouns – as in some prominent expositions of the Binding Theory (Jackendoff, 1972; Chomsky, 1995) – PDEs like (3), which involve non-referential antecedents will be left unexplained.

[1]Over the years, there have been several attempts to derive Principle B from more principled assumptions such as constraints on movement, principles of agreement or economy conditions on chains (Burzio 1989; Menuzzi 1999; Hornstein 2001; Kayne 2005; Chomsky 2008; Hicks 2009; Rooryck & Vanden Wyngaerd 2011). These proposals still count as instances of the Unified View insofar as they accept that there is a single unified cause underlying PDEs which is universal and syntactic in nature.

(3) *{No actress$_1$ / Every actress$_1$} hates her$_1$.

For this reason, it widely recognized the kind of identity which is governed by Principle B should not be at the level of real-world reference, but, rather, at the level of discourse representation or logical syntax (Pollard & Sag, 1994; Reinhart, 2006; Reuland, 2011). HPSG incorporates this insight by stating its own version of Principle B as a constraint against the identity of INDEX values among members of a single ARG-ST list (Pollard & Sag, 1994; Manning & Sag, 1998; Pollard, 2005; Müller, 2021):

(4) PRINCIPLE B:
A p-pronoun is not coindexed with any of its local o-commanders.[2]

Indices lead a double life within the HPSG formalism. On the one hand, they encode grammatically relevant information that enters into agreement. This is specified as part of the grammar signature, which declares the features PERS, NUM and GEND appropriate to objects of the sort *index* The abbreviated structure in (5) shows that the INDEX value is what express the information that the p-pronoun *her* is 3rd person, singular and feminine:

(5)

$$\begin{bmatrix} \text{PHON} & \langle \textit{her} \rangle \\ \text{SYNSEM}|\text{LOC} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{HEAD} & \begin{bmatrix} \textit{noun} & \\ \text{CASE} & \textit{acc} \end{bmatrix} \\ \text{SPR} & \langle\rangle \\ \text{COMPS} & \langle\rangle \end{bmatrix} \\ \text{CONTENT} & \begin{bmatrix} \textit{ppro} & \\ \text{INDEX} & \begin{bmatrix} \textit{index} & \\ \text{PER} & \textit{3rd} \\ \text{NUM} & \textit{sing} \\ \text{GEND} & \textit{fem} \end{bmatrix} \\ \text{RELS} & \langle\rangle \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

On the other hand, HPSG indices also play a semantic role, which is analogous to that of individual variables in first-order logic (Copestake et al., 2005; Koenig & Richter, 2021). In (6), for example, the index 1, which is shared between the reflexive and its antecedent, also fills in the two argument

[2] Ancillary definitions are given below (Pollard & Sag 1994, 253-4):

(i) Let Y and Z be *synsem* objects with distinct LOCAL values, Y referential.

a. Y LOCALLY O-COMMANDS Z *iff* Y is less oblique than Z.
b. Z is LOCALLY BOUND by Y iff Z is locally o-commanded by Y and Z and Y are coindexed.

roles of the elementary predication introduced by the verb *hates*.

(6) Every actress$_1$ hates herself$_1$

$$\begin{bmatrix} \textit{headed-phrase} & \\ \text{HD-DTR}|\text{ARG-ST} & \langle \text{NP}_{\boxed{1}},\ \text{NP}[\textit{refl}]_{\boxed{1}} \rangle \\ \text{CONTENT}|\text{RELS} & \left\langle \begin{bmatrix} \textit{every-rel} & \\ \text{LBL} & \boxed{2} \\ \text{ARG0} & \boxed{1} \\ \text{RSTR} & \boxed{3} \\ \text{BODY} & \boxed{4} \end{bmatrix}, \begin{bmatrix} \textit{actress-rel} & \\ \text{LBL} & \boxed{3} \\ \text{ARG0} & \boxed{1} \end{bmatrix}, \begin{bmatrix} \textit{hate-rel} & \\ \text{LBL} & \boxed{4} \\ \text{ARG1} & \boxed{1} \\ \text{ARG2} & \boxed{1} \end{bmatrix} \right\rangle \end{bmatrix}$$

Also like variables in predicate logic, different indices can be assigned or anchored to the same real-world referent. This kind of non-injective mapping from indices to referents can be illustrated with Pollard & Sag's (1994, 72) example in (7) (coreference is signaled by placing NPs in italics):

(7) *The senate*$_1$ just voted *itself*$_1$ another raise. Most of *them*$_2$ were already overpaid to begin with.

In (7) we have a plural index that is part of the CONTENT value of the pronoun *them* picking out the same referent as the singular index that is part of the CONTENT value of *the senate* and *itself*. This mode of achieving coreference is established on purely pragmatic grounds, subject to general anchoring conditions specified by the grammar (Pollard & Sag, 1994).

Given the existence of cases like (7), HPSG's purely index-based Principle B does not rule out the possibility of p-pronouns coreferring with local o-commanding NPs as well as long as token-identity of indices is not involved. This seems to be a particularly useful way to understand why coreference is possible in (8) (Reinhart, 1983; Pollard & Sag, 1994; Heim, 1998):

(8)
a. *I*$_2$ dreamt that *I*$_2$ was *Elaine Stritch*$_1$ and *I*$_1$ kissed *me*$_2$.
b. How can you doubt that *the speaker*$_1$ is *Amy*$_2$? *She*$_1$ praises *her*$_2$ to the sky.
c. *Sara*$_1$ said that only *she*$_1$ voted for *her*$_2$.

Since p-pronouns in (8) are not coindexed with their local antecedents, coreference is correctly not excluded by Principle B, which merely requires nonidentity of indices. However, for this same reason, we need some other principle to explain why coreference with local o-commanding NPs is not acceptable *in general* – e.g. why we don't get it in neutral contexts like (9):

(9)
a. **I*$_1$ kissed *me*$_2$.
b. **Amy*$_1$ praises *her*$_2$.
c. **Sara*$_1$ voted for *her*$_2$.

## 3 A solution: Coindexing Preference

The fact that Principle B cannot explain why semantic identity is ruled out in (9), entails that the Unified View is too weak – i.e. it fails to predict cases of disjointness attested in English, as well as in other languages (Noguchi, 1993). To my knowledge, an account of this has not been explicitly proposed in the HPSG literature (but see Pollard & Sag (1994, 74) for some hints).

Some authors within MGG argue that the contrast between (8) and (9) is due to an economy principle that establishes a preference for encoding semantic identity in structural terms (e.g. via syntactic binding) over inferring it on the basis of contextual cues (Reinhart, 1983; Grodzinsky & Reinhart, 1993; Krifka, 2018). I propose something similar for HPSG:

(10) COINDEXING PREFERENCE:
Let X and Y be *synsem* objects with distinct INDEX values. X cannot corefer with Y if replacing the INDEX value of Y with the INDEX value of X yields an indistinguishable interpretation.

The basic idea is that speakers should not opt for anchoring distinct indices to the same referent unless there is a clear interpretive motivation for not using a plain coindexed structure – i.e. if there is some specific interpretive effect attainable solely by a non-coindexed variant. This is arguably a consequence of Levinson's (2000) MANNER PRINCIPLE:

(11) MANNER PRINCIPLE:
Avoid prolix, obscure or marked expressions without reason.

Coindexed structures are *less ambiguous* (and, thus, *less obscure*) than non-coindexed ones because they can only be interpreted as expressing semantic identity. Non-coindexed structures, in turn, have a broader range of possible interpretations: they can convey semantic identity as well as disjoint reference. The only reason for expressing coreference *without* coindexing (given that expressing coreference *with* coindexing is generally clearer) is if there is some interpretive justification for using an extra index.

In Pollard & Sag's example in (7), each index signals a different mode of individuation in virtue of the distinct anchoring conditions the grammar of English associates with the features *sing* and *plur*. These anchoring conditions may be stated in the form of implicational constraints (Meurers, 2000):

(12) $\left[\text{CONTENT}|\text{INDEX}\ \boxed{1}\left[\text{NUM}\ \ \textit{sing}\right]\right] \Rightarrow \left[\text{CONTEXT}|\text{BACKGR}\ \left\{\begin{bmatrix}\textit{non-aggregate-rel}\\ \text{ARG0}\ \ \boxed{1}\end{bmatrix}\right\}\right]$

(13) $\left[\text{CONTENT}|\text{INDEX}\ \boxed{2}\left[\text{NUM}\ \ \textit{plur}\right]\right] \Rightarrow \left[\text{CONTEXT}|\text{BACKGR}\ \left\{\begin{bmatrix}\textit{aggregate-rel}\\ \text{ARG0}\ \ \boxed{2}\end{bmatrix}\right\}\right]$

The distinct modes of individuation conveyed as background assumptions by each type of index may justify using singular and plural to pick out the same referent, as long as the referent in question is one that can be conceptualized simultaneously as an aggregate and as a non-aggregate entity. This is the case for *the senate* and other collective-denoting NPs.

In contexts where using a new index for an old referent can be justified on interpretive grounds, there is nothing stopping p-pronouns from coreferring with locally o-commanding NPs. This is precisely what happens in (8).

In (8-a) and (8-b), each index is associated with a different *descriptive relation* or *guise* via the BACKGR(OUND) attribute. In (8-a), index 1 represents its referent under the Elaine Stritch guise and 2 as the dream counterpart of the speaker (Lakoff, 1972; Safir, 2004). In (8-b), index 1 represents the referent as *the speaker* and 2 represents it as the bearer of the name *Amy* (Heim, 1998). The following is an abbreviated structure for the latter example:

(14)
$$\begin{bmatrix} \textit{headed-phrase} & \\ \text{HD-DTR}|\text{ARG-ST} & \langle \mathrm{NP}_{\boxed{1}},\ \mathrm{NP}[\textit{ppro}]_{\boxed{2}} \rangle \\ \text{CONTENT}|\text{RELS} & \left\langle \begin{bmatrix} \textit{praise-rel} & \\ \text{LBL} & \boxed{3} \\ \text{ARG1} & \boxed{1} \\ \text{ARG2} & \boxed{2} \end{bmatrix} \right\rangle \\ \text{CONTEXT}|\text{BACKGR} & \left\{ \begin{bmatrix} \textit{speaker-rel} & \\ \text{LBL} & \boxed{4} \\ \text{ARG0} & \boxed{1} \end{bmatrix}, \begin{bmatrix} \textit{name-rel} & \\ \text{LBL} & \boxed{5} \\ \text{ARG0} & \boxed{2} \\ \text{NAME} & \textit{Amy} \end{bmatrix} \right\} \end{bmatrix}$$

The non-coindexed structure in (8-c) is also not interpretively equivalent to a coindexed one, since different properties are ascribed to Sara in each of these cases. The non-coindexed structure ascribes the property in (15-a), while a coindexed one would ascribe (15-b):

(15) a. $\lambda x.\ x$ voted for $y$ (where $y$ is contextually anchored to Sara)
b. $\lambda x.\ x$ voted for $x$

These two properties yield distinct truth-conditional effects in the presence of the focus-sensitive operator *only* (Rooth, 1992). Saying that Sara is the sole possessor of the property in (15-a), which is conveyed by a non-coindexed ARG-ST, entails that Sara received a total of one vote. This is compatible with a scenario with other people voted for themselves. If a coindexed structure were used, (15-b) would ascribed to Sara, given that the two argument roles of the predicate would be filled by the same index. The resulting structure would entail that Sara is the only self-voter. This is compatible with a situation where other people also voted for Sara. Since the non-coindexed structure is not interpretively equivalent to the coindexed one in this case, (10) does not rule out coreference in the former (Heim, 1998).

None of these differences in interpretation between coindexed and non-coindexed structures exist in neutral contexts like (9). Therefore, Coindexing Preference correctly predicts PDEs to emerge in these cases. If we assume r-expressions introduce fresh indices by default, Coindexing Preference also goes a long way in deriving Principle C effects along with many exceptions to Principle C (Grodzinsky & Reinhart, 1993; Varaschin et al., in press).

## 4 The Unified View is too strong

The idea that a syntactic Principle B exhausts the range of disjointness effects involving p-pronouns is also TOO STRONG: i.e. it predicts semantic disjointness for p-pronouns where we see none. The excessive restrictiveness of the Unified View can be illustrated with data from the dialect of Brazilian Portuguese (BP) spoken in the states of São Paulo and Minas Gerais. I will specifically look at the behavior of the 3SG p-pronouns *ele* ('him') and *ela* ('her') as it is reported in previous theoretical and experimental literature (Moreira da Silva, 1983; Galves, 1986; Menuzzi, 1999; Grolla, 2011; Grolla & Bertolino, 2011; Lacerda et al., 2014; Varaschin, 2021).

First, note that *ele*/*ela* have all of the characteristics independently ascribed to p-pronouns (Zribi-Hertz, 1995; Safir, 2004; Reuland, 2011). They can be used as demonstratives (16) and with non-local antecedents (17):

(16) Dê o livro pra ele$_1$, pra ela$_2$ e pra ele$_3$. [pointing gestures]
give the book to him to her and to him
'Give the book to him$_1$, to her$_2$ and to him$_3$.'

(17) Nenhuma atriz$_1$ disse [que o Pedro odeia ela$_1$].
no actress said that the Pedro hates her
'No actress$_1$ said that Pedro hates her$_1$.'

Furthermore, in (18), p-pronouns in BP exhibit PDEs just like their English counterparts would in similar environments:

(18) a. *O Paulo$_1$ viu ele$_1$.
the Paulo saw him
'Paulo$_1$ saw him(self)$_1$.'

b. *A Sara$_1$ esqueceu de elogiar ela$_1$ na festa.
the Sara forgot to praise her in-the party
'Sara$_1$ forgot to praise her(self)$_1$ at the party.'

c. *A Amy$_1$ bateu primeiro nela$_1$, depois nos outros.
the Amy hit first on-her, then on-the others
'Amy$_1$ hit her(self)$_1$ first, then other people.'

d. *O Pedro$_1$ não depreciou ele$_1$ na festa.
the Pedro not disparaged him in-the party
'Pedro$_1$ didn't disparage him(self)$_1$ at the party.'

e. *Todo político$_1$ fica reclamando dele$_1$ o tempo todo.
every politician stayed complaining of-him the time all
'Every politician$_1$ complains about him(self)$_1$ all the time.'

The problem, however, is that slight modifications of (18) make binding by a local coargument fully acceptable, in violation of Principle B:

(19) a. O Paulo$_1$ viu ele$_1$ no espelho.
the Paulo saw him in-the mirror
'Paulo$_1$ saw him(self)$_1$ in the mirror.'

b. A Sara$_1$ esqueceu de incluir ela$_1$ na lista de convidados.
the Sara forgot to include her in-the list of guests
'Sara$_1$ forgot to include her(self)$_1$ in the guest list.'

c. A Amy$_1$ pensa primeiro nela$_1$, depois nos outros.
the Amy thinks first on-her, then on-the others
'Amy$_1$ thinks of her(self)$_1$ first, then of others.'

d. O Pedro$_1$ não reconheceu ele$_1$ na foto.
the Pedro not recognized him in-the photo
'Pedro$_1$ didn't recognize him(self)$_1$ in the photo'.

e. Todo político$_1$ fica falando dele$_1$ o tempo todo.
every politician stays talking of-him the time all
'Every politician$_1$ talks about him(self)$_1$ all the time.'

The first set of data in (18) suggests that BP p-pronouns are subject to a disjointness constraint of some sort. However, the subsequent examples in (19) show that this constraint cannot be Principle B as it applies to English, since the latter incorrectly rules out instances of local binding that are acceptable in BP. This presents a major puzzle for the Unified View, which attempts to reduce all PDEs to a single syntactic constraint, which is supposed to be universal and apply in the same way in different languages.[3]

We see similar patterns in several other languages. The examples below provide illustrations of similar contrasts in French (Pica, 1984; Zribi-Hertz, 1995), Middle English (Faltz, 1985; Peitsara, 1997; van Gelderen, 2000) and Frisian (Reinhart & Reuland, 1993; Rooryck & Vanden Wyngaerd, 2011):[4]

[3]The explanation for why semantic identity is possible in (19) cannot be coreference-without-coindexing (as suggested for (8) above) for two main reasons: (i) it can involve non-referential antecedents (cf. (19-e)), and (ii) unlike what we saw in (8), the examples in (19) do not require any special motivating context. See Varaschin (2021) for more.

[4]The fact that we find counterexamples to Principle B in these particular languages also undermines competition-based theories of anaphora (Burzio, 1989; Menuzzi, 1999; Safir, 2004; Hicks, 2009). These approaches are more flexible than the standard Binding Theory because they allow locally bound p-pronouns whenever anaphors are not available as alternative ways to express semantic identity. The problem for them is that BP, French, Middle English and Frisian all have dedicated anaphors which could be used in contexts like (19)/(21)/(23)/(25) with no relevant difference in meaning: *ele mesmo* in BP, *lui-même* in French, *hymself* in Middle English and *himsels* in Frisian (Varaschin, 2021).

(20) a. *Pierre$_1$ bavarde avec lui$_1$.
Pierre is.chatting with him
'Pierre$_1$ is talking to him(self)$_1$.'

b. *Pierre$_1$ est jaloux de lui$_1$.
Pierre is jealous of him
'Pierre$_1$ is jealous of him$_1$.'

(21) a. Jean$_1$ parle souvent de lui$_1$.
Jean often talks about him
'Jean$_1$ often talks about him(self)$_1$.'

b. Pierre$_1$ est fier de lui$_1$.
Pierre is proud of him
'Pierre$_1$ is proud of him(self)$_1$.'

(22) a. *Hie$_1$ forseoth hie$_1$.
he despises him
'He$_1$ despises him(self)$_1$.'

b. *He$_1$ hynge hym$_1$.
he hanged him
'He$_1$ hanged him(self)$_1$.[5]

(23) a. He$_1$ cladde hym$_1$ as a poure laborer.
he dressed him as a poor laborer
'He$_1$ dressed him(self)$_1$ as a poor laborer.'

b. He$_1$ repentyd hym$_1$.
he repented him
'He$_1$ repented (himself$_1$).'

(24) a. *Max$_1$ hatet him$_1$.
Max hates him
'Max$_1$ hates him(self)$_1$.'

b. *Willem$_1$ bewûnderet him$_1$.
Willem admires him
'Willem$_1$ admires him(self)$_1$.'

(25) a. Max$_1$ wasket him$_1$.
Max washes him
'Max$_1$ washes him(self)$_1$.'

b. Jack$_1$ fielde him$_1$ fuortglieden.
Jack felt him slip-away
'Jack$_1$ felt him(self)$_1$ slip away.'

There is no syntactic generalization that distinguishes the good and bad cases of local binding in these languages in a general way. Rather, the difference seems to be related to a semantic property of the predicates that

[5] The judgments in (22) are hypotheses motivated by the unexpected absence of locally bound *hym* with these kinds of predicates in corpora (Faltz, 1985; Peitsara, 1997).

p-pronouns contribute their INDEX values to – e.g. the difference between *reclamar* ('complain') and *falar* ('talk') in the BP contrast below:

(26) a. *Todo político$_1$ fica **reclamando** dele$_1$ o tempo todo.
every politician stayed complaining of-him the time all
'Every politician$_1$ complains about him(self)$_1$ all the time.'

b. Todo político$_1$ fica **falando** dele$_1$ o tempo todo.
every politician stays talking of-him the time all
'Every politician$_1$ talks about him(self)$_1$ all the time.'

This suggests that PDEs in these languages are not the product of Principle B, but of some principle which is sensitive to non-syntactic properties of predicates (Zribi-Hertz, 1995; Menuzzi, 1999; König & Siemund, 2000).

## 5 A solution: Constraint on Reflexive Relations

The simplest solution involves to the problem mentioned in the previous section involves (i) abandoning the idea that p-pronouns in BP, French, Middle English and Frisian abide by Principle B; and (ii) explaining PDEs in these languages with a constraint over non-syntactic aspects of *word* objects.

The first step in this solution implies rejecting the assumption that Principle B is a syntactic universal, which lies at the heart of the Unified View. In this spirit, we can regard Principle B as a language-specific implicational constraint on the ARG-ST values of predicative words, as in (27):

(27) $$\begin{bmatrix} \textit{word} \\ \text{ARG-ST} \quad \textit{list} \oplus \langle \text{NP}[\textit{ppro}] \rangle \end{bmatrix} \Rightarrow \begin{bmatrix} \textit{word} \\ \text{ARG-ST} \quad \langle \text{NP}_{\boxed{1}}(,\ \text{NP}_{\boxed{2}}) \rangle \oplus \langle \text{NP}[\textit{ppro}]_{\neg\boxed{1} \wedge \neg\boxed{2}} \rangle \end{bmatrix}$$

The effect of (27) is to prohibit sharing the INDEX values of p-pronoun complements with any o-commanding coarguments. This syntactic constraint is operative in English. Languages like BP, Middle English, Frisian and French, however, simply they lack (27) as a constraint on their *word* objects. The cases where locally bound p-pronouns are *not* acceptable in these languages are handled by a constraint which is sensitive to the CONTENT values of *word* objects – i.e. a semantically-based constraint:

(28) CONSTRAINT ON REFLEXIVE RELATIONS (CRR):
If the CONTENT|RELS value of a *word* object $W$ contains a reflexive relation $R$ and $R$ is stereotypically non-reflexive, then $W$ must be reflexive-marked, where

(i) $R$ is reflexive iff the values for two ARG attributes of $R$ are structure-shared;
(ii) $W$ is reflexive-marked iff a member of $W$'s ARG-ST is NP[*refl*].

The notion of stereotypical non-reflexivity invoked by (28) comes from functionalist work on anaphora (Faltz, 1985; Comrie, 1999; Levinson, 2000; König & Siemund, 2000; Ariel, 2008; Haspelmath, 2008). It is based on the intuition that reflexive interpretations are less expected for some predicative words (e.g. *hit*, *jealous*, *hate*) than for others (e.g. *dress*, *proud*, *shave*). Like other kinds of stereotypes, stereotypes about non-reflexivity are arguably product of inductive regularities in speakers' experience of the world: e.g. people experience less often self-directed instances of actions like *hitting* than of actions like *dressing* (Levinson, 2000).

These stereotypes are also plausibly reflected in frequency of reflexive use: words that introduce stereotypically non-reflexive relations like *jealous* and *hang* occur less frequently with reflexive arguments (signaling reflexive readings) than other words like *proud* or *dress* (Haspelmath, 2008; Ariel, 2008; Bouma & Spenader, 2008). This is confirmed by the following data:

| | Non-reflexive Pronoun | Reflexive Pronoun |
|---|---|---|
| *jealous* | 41 (100%) | 0 (0%) |
| *proud* | 212 (84%) | 39 (16%) |

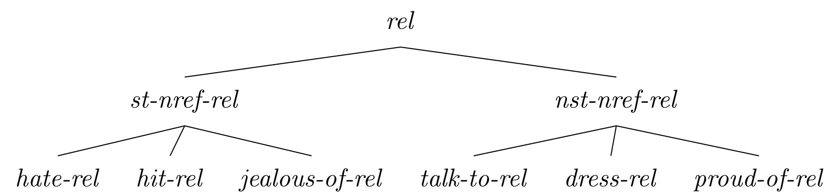
Table 1: Reflexive *vs.* non-reflexive readings in the British National Corpus (adapted from Haspelmath 2008, 47)

| | Non-reflexive Pronoun | Reflexive Pronoun |
|---|---|---|
| *hit* | 109 (99.1%) | 1 (0.09%) |
| *dress* | 4 (6.2%) | 60 (93.7%) |

Table 2: Reflexive *vs.* non-reflexive readings in the Longman Spoken American Corpus (adapted from Ariel 2008, 231-232)

I assume that stereotypically non-reflexive relations (*st-nref-rel*) and their complement (*nst-nref-rel*) form a sortal hierarchy, similar to the one used in the linking theory of Davis & Koenig (2000). The following is partial representation of this hierarchy, based on what we have seen so far:[6]

(29)




[6] Though the CRR is plausibly universal, I leave open the possibility that some aspects of this hierarchy (e.g. what relations wind up being subsorts of *st-nref-rel* or *nst-nref-rel*) may be language-specific. There is some reason to believe that grooming relations like *dress-rel* and *shave-rel* are not subsorts of *nst-nref-rel* in BP (Varaschin, 2021, 349).

Given this, we can state the CRR more formally as the following implicational constraint (where $\bigcirc$ is the shuffle relation).[7]

(30)
$$\begin{bmatrix} \textit{word} & \\ \text{CONTENT}|\text{RELS} & \left\langle \begin{bmatrix} \textit{st-nrefl-rel} & \\ \text{ARG1} & \boxed{1} \\ \text{ARG2} & \boxed{1} \end{bmatrix} \right\rangle \end{bmatrix} \Rightarrow \begin{bmatrix} \textit{word} & \\ \text{ARG-ST} & \textit{list} \bigcirc \langle \text{NP}[\textit{refl}]_{\boxed{1}} \rangle \end{bmatrix}$$

The CRR is similar to the Reflexivity Condition B of Reinhart and Reuland's (1993) Reflexivity Theory. Unlike Reinhart & Reuland's principle, however, the CRR should not be seen as a primitive feature of UG, but as a consequence of a universal pragmatic principle that associates unmarked forms with stereotypical interpretations (Levinson, 2000, 37):

(31) INFORMATIVENESS PRINCIPLE:
What is expressed simply is stereotypically exemplified.

The idea is that, since p-pronouns are simple unmarked forms (in contrast to reflexives), (31) motivates an inference to a stereotypical interpretation for each word in whose ARG-ST p-pronouns occur. This means that if a non-reflexive interpretation is stereotypical for a *word* object $W$, p-pronouns, *qua* unmarked forms, will trigger an inference to a non-reflexive interpretation for $W$. The only way to signal that $W$ is to be interpreted reflexively in such cases is by resorting to specialized reflexive-marking. A reflexive NP acts as a marked form which blocks the inference to the non-reflexive stereotype.

The BP, French, Middle English and Frisian structures in (32), repeated from earlier examples, are ruled out by the CRR because the words in boldface all introduce stereotypically non-reflexive relations (*complain-rel*, *jealous-of-rel*, etc.) without being appropriately reflexive-marked:

(32) a. *Todo político$_1$ fica **reclamando** dele$_1$ o tempo todo.
every politician stays complain of-him the time all

b. *Pierre$_1$ est **jaloux** de lui$_1$.
Pierre is jealous of him

c. *He$_1$ **hynge** hym$_1$.
he hanged him

d. *Max$_1$ **hatet** him$_1$.
Max hates him

For such cases, the effects of the CRR are indistinguishable from those of Principle B. Differences between the two constraints emerge in contexts where CRR predicts exemption from the disjointness requirement. The CRR

[7] Note that since (30) employs the shuffle relation, NP[*refl*] can occupy any position in the ARG-ST list. What prevents a reflexive like *himself* from occupying the position that gets mapped to SUBJ is its specification for accusative case (Pollard & Sag, 1994, 262).

gives us basically two logically possible scenarios where a locally bound p-pronoun may be acceptable in languages lacking Principle B:

(33) a. When the *rel* introduced by the word in whose ARG-ST the p-pronoun appears is not stereotypically non-reflexive.
b. When the *rel* introduced by the word in whose ARG-ST the p-pronoun appears is not reflexive.

The scenario in (33-a) covers the following kinds of cases:

(34) a. Todo político$_1$ fica **falando** dele$_1$ o tempo todo.
every politician stays talking of-him the time all
b. Pierre$_1$ est **fier** de lui$_1$.
Pierre is proud of him
c. He$_1$ **cladde** hym$_1$ as a poure laborer.
he dressed him as a poor laborer
d. Max$_1$ **wasket** him$_1$.
Max washes him

The relations introduced by the predicates in boldface (*talk-to-rel*, *proud-of-rel*, *dress-rel* and *wash-rel*) are not stereotypically non-reflexive. Therefore, they do not satisfy the antecedent of the constraint (30) and are exempt from the reflexive-marking requirement expressed in the consequent.

The CRR also allows local binding of p-pronouns whenever the relation encoded by word where the p-pronoun appears as an argument is not reflexive to begin with (cf. (33-b)). This happens in raising to object structures, which imply a mismatch between the syntactic locality of ARG-ST lists and the semantic locality of the relations expressed as the CONTENT|RELS values of words (Reinhart & Reuland, 1993). This allows us to predict the following BP and Frisian examples:

(35) a. O Roberto$_1$ imaginou ele$_1$ casado.
the Roberto imagined him married
'Roberto$_1$ imagined him(self)$_1$ married.'
b. Jack$_1$ fielde him$_1$ fuortglieden.
Jack felt him slip-away
'Jack$_1$ felt him(self)$_1$ slip away.'

Even though the p-pronouns and their antecedents in (35) are in a local relationship with respect to the ARG-ST of the matrix verb, they carry indices that contribute to separate semantic relations: *marry-rel* in (35-a) and *slip-away-rel* in (35-b). This is made clear in the simplified structure in (36), which depicts the CONTENT value for (35-a). Since BP and Frisian lack the purely ARG-ST-based Principle B we see in English, these examples are predicted to be fine: there is no reflexive relation in need of reflexive-marking.

(36) $\begin{bmatrix} \text{INDEX} & \boxed{3} \\ \text{RELS} & \left\langle \begin{bmatrix} \textit{name-rel} & \\ \text{LBL} & \boxed{2} \\ \text{ARG0} & \boxed{1} \\ \text{NAME} & \textit{Roberto} \end{bmatrix}, \begin{bmatrix} \textit{imagine-rel} & \\ \text{LBL} & \boxed{4} \\ \text{ARG1} & \boxed{1} \\ \text{ARG2} & \boxed{5} \end{bmatrix}, \begin{bmatrix} \textit{married-rel} & \\ \text{LBL} & \boxed{5} \\ \text{ARG0} & \boxed{1} \end{bmatrix} \right\rangle \end{bmatrix}$

Something similar goes on in cases where the meaning of the p-pronoun is not identical to that of its antecedent, but is shifted to denote a representational proxy of the latter (Jackendoff, 1992; Safir, 2004; Varaschin, 2020).[8] This is what happens in the BP example (37), where *ele* ('him') is interpreted as a visual image of Pedro, as the structure in (38) makes clear:

(37) O Pedro$_1$ não reconheceu ele$_1$ na foto.
the Pedro not recognized him in-the photo
'Pedro$_1$ didn't recognize him(self)$_1$ in the photo'.

(38) $\begin{bmatrix} \text{ARG-ST} & \langle \text{NP}_{\boxed{1}}, \text{NP}_{\boxed{1}} \rangle \\ \text{CONTENT}|\text{RELS} & \left\langle \begin{bmatrix} \textit{recognize-rel} & \\ \text{LBL} & \boxed{3} \\ \text{ARG1} & \boxed{1} \\ \text{ARG2} & \boxed{2} \end{bmatrix}, \begin{bmatrix} \textit{proxy-rel} & \\ \text{LBL} & \boxed{4} \\ \text{IMAGE PROXY} & \boxed{2} \\ \text{REPRESENTED} & \boxed{1} \end{bmatrix} \right\rangle \end{bmatrix}$

Since the object NP in (37) receives a proxy reading, it no longer contributes its literal meaning to the relation that corresponds to the verb. Rather, the verb comes to express a relation between Pedro and his image proxy.

This is also what happens in the infinitival VP in (39):

(39) A Joana$_1$ esqueceu de incluir ela$_1$ na lista de convidados.
the Joana forgot to include her in-the list of guests
'Joana$_1$ forgot to include her(self)$_1$ in the guest list.'

[8] Proxy readings are semantically distinct from the guise reading of the first person pronoun in (8-a) (Safir, 2004, 114-118), repeated below with the guise NP in boldface:

(i) I dreamt that I was Elaine Stritch and **I** kissed me.

Guise readings occur when an NP is interpreted as a person assuming the perspective of another while retaining some aspects of their own original identity: e.g. when speakers say (8-a)/(i), they are talking about *themselves-as-Elaine-Stritch*, rather than *Elaine Stritch* per se. Proxy readings, by contrast, do not preserve any kind of semantic identity relation between the normal meaning and the proxy meaning: i.e. the pronoun in (35) does not refer to *Pedro-as-an-image*, but to an *image of Pedro*. In other words, while a referent and its guise are still, in some sense, the same entity (one is a counterpart of the other), a proxy and the entity it represents are not. I express this difference by having the proxy and the entity it represents correspond to different indices in the CONTENT value. I assume that guises and their perspective-holders are identical in terms of CONTENT. I do not attempt to state the constructions responsible for proxy and guise readings in this paper.

(40)
$$\begin{bmatrix}\textsc{arg-st} & \langle \text{NP}_{\boxed{1}}, \text{NP}_{\boxed{1}} \rangle \\ \textsc{content}|\textsc{rels} & \left\langle \begin{bmatrix} \textit{include-rel} & \\ \textsc{lbl} & \boxed{3} \\ \textsc{arg1} & \boxed{1} \\ \textsc{arg2} & \boxed{2} \end{bmatrix}, \begin{bmatrix} \textit{proxy-rel} & \\ \textsc{lbl} & \boxed{4} \\ \textsc{name proxy} & \boxed{2} \\ \textsc{represented} & \boxed{1} \end{bmatrix} \right\rangle \end{bmatrix}$$

As the abbreviated structure for the infinitival VP in (40) makes clear, CONTENT|RELS value of *incluir* ('include') in (39) expresses a relation between Joana and a proxy of Joana (namely, *her name*). Given that there is no reflexive relation in semantics, no reflexive-marking is necessary either.

Since the CRR is grounded in the pragmatic INFORMATIVENESS PRINCIPLE, it should be universal (*pace* possible cross-linguistic variation regarding the hierarchy of semantic sorts in (29)). Something like the CRR does indeed seems to be a genuine source of invariance across the anaphoric systems of different languages (Levinson, 2000; König & Siemund, 2000; Haspelmath, 2008; Ariel, 2008; Volkova & Reuland, 2014). We even see some of its effects in English words that are exempt from syntactic Principle B.

This is the case of locative Ps (Reinhart & Reuland, 1993; Menuzzi, 1999). These words are exempt from Principle B because they have single-membered ARG-ST lists. However, in spite of this, they encode binary relations as their CONTENT|RELS value. A preposition like *over*, for example, expresses a relation *over-rel* that holds between a surface and an entity that is located above the surface. In typical cases, these relations are not interpreted reflexively:

(41) Bobby$_1$ rolled the carpet over him$_1$.

(42)
$$\begin{bmatrix} \textit{headed-phrase} & \\ \textsc{hd-dtr}|\textsc{dtrs} & \left\langle \ldots \begin{bmatrix} \textsc{synsem}|\textsc{cat} & \begin{bmatrix} \textsc{head} & \textit{prep} \\ \textsc{arg-st} & \langle \text{NP}[\textit{ppro}]_{\boxed{1}} \rangle \end{bmatrix} \end{bmatrix} \ldots \right\rangle \\ \textsc{content}|\textsc{rels} & \left\langle \begin{bmatrix} \textit{name-rel} & \\ \textsc{lbl} & \boxed{4} \\ \textsc{arg0} & \boxed{1} \\ \textsc{name} & \textit{bobby} \end{bmatrix}, \begin{bmatrix} \textit{carpet-rel} & \\ \textsc{lbl} & \boxed{5} \\ \textsc{arg0} & \boxed{2} \end{bmatrix}, \begin{bmatrix} \textit{roll-rel} & \\ \textsc{lbl} & \boxed{6} \\ \textsc{arg1} & \boxed{1} \\ \textsc{arg2} & \boxed{2} \\ \textsc{arg3} & \boxed{3} \end{bmatrix}, \begin{bmatrix} \textit{over-rel} & \\ \textsc{lbl} & \boxed{3} \\ \textsc{arg1} & \boxed{2} \\ \textsc{arg2} & \boxed{1} \end{bmatrix} \right\rangle \end{bmatrix}$$

It is, however, possible for (at least some of) these locative relations to be interpreted reflexively. When the *word* object that corresponds to preposition does contain a reflexive relation among the values of CONTENT|RELS in a particular sentence, CRR predicts reflexive marking to be necessary. This prediction is in fact correct (Reinhart & Reuland, 1993, 687-8):

(43) *Bobby rolled the carpet$_2$ over it$_2$.

(44)

$$\begin{bmatrix} \textit{headed-phrase} & \\ \text{HD-DTR}|\text{DTRS} & \left\langle \dots \begin{bmatrix} \text{SYNSEM}|\text{CAT} & \begin{bmatrix} \text{HEAD} & \textit{prep} \\ \text{ARG-ST} & \langle \text{NP}[\textit{ppro}]_{\boxed{2}} \rangle \end{bmatrix} \end{bmatrix} \dots \right\rangle \\ \text{CONTENT}|\text{RELS} & \left\langle \begin{bmatrix} \textit{name-rel} & \\ \text{LBL} & \boxed{4} \\ \text{ARG0} & \boxed{1} \\ \text{NAME} & \textit{bobby} \end{bmatrix}, \begin{bmatrix} \textit{carpet-rel} & \\ \text{LBL} & \boxed{5} \\ \text{ARG0} & \boxed{2} \end{bmatrix}, \begin{bmatrix} \textit{roll-rel} & \\ \text{LBL} & \boxed{6} \\ \text{ARG1} & \boxed{1} \\ \text{ARG2} & \boxed{2} \\ \text{ARG3} & \boxed{3} \end{bmatrix}, \begin{bmatrix} \textit{over-rel} & \\ \text{LBL} & \boxed{3} \\ \text{ARG1} & \boxed{2} \\ \text{ARG2} & \boxed{2} \end{bmatrix} \right\rangle \end{bmatrix}$$

Note that (43) is not ruled out by Principle B (cf. (27)) because *over* has a single-membered ARG-ST where the NP[*ppro*] is not locally o-commanded by anything. The only principle that rules out (43) is the CRR.

## 6 Concluding Remarks

The phenomena examined throughout this paper strongly suggest that the disjointness effects typically attributed to Principle B do not stem from a single cause, thereby contradicting the Unified View. I proposed that the responsibility for accounting for PDEs across different languages should distributed into at least three independent factors:

(i) a preference for expressing semantic identity with coindexation;

(ii) a language-specific variant of Principle B (interpreted as an implicational constraint on *word* objects), and

(iii) a constraint on the morphosyntactic encoding of reflexive relations.

Unlike the traditional Principle B, none of these factors is a syntactic universal. (ii) is syntactic, but not universal. In fact, (ii) is probably learned on the basis of indirect negative evidence, such as statistical preemption – i.e. learners posit something like Principle B if they are consistently faced with positive evidence for other forms (e.g. reflexives) that occur in local binding contexts (Elbourne, 2005; Varaschin, 2021).[9] (i) and (iii) are plausibly universal, but they are not crucially syntactic. I suggested that (i) might be subsumed under Levinson's (2000) Manner Principle, which associates marked forms with marked meanings, and (iii) might be motivated by Levinson's (2000) Informativeness Principle, which associates unmarked forms with unmarked (i.e. stereotypical) meanings.

[9] This provides a novel way to interpret the well-attested fact that children do not display robust adult-level knowledge of Principle B until the age of seven (Elbourne 2005; Hamann 2011; Baauw 2018). If the purely syntactic Principle B pattern we see in English has to be learned, it is not surprising that children might not know it at some point. Furthermore, if Principle B is posited on the basis of statistical preemption, we explain the absence of syntactic PDEs in languages that lack grammaticalized reflexives.

# References

Ariel, Mira. 2008. *Pragmatics and grammar.* Cambridge: Cambridge Univeristy Press.

Baauw, Sergio. 2018. The interpretation of pronouns across Spanish-Speaking Populations. *Languages* 3(2). 11.

Bouma, Gosse & Jennifer Spenader. 2008. The distribution of weak and strong object reflexives in Dutch. *LOT Occasional Series* 12. 103–114.

Burzio, Luigi. 1989. On the non-existence of disjoint reference principles. *Rivista di Grammatica Generativa* 14. 3–27.

Chomsky, Noam. 1981. *Lectures on government and binding.* Dordecht: Foris.

Chomsky, Noam. 1986. *Knowledge of language.* New York, NY: Praeger Publishers.

Chomsky, Noam. 1995. *The minimalist program.* Cambridge, MA: The MIT Press.

Chomsky, Noam. 2008. On phases. In Robert Freidin, Carlos P. Otero & Maria Luisa Zubizarreta (eds.), *Foundational issues in linguistic theory: Essays in honor of Jean-Roger Vergnaud*, 133–66. Cambridge, MA: MIT Press.

Comrie, Bernard. 1999. Reference-tracking: description and explanation. *STUF-Language Typology and Universals* 52(3-4). 335–346.

Copestake, Ann, Dan Flickinger, Carl Pollard & Ivan Sag. 2005. Minimal recursion semantics: an introduction. *Research on Language and Computation* 3. 281–332.

Davis, Anthony R. & Jean-Pierre Koenig. 2000. Linking as constraints on word classes in a hierarchical lexicon. *Language* 76(1). 56–91.

Elbourne, Paul. 2005. On the acquisition of Principle B. *Linguistic Inquiry* 36(3). 333–365.

Faltz, Leonard M. 1985. *Reflexivization: A study in universal syntax.* New York, NY: Garland.

Fiengo, Robert & Robert May. 1994. *Indices and identity.* Cambridge, MA: MIT Press.

Galves, Charlotte. 1986. A interpretação "reflexiva" do pronome no português do Brasil. *DELTA: Documentação e Estudos em Linguística Teórica e Aplicada* 2(2).

van Gelderen, Elly. 2000. *A history of English reflexive pronouns: Person, self, and interpretability*, vol. 39. Amsterdam: John Benjamins.

Grodzinsky, Yosef & Tanya Reinhart. 1993. The innateness of binding and coreference. *Linguistic Inquiry* 24(1). 69–102.

Grolla, Elaine. 2011. The acquisition of contrastive and non-contrastive anaphoric forms in Brazilian Portuguese. In *Selected proceedings of the 4th Conference on Generative Approaches to Language Acquisition North America*, 78–89.

Grolla, Elaine & Karina G. Bertolino. 2011. A proforma 'ele' com antecedente local em portugues brasileiro adulto e infantil. In *Estudos da linguagem: casamento entre temas e perspectivas*, Joao Pessoa: Editora da UFPB.

Hamann, Cornelia. 2011. Binding and coreference: Views from child language. In Jill de Villiers & Tom Roeper (eds.), *Handbook of generative approaches to language acquisition*, 247–290. Dordrecht: Springer.

Haspelmath, Martin. 2008. A frequentist explanation of some universals of reflexive marking. *Linguistic Discovery* 6(1). 40–63.

Haspelmath, Martin. forthcoming. Comparing reflexive constructions in the worlds languages. In Katarzyna Janic, Nicoletta Puddu & Martin Haspelmath (eds.), *Reflexive constructions in the world's languages*, Berlin: Language Science Press.

Heim, Irene. 1998. Anaphora and semantic interpretation: A reinterpretation of Reinhart's approach. In Orin Percus & Uli Sauerland (eds.), *MIT working papers in linguistics the interpretive tract*, vol. 25, 205–246. Cambridge, MA: MIT, Department of Linguistics.

Hicks, Glyn. 2009. *The derivation of anaphoric relations*. Philadelphia, PA: John Benjamins.

Hornstein, Norbert. 2001. *Move! A minimalist theory of construal*. Malden, MA: Blackwell.

Huang, Yan. 2000. *Anaphora: A cross-linguistic approach*. New York, NY: Oxford University Press.

Jackendoff, Ray. 1972. *Semantic interpretation in generative grammar*. Cambridge, MA: MIT Press.

Jackendoff, Ray. 1992. Mme. Tussaud meets the Binding Theory. *Natural Language and Linguistic Theory* 10(1). 1–32.

Kayne, Richard. 2005. *Movement and silence*. Oxford: Oxford University Press.

Koenig, Jean-Pierre & Frank Richter. 2021. Semantics. In Stefan Müller, Anne Abeillé, Robert D. Borsley & Jean-Pierre Koenig (eds.), *Head-Driven Phrase Structure Grammar: The handbook*, Berlin: Language Science Press.

König, Ekkehard & Peter Siemund. 2000. Intensifiers and reflexives: A typological perspective. In Zygmunt Frajzyngier & Traci Curl (eds.), *Reflexives: Forms and functions*, 41–74. Amsterdam: John Benjamins.

Krifka, Manfred. 2018. A direct compositionality approach to Condition C effects under reconstruction and their exceptions. In Manfred Krifka & Mathias Schenner (eds.), *Reconstruction effects in relative clauses*, Berlin: De Gruyter.

Lacerda, Maria Cláudia Mesquita, Rosana Costa de Oliveira & Márcio Martins Leitão. 2014. O processamento da anáfora "se" em português brasileiro e a influência da variação dialetal. *Fórum Linguístico* 11(3). 243–260.

Lakoff, George. 1972. Linguistics and natural logic. In Donald Davidson & Gilbert Harman (eds.), *Semantics of natural language*, Dordecht: Reidel.

Levinson, Stephen C. 2000. *Presumptive meanings*. Cambridge, MA: MIT Press.

Manning, Christopher D & Ivan A Sag. 1998. Argument structure, valence, and binding. *Nordic Journal of Linguistics* 21. 107–144.

Menuzzi, Sergio. 1999. *Binding theory and pronominal anaphora in Brazilian Portuguese*. Utrecht: Holland Academic Graphics.

Meurers, Detmar. 2000. *Lexical generalizations in the syntax of German non-finite constructions*. Tübingen: University of Tübingen dissertation.

Müller, Stefan. 2021. Anaphoric binding. In Stefan Müller, Anne Abeillé, Robert D. Borsley & Jean-Pierre Koenig (eds.), *Head-Driven Phrase Structure Grammar: The handbook*, Berlin: Language Science Press.

Noguchi, Tohru. 1993. Pronominal binding and syntactic categories. In Amy J. Schafer (ed.), *Proceedings of the North East Linguistic Society 23*, 351–365. University of Ottawa: Graduate Linguistic Student Association.

Peitsara, Kirsti. 1997. The development of reflexive strategies in English. In Merja Kytö Matti Rissanne & Kirsi Heikkonen (eds.), *Grammaticalization at work: Studies of long-term developments in english*, vol. 24, 277–370. Berlin: Walter de Gruyter.

Pica, Pierre. 1984. Liage et contiguité. In Jean-Claude Milner (ed.), *Recherches sur l'anaphore*, 119–164. Paris: Paris IV.

Pollard, Carl. 2005. Remarks on binding theory. In Stefan Müller (ed.), *Proceedings of the 12th international conference on Head-Driven Phrase Structure Grammar*, vol. 12, 561–577. Stanford, CA.

Pollard, Carl & Ivan A. Sag. 1994. *Head-Driven Phrase Structure Grammar*. Chicago, IL: University of Chicago Press and CSLI Publications.

Reinhart, Tanya. 1983. *Anaphora and semantic interpretation*. Chicago, IL: University of Chicago Press.

Reinhart, Tanya. 2006. *Interface strategies*. Cambridge, MA: MIT Press.

Reinhart, Tanya & Eric Reuland. 1993. Reflexivity. *Linguistic Inquiry* 24(4). 657–720.

Reuland, Eric. 2011. *Anaphora and language design*. Cambridge, MA: MIT Press.

Rooryck, Johan & Guido Vanden Wyngaerd. 2011. *Dissolving Binding Theory*. Oxford: Oxford University Press.

Rooth, Mats. 1992. A theory of focus interpretation. *Natural Language Semantics* 1(1). 117–121.

Safir, Ken. 2004. *The syntax of anaphora*. New York, NY: Oxford University Press.

Moreira da Silva, Samuel. 1983. *Études sur la symétrie et l'asumétrie sujet/objet dans le Portuguais du Brésil*. Paris: Paris 7 dissertation.

Varaschin, Giuseppe. 2020. Anti-reflexivity and logophoricity: an account of unexpected reflexivization contrasts. *Glossa: a journal of general linguistics* 5(1).

Varaschin, Giuseppe. 2021. *A simpler syntax of anaphora*. Florianopolis: Universidade Federal de Santa Catarina dissertation.

Varaschin, Giuseppe, Peter W. Culicover & Susanne Winkler. in press. In pursuit of Condition C: (non-)coreference in grammar, discourse and processing. In Andreas Konietzko & Susanne Winkler (eds.), *Information structure and discourse in generative grammar*, Berlin: De Gruyter.

Volkova, Anna & Eric Reuland. 2014. Reflexivity without reflexives? *The Linguistic Review* 31(3-4). 587–633.

Zribi-Hertz, Anne. 1995. Emphatic or reflexive? on the endophoric character of French lui-même and similar complex pronouns. *Journal of Linguistics* 31(2). 333–374.

# Morphological marking of constituent questions: A case for nonlocal amalgamation

Olga Zamaraeva
University of A Coruña

Proceedings of the 28th International Conference on
Head-Driven Phrase Structure Grammar

Online (Frankfurt/Main)

Stefan Müller, Nurit Melnik (Editors)

2021

Frankfurt/Main: University Library

pages 241–261

Keywords: HPSG, interrogatives, grammar engineering, DELPH-IN, nonlocal features, cross-linguistic modeling

Zamaraeva, Olga. 2021. Morphological marking of constituent questions: A case for nonlocal amalgamation. In Stefan Müller & Nurit Melnik (eds.), *Proceedings of the 28th International Conference on Head-Driven Phrase Structure Grammar, Online (Frankfurt/Main)*, 241–261. Frankfurt/Main: University Library. DOI: 10.21248/hpsg.2021.13.

**Abstract**

This paper considers the role of nonlocal amalgamation in a system of analyses for typologically diverse languages. Nonlocal amalgamation (Bouma et al., 2001a) was suggested in particular to get rid of extraction rules in Pollard & Sag's (1994) analysis of long-distance dependencies. However, in implemented projects like the English Resource Grammar (Flickinger, 2000, 2011) and the Grammar Matrix (Bender et al., 2002, 2010), the extraction rules have been maintained, while nonlocal amalgamation is used for the analysis of phenomena like the *easy*-adjectives. Zamaraeva & Emerson (2020) argue that, if extraction rules are kept, then supporting the English *easy*-adjectives may be an insufficient reason to maintain nonlocal amalgamation in a cross-linguistic system like the Grammar Matrix, as it complicates the analysis of multiple question word fronting with flexible word order (in languages such as Russian [rus]). However, I present here a case of morphological marking of questions (in languages like Makah [myh]) which further motivates nonlocal amalgamation, as the analysis is remarkably more simple with it than it is without it. An analysis of morphological marking of questions needs to be part of a cross-linguistic system such as the Grammar Matrix as well as an analysis of multiple fronting, which adds a new tension at the level of the Matrix "core" and provides concrete material for discussion of issues ranging from empirical implementation of theoretical ideas like nonlocal amalgamation to the big question of how much of typological space a single system of grammar is expected to cover.

# 1 Introduction

This paper is about interrogative constructions (questions), specifically constituent questions often referred to in the western literature as *wh*-questions (*Who did what to whom?*).[1] Such interrogative constructions take various forms but in most cases there are the question words (like *who*), and in many languages there is also something special going on at the syntactic level, such as obligatory fronting of one or more question words or special morphological marking on the verb that has a *wh* argument. There is rich syntactic literature, in all theoretic traditions including HPSG, dedicated to the syntax of constituent questions in English (Ross, 1967; Ginzburg & Sag, 2000, among many others), containing many focused analyses of *long-distance dependencies*, constructions where a verb and its argument are separated by a clause boundary (1).

(1) *Who* do you think Kim said Sandy believes *did* what to whom? [eng]

This paper considers the role of *nonlocal amalgamation* (aka "lexical threading" of nonlocal features) in a cross-linguistic system of analyses which supports typologically diverse languages. Nonlocal amalgamation (Bouma et al., 2001a) is a theoretical concept in HPSG having to do with propagating the information

[1] Parts of this paper are from the unpublished portions of my dissertation (Zamaraeva, 2021).

about long-distance dependencies in the derivation. It is intended to make analyses more elegant, in particular by getting rid of *extraction lexical rules*, an HPSG device which takes a verb's argument off of its valence list and places it elsewhere, such that it can appear at a dislocated position. This theoretical concept was implemented and tested as part of DELPH-IN grammar engineering projects such as the English Resource Grammar (ERG; Flickinger, 2000, 2011) and the Grammar Matrix (Bender et al., 2002, 2010). One of the research goals of such projects is to test theoretical concepts, particularly in interaction with each other and in the context of prolonged application to large datasets. The Grammar Matrix contains a large system of analyses which, in different customized combinations, cover data (grammatical and ungrammatical sentences) from hundreds of different language types, at least to the extent of test suites which are stored along with the system.

Below, I discuss how such testing of a theoretical idea leads to discovering tensions in cross-linguistic systems of analyses. This paper builds directly on previous work of similar kind. In Zamaraeva & Emerson 2020, we discuss how using nonlocal amalgamation not just theoretically but as implemented in the DELPH-IN version of the HPSG formalism, complicates the analysis of multiple fronting in languages with flexible word order (using Russian as the example). In the context of the Grammar Matrix, that discussion led to actually abandoning nonlocal amalgamation.[2] Here, however, I present a case *for* nonlocal amalgamation which I developed in the process of my work on a cross-linguistic analysis of interrogatives for the Grammar Matrix which followed Zamaraeva & Emerson 2020 (Zamaraeva, 2021). The case is of languages that mark interrogatives morphologically, and in particular the ones which have distinct paradigms for polar and constituent questions (in addition to a separate paradigm for declarative forms).

The paper is structured as follows. Section §2 presents illustrative data from languages which mark interrogatives morphologically, showing how some have a paradigm for constituent questions which is distinct from the set of inflections verbs use in polar questions. Section §3 gives the necessary background on the version of the HPSG formalism that the Grammar Matrix uses, presents the Grammar Matrix project, and provides a summary of how nonlocal features work generally and what nonlocal amalgamation is. The analysis (§4) is given in two parts, each presenting an alternative: morphological marking of interrogatives with (§4.1) and without (§4.2) nonlocal amalgamation, showing that the former is much simpler than the latter. The paper concludes with brief notes regarding future work (§5) and a detailed discussion of how the revealed tension in the system of analyses may help guide future inquiry into linguistic theory (§6).

[2] I omit any detailed exposition of the issue in this paper and refer the reader to Zamaraeva & Emerson 2020 and to Zamaraeva 2021, §6.5.

# 2 Data

In some languages, questions (polar and constituent) involve special morphological marking on the verb, as illustrated by examples from Negidal ([neg]; Tungusik), where the subject agreement marker on the verb in a declarative sentence (2) is different from that in an interrogative sentence (3)–(4).[3]

(2) oǯa-va iche-ǯee-**v**
track-ACC see-FUT-**1SG**
'I will see the tracks.' [neg] (Hölzl, 2018, p. 295)

(3) ii-ǰə-**m** = i?
enter-FUT.Q-**1SG.Q** = Q
'Shall I come in?' [neg] (Hölzl, 2018, p. 295)

(4) eeva iche-ǯa-**m**?
what see-FUT.Q-**1SG.Q**
'What will I see?' (Hölzl, 2018, p. 295)

This type of morphological marking is also found in Yukaghir ([yux]; isolate) and is generally not typologically uncommon. Negidal and Yukaghir will be used in this paper just as two examples of a fairly common phenomenon, in particular because Negidal has non-zero marking and thus is very illustrative, while Yukaghir is in practice part of the Grammar Matrix set of test suites and supported languages (see §3.1 below and Zamaraeva 2021 §§5.2-5.6). The zero marking special for the interrogative paradigm in Yukaghir is illustrated in (5)-(6).[4]

(5) kin ejre-**0**?
who.NOM walk-**ITRG.3SG**
'Who is coming?' [yux] (Constructed by me based on Maslova (2003).)

(6) touke-lek ejre-**0**?
dog-PRED walk-**ITRG.3SG**
'Is the dog coming?' [yux] (Constructed by me based on Maslova (2003).)

Furthermore, in some languages, e.g. in Makah ([myh], Wakashan), the paradigms for constituent and polar questions are distinct. The marker occurring in constituent interrogatives is shown in (7)–(8); note that the question word here is actually analyzed as the main predicate (Davidson, 2002, p. 285).

(7) ʔačaq=**qa:ɬ** duduˈk
who = **CONTENT.3SG** sing
'Who is singing?' [myh] (Davidson, 2002, p.285)

[3] The future tense markers differ as well, and there is an additional question marker =*i*, but it is sufficient to look at just the person and number marker.

[4] Native speakers of Yukaghir are not available, so some examples have to be constructed.

(8) baqiq=**qa:ɬ** tiˈ
what = CONTENT.3SG DEM
'What is this?' [myh] (Davidson, 2002, p.285)

Polar question marking is exemplified in (9).

(9) duduˈk = 'aƛ̓=**qa:k** = s
sing = TEMP = POLAR = 1SG
'Am I singing?' [myh] (Davidson, 2002, p.100)

The goal of this paper is to model separate paradigms as in Makah (7)–(9). Furthermore, the analysis is intended for the Grammar Matrix framework, which means it must fit into a broader system of analyses for different types of languages, including not only the ones like Negidal or Yukaghir but also languages like Russian, among others.

# 3 Background

The goal of §3 is two-fold: (i) to orient the reader in questions of empirical HPSG implementation and explain the specific form in which the analysis issues are presented later in §4; and (ii) aggregate several pieces of analyses scattered around several classic HPSG works such as Pollard & Sag 1994, Ginzburg & Sag 2000, and Bouma et al. 2001a. First, in §3.1 I give a brief overview of the DELPH-IN version of the HPSG formalism and of the Grammar Matrix meta-grammar engineering project. Then I give a summary of what nonlocal features are and how they are traditionally used in HPSG analyses of nonlocal dependencies (§3.2), and how the idea of nonlocal amalgamation fits in (§3.3). I illustrate the theoretical concepts here in the DELPH-IN formalism, because this is what §4 is situated in.

## 3.1 DELPH-IN and the Grammar Matrix

DELPH-IN (DEep Linguistic Processing with HPSG INitiative)[5] is an international consortium of researchers who are interested in engineering grammars using HPSG. DELPH-IN members pursue an integrated research-engineering goal of advancing linguistic theory (particularly syntactic and semantic) through modeling it rigorously on the computer and in the context of real-life applications.[6] DELPH-IN Joint Reference Formalism (JRF; Copestake, 2000) is an HPSG formalism restricted to rely on only unification as a native operation, without relational constraints such as list reordering or counting. This feature of DELPH-IN JRF allows for relatively fast parsing and makes it possible to deploy DELPH-IN

[5]www.delph-in.net; https://github.com/delph-in/

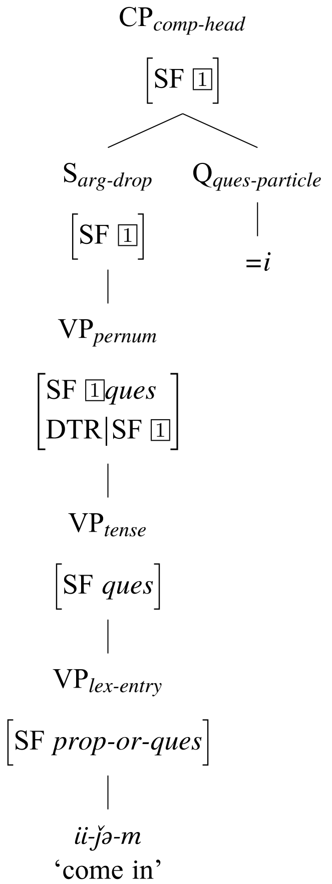
[6]There are other HPSG-based formalisms with varying properties but with similar goals, including ALE (Penn, 2000), LIGHT (Ciortuz, 2002; Ciortuz & Saveluc, 2012), Alpino (Bouma et al., 2001b; Van Noord et al., 2006, focusing on Dutch), and Enju (Miyao & Tsujii, 2008, focusing on probabilistic disambiguation). CoreGram (Müller, 2015) is a grammar engineering project similar to the Grammar Matrix but couched within ALE rather than the DELPH-IN formalism.

grammars for practical applications such as grammar coaching (e.g. Morgado da Costa et al., 2020). Other features of DELPH-IN relevant to this paper's material include the use of lists instead of sets for nonlocal features (see Zamaraeva & Emerson 2020 for details). Constraint unification in DELPH-IN is defined in the context of the "closed world" hierarchy assumption. This means that, in order for any two types to unify, there must be a single (unique) type in the hierarchy which represents their combination (Copestake, 2002, p.42). This is helpful to know to understand the parameterized list hierarchy in §4.2. DELPH-IN JRF incorporates the Minimal Recursion Semantics formalism (MRS; Copestake et al., 2005). Major DELPH-IN projects include the English Resource Grammar (ERG, Flickinger, 2000, 2011); Jacy (a grammar of Japanese, Siegel et al., 2016); Zhong (a grammar of Chinese, Fan, 2018); the LKB grammar engineering environment (Copestake, 2002); the ACE parser (Crysmann & Packard, 2012); and the Grammar Matrix (Bender et al., 2002, 2010), among many others.

The Grammar Matrix (Bender et al., 2002, 2010) is a DELPH-IN-based meta-grammar engineering project that includes a web questionnaire, a core HPSG grammar, a grammar customization system, and a set of language test suites illustrating the supported typological space. Given a typological specification (e.g. "the language uses special morphological marking in questions"), it automatically outputs an HPSG grammar fragment which covers data from the language to the extent specified. The grammar consists of lexical entries as well as phrasal and lexical rules. The types are customized according to the specification but each grammar is based on the same "core". For example, there is a core type for lexical rule, *lex-rule*, from which all customized lexical rules inherit. The core types were originally distilled from the ERG (Flickinger, 2000), as part of Bender et al. 2002. Only few core types are intended as rules for actual licensing of strings in the grammar though, and most of the types in an actual grammar that the Matrix outputs will be customized versions of the core types.

Morphological rules in the Matrix are lexical rules which apply to terminal nodes in the derivation (O'Hara, 2008; Goodman & Bender, 2010). For example, the Negidal example (3) would be analyzed as illustrated in (10). The affixes attach in order. I assume here that the final =*i* is a clause-final question particle which in the Grammar Matrix is analyzed as a complementizer (Bender & Flickinger, 2005). The tense as well as the person and number affixes, being specific to the interrogative paradigm, constrain the clause to have question semantics via the Sentential Force feature ([SF *ques*]), and all other affixes have to unify with that, so an affix from an indicative paradigm would not appear.

(10)



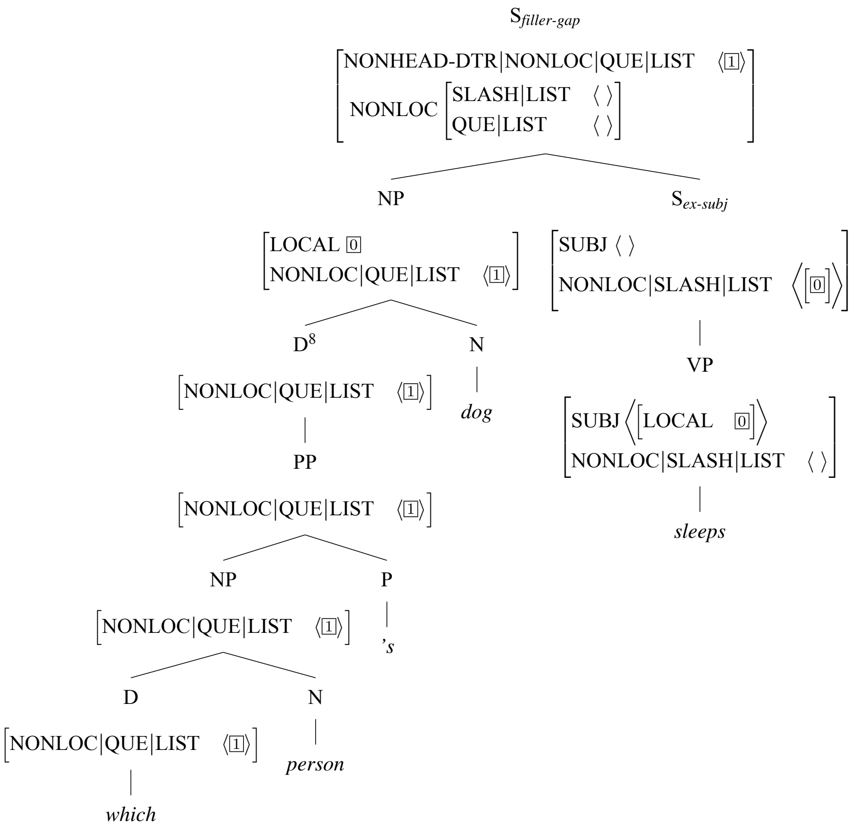

The analyses presented in §4 were developed as part of my work on the constituent questions library for the Matrix. Adding libraries to the Matrix has a fairly established methodology (Bender et al., 2010). The goal of creating a new library is adding testable support for a new syntactic phenomenon. For example, adding support for constituent questions means the user should as a result be able to automatically obtain a grammar which can pair sentences containing constituent questions with syntactic and semantic representations, for a range of languages. In particular, the semantic representations should be well-formed and standard for the Minimal Recursion Semantics formalism. Testing for these criteria can be made automatic, reducing human error to "bugs" that can be made fully explicit and fixed systematically.

## 3.2 Nonlocal features and long-distance dependencies

At the core of Pollard & Sag's (1994) HPSG analysis of long-distance dependencies there are three concepts: (i) nonlocal features; (ii) the Nonlocal Feature Principle (NFP), which is related to nonlocal amalgamation, the focus of this paper; and (iii) the filler-gap construction, aka the head-filler schema. These three concepts can be mapped to three tiers of the analysis: (i) introducing the dependency (the "bottom" tier; nonlocal features); (ii) propagating the dependency ("middle"; the NFP or later nonlocal amalgamation); and (iii) filling the dependency ("top"; filler-gap).

An example illustrating all three tires in a derivation is given in (11).[7]

(11)




Example (11) shows two nonlocal features, SLASH and QUE. That SLASH is "housed" under the nonlocal feature path along with QUE means, if there is any principle which affects all nonlocal features, it will affect both SLASH and QUE. In particular, nonlocal amalgamation (§3.3) was originally developed for SLASH (Bouma et al., 2001a) but Ginzburg & Sag (2000) later suggested a unified nonlocal amalgamation principle applying to all nonlocal features.

In (11), a feature structure labeled $\boxed{0}$ contains the local features of the noun phrase *which person's dog*, and those are also the local features of the subject of *sleeps*. In order for *which person's dog* to appear in its fronted position,[9] the

[7]This example is in the DELPH-IN formalism (§3.1); the feature paths are abbreviated, though the LIST feature of SLASH and QUE is given explicitly, because this is an important detail for technical implementation of list append (see Zamaraeva & Emerson 2020). For a detailed explanation of how nonlocal features work theoretically in Pollard & Sag (1994) and Ginzburg & Sag (2000), see Zamaraeva 2021, pp. 57-74.

[9]It may not be obvious that the position is fronted but consider (i), and see also Zamaraeva 2021,

subject is essentially taken off of the SUBJ list and put on the nonlocal SLASH list by the *subject extraction* phrase structure rule. This is the "bottom" tier. That the SLASH values are propagated through the tree is the "middle" tier, and this is happening due to what Pollard & Sag (1994) call the NFP and what Bouma et al. (2001a) and Ginzburg & Sag (2000) later developed into "nonlocal amalgamation" (§3.3). Finally, at the "top", the filler-gap phrase structure rule "discharges" the dependency; now all nonlocal lists are empty, which is consistent with the definition of a successful parse. The top filler-gap phrase must also be a subtype of the interrogative clause (12), in particular in order for the semantics (e.g. the CONT features) to be correct.

(12)
$$\begin{bmatrix} \textit{interrogative-clause} & \\ \text{SYNSEM}|\text{LOCAL}|\text{CONT}|\text{HOOK} & \boxed{1}\begin{bmatrix}\text{INDEX}|\text{SF} & \textit{ques}\end{bmatrix} \\ \text{HEAD-DTR}|\text{SYNSEM}|\text{LOCAL}|\text{CONT}|\text{HOOK} & \boxed{1} \\ \text{C-CONT}|\text{HOOK} & \boxed{1} \end{bmatrix}$$

Note that the non-head daughter of the filler-gap rule in (11) must have a nonempty QUE value. According to Ginzburg & Sag (2000), the lexical types for some words (such as most question words) will have a nonempty QUE value, while other words will have an empty one. This means only phrases containing a *wh*-word are suitable as filler daughters in this filler-gap construction. Note also that in addition to the SLASH dependency, example (11) shows also the QUE dependency, which is an unbounded dependency between the top of the construction and the bottom of the filler daughter ("pied piping"; Ross, 1967). In other words, QUE helps characterize what types of constituents can occur in the initial position in constituent questions and supports modeling of pied piping.

### 3.3 Nonlocal amalgamation

Bouma et al. 2001a suggested improvements to the analysis in Pollard & Sag 1994, which were later incorporated into Ginzburg & Sag's (2000) account of English interrogatives. In particular, Bouma et al. (2001a) further motivate and simplify the "middle" tier of the analysis. At the core of the classic analysis of that tier is the observation that (i) the information about the long-distance dependency is encoded locally throughout the derivation path (the "middle" part of the long-distance dependency mechanism needs access to the local features of the extracted element at every step); and that (ii) extraction is furthermore registered lexically as selection for a "slashed" argument. Building on the critique of Pollard &

p. 63 for a summary of Ginzburg & Sag's (2000) and Bouma et al.'s (2001a) argument for why the position can be considered fronted even when there is only a single clause in the sentence. At any rate, (11) is intended to just generally illustrate how long-distance dependencies are analyzed.

(i) Which person's dog do you think sleeps? [eng]

Sag 1994 by Hukari & Levine (1996), Bouma et al. (2001a) further motivate the need to register nonlocal information at every step of the derivation by data from languages like Chamorro ([cha], Austronesian), in which verbs exhibit agreement with extracted arguments (13)–(14).

(13) Hayi f-um-a'gasi i kareta
who WH.SU-wash the car
'Who washed the car?' [cha] (Bouma et al., 2001a, p.4)

(14) Hayi si Juan ha-sangan-i hao [f-um-a'gasi i kareta]
who UNM Juan E3S-say-DAT you WH.SU-wash the car
'Who did Juan tell you washed the car?' [cha] (Bouma et al., 2001a, p.5)

Following Chung (1982, 1994), Bouma et al. (2001a) analyze the verb morphology in Chamorro as registering agreement with arguments that contain extracted elements, uniformly in main (13) and embedded (14) clauses. They note that in such a case, a subject extraction rule is not desirable; instead, there can be a unified account of fronted subjects, complements, and adjuncts which (at least for English) does not require extraction lexical rules at all, because they can be replaced by the principle of nonlocal amalgamation. The nonlocal amalgamation principle constrains a head's nonlocal features to be the union of its arguments' nonlocal feature sets, which then allows phrases to simply inherit the nonlocal values of the head daughter, instead of explicitly gathering all the values of all daughters via the extraction lexical rules. In DELPH-IN, this principle is implemented with supertypes like (15), from which all relevant heads (such as verbs) inherit.

(15)
$$\begin{bmatrix} \textit{basic-two-arg-lex-item} & \\ \text{ARG-ST} & \left\langle \begin{bmatrix}\text{NON-LOCAL} & \begin{bmatrix}\text{SLASH} & \boxed{1}\\ \text{REL} & \boxed{2} \\ \text{QUE} & \boxed{3}\end{bmatrix}\end{bmatrix}, \begin{bmatrix}\text{NON-LOCAL} & \begin{bmatrix}\text{SLASH} & \boxed{4}\\ \text{REL} & \boxed{5} \\ \text{QUE} & \boxed{6}\end{bmatrix}\end{bmatrix} \right\rangle \\ \text{SYNSEM|NON-LOCAL} & \begin{bmatrix} \text{SLASH|APPEND} & \left\langle \boxed{1}, \boxed{4} \right\rangle \\ \text{REL|APPEND} & \left\langle \boxed{2}, \boxed{5} \right\rangle \\ \text{QUE|APPEND} & \left\langle \boxed{3}, \boxed{6} \right\rangle \end{bmatrix} \end{bmatrix}$$

In the English Resource Grammar (Flickinger, 2000, 2011) and subsequently in the Grammar Matrix (Bender et al., 2002, 2010), nonlocal amalgamation was implemented mainly to support an elegant analysis of e.g. English *easy*-adjectives. However, extraction lexical rules were maintained, in particular to avoid positing additional lexical entries for all heads which can have their arguments extracted.[10] In Zamaraeva & Emerson (2020), we argue that while for the English Resource Grammar implementing nonlocal amalgamation may be convenient, maintaining nonlocal amalgamation in a cross-linguistic system (the Grammar Matrix) complicates the analysis of multiple question fronting such as is found in Russian. We show that, in the context where extraction rules are present anyway, maintaining

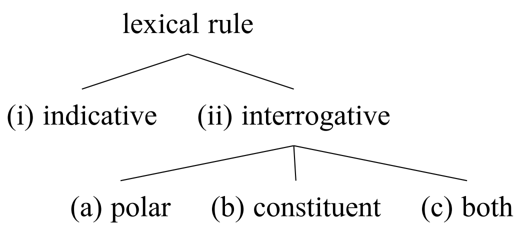
[10] Having to explicitly implement the entire lexicon is one of the things which make empirical approaches to grammar principally different from purely theoretical approaches.

nonlocal amalgamation necessitates adding even more extraction rules, to model languages with flexible order of fronting, where an extracted adjunct may appear between two extracted arguments as well as before or after them. Here in §4, I present a counterpoint to this and show that nonlocal amalgamation greatly simplifies the analysis of morphological marking of questions, thus making explicit a tension in a cross-linguistic system of analyses.

## 4 Analysis

In the context of question marking, a lexical rule can be (i) indicative or (ii) interrogative; and if it is interrogative, it can serve (a) polar, (b) constituent questions, or (c) both:

(16)

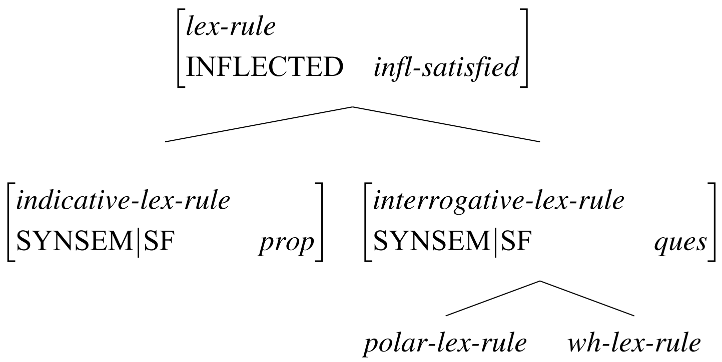



Makah is an example of a language which makes the (a)-(b) distinction, while Negidal and Yukaghir are of the (c) type.

Morphological marking of constituent questions is an example of where nonlocal amalgamation allows for a particularly elegant analysis, especially when it comes to modeling the distinction between options (a), (b), and (c) above, while modeling the difference between (i) and (ii) is straightforward with or without nonlocal amalgamation.

To see why modeling the difference between (i) and (ii) is straightforward either way, consider an HPSG hierarchy of lexical rules (17).[11]

(17)




An *indicative-lex-rule* simply says its SF value is *prop*. This ensures the correct semantics. As for blocking an application of any subtype of the *interrogative clause*,

[11] Feature structures are abbreviated, here and throughout.

it will be ruled out even without saying anything about the nonlocal features of the verb or of its argument, due to the identity between the mother and the daughter's semantic HOOK values which comes from the definition of all head-compositional phrases in the Grammar Matrix, including *interrogative-clause* (12). This somewhat subtle mechanism is illustrated in (18). Red indicates unification failure.

(18)

*$S_{in\text{-}situ}$

[LOCAL|CONT|HOOK|INDEX|SF $\boxed{1}$*ques*
HEAD-DTR $\boxed{2}$[SYNSEM|LOCAL|CONT|HOOK $\boxed{1}$]]

$\boxed{2}S_{subj\text{-}head}$

[LOCAL|CONT|HOOK|INDEX|SF *prop*]

NP

*wh-noun*

$VP_{lex\text{-}rule}$

[LOCAL|CONT|HOOK|INDEX|SF *prop*]

VP

[LOCAL|CONT|HOOK|INDEX|SF *prop-or-ques*]

*verb-IND*

An *interrogative-lex-rule* will say that its SF value is *ques*, allowing verbs marked with such rule to go through a question-forming phrase structure rule, or, if it is a polar question, to make the semantics of the clause interrogative without an additional phrase structure rule, like in (19) for the Yukaghir sentence (6).

(19)

$S_{subj\text{-}head}$

[SF *ques*]

NP

*toukelek*
'dog'

$VP_{lex\text{-}rule}$

[SF *ques*]

VP

[SF *prop-or-ques*]

*ejre-∅*
'come'

While the distinction between (i) and (ii), and by extension (c),[12] is straightforwardly modeled with just the SF feature with or without nonlocal amalgamation (assuming semantic compositionality which ensures the semantic HOOK identities in the phrasal rules), modeling the distinction between (a) and (b) is much easier with nonlocal amalgamation than without it.

### 4.1 Analysis 1: With nonlocal amalgamation

Under the nonlocal amalgamation assumption and in the context of DELPH-IN JRF, a verb's QUE value will be the append of its subject's and objects' (20).

(20)
$$\begin{bmatrix} \textit{verb} & \\ \text{SYNSEM} & \begin{bmatrix} \text{NON-LOCAL|QUE|APPEND} & \langle \boxed{1}, \boxed{2} \rangle \\ \text{LOCAL|CAT|VAL} & \begin{bmatrix} \text{SUBJ} & \left\langle \begin{bmatrix} \text{NON-LOCAL|QUE } \boxed{1} \end{bmatrix} \right\rangle \\ \text{COMPS} & \left\langle \begin{bmatrix} \text{NON-LOCAL|QUE } \boxed{2} \end{bmatrix} \right\rangle \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

In other words, if one or more of the verb's arguments are *wh*-words, the verb's own QUE list will be non-empty; otherwise it will be empty. Given this, modeling the distinction between (i) and (ii) and furthermore between (a) and (b) is straightforward. Markers which are to be used exclusively in polar questions constrain the daughter of the rule (the verb) to be QUE-empty (21).

(21)
$$\begin{bmatrix} \textit{polar-lex-rule} & \\ \text{SYNSEM|SF} & \textit{ques} \\ \text{DTR|SYNSEM|NON-LOCAL|QUE|LIST} & \langle\ \rangle \end{bmatrix}$$

Under the nonlocal amalgamation assumption, this is the same as to say that neither of the arguments is a *wh*-word. Conversely, the ones which are to be used exclusively for *wh*-questions are customized to take QUE-nonempty daughters (22).

(22)
$$\begin{bmatrix} \textit{wh-lex-rule} & \\ \text{SYNSEM|SF} & \textit{ques} \\ \text{DTR|SYNSEM|NON-LOCAL|QUE|LIST} & \textit{cons} \end{bmatrix}$$

This means one or more of the arguments is a *wh*-word.[13] I illustrate the situation with subtrees for (9) and (7) presented side by side in (23).

[12] Option (c) is essentially a statement that only the distinction between (i) and (ii) is relevant.
[13] *Cons* in (22) is a type for non-empty list.

(23)

a.

$\text{VP}_{\textit{polar}}$

$\left[\text{QUE}|\text{LIST}\ \boxed{1}\right]$

$\text{VP}_{\textit{pernum}}$

$\left[\text{QUE}|\text{LIST}\ \boxed{1}\right]$

$\text{VP}_{\textit{lex-entry}}$

$\left[\text{QUE}|\text{LIST}\ \boxed{1}\ \langle\ \rangle\right]$

*dudu'k='aƛ=qa:k=s*

'sing'

b.

$\text{VP}_{\textit{pernum-content}}$

$\left[\text{QUE}|\text{LIST}\ \boxed{1}\right]$

$\text{VP}_{\textit{lex-entry}}$

$\left[\text{QUE}|\text{LIST}\ \boxed{1}\ \langle\ \textit{ref}\ \rangle\right]$

*ʔačaq=qa:ɬ*

'who$_{\textit{predicative}}$'

In the analysis on the left (23a), because the verb has no *wh*-argument, it has an empty QUE value. In the analysis on the right (23b), the verb has a *wh*-subject, and so its own QUE value is not empty. The correct morphological behavior follows, with only the appropriate affix licensed in each case. Note that there is no need to worry about how many arguments the verb has and how many of them are *wh*, and which positions they occupy on the argument list. If the same marker is used for both polar and constituent questions (c), the QUE value on the daughter is underspecified. The analysis is thus simple and elegant.

## 4.2 Analysis 2: Without nonlocal amalgamation

In Zamaraeva 2021, nonlocal amalgamation is not used for reasons addressed in Zamaraeva & Emerson (2020) (namely, to simplify the analysis of multiple fronting and also to make the large system easier to reason about). Nonlocal amalgamation was an integral part of the Matrix core, and after it was removed, no grammars could use it. Therefore, since Zamaraeva 2021 is a cross-linguistic account of multiple types of question-forming strategies, I was forced to develop an account of morphological marking for languages like Makah (making the (a)-(b) distinction in (16)) without nonlocal amalgamation as well. I present it below.

Without nonlocal amalgamation, option (c) (languages which just use one marker for all types of questions) still does not pose complications; the analysis is the same as with nonlocal amalgamation: the QUE value of the lexical rule's sole daughter is underspecified on the rule. However, neither (21) nor (22) will lead to the desired analysis of (a) and (b).

Recall from §3.2 that lexical entries that are not *wh*-words have empty QUE-lists, and the way the QUE values are propagated up the tree is an explicit inheritance in unary and an explicit append in binary rules. Verbs' own QUE lists are empty. This means that most verbs will unify with the daughter of (21) regardless of what their arguments are. An explicit constraint must be put on the verb's arguments instead, but this means an explicit constraint is required for the subject and yet another for the complement.

For the analysis of options (a) and (b), I use a constructed pseudolanguage for an exposition because sufficient data from Makah is not available to me at this time. This pseudolanguage is similar to Makah in the sense that it has two distinct paradigms for polar and constituent questions (24)–(32).

(24) noun tverb-PQ noun?

(25) *noun tverb-WHQ noun?

(26) who iverb-WHQ?

(27) who tverb-WHQ what?

(28) who tverb-WHQ noun?

(29) noun tverb-WHQ what?

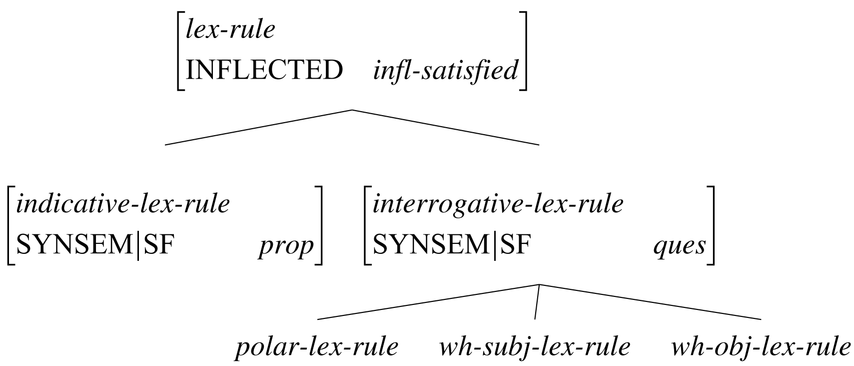
(30) *who tverb-PQ what?

(31) *who tverb-PQ noun?

(32) *noun tverb-PQ what?

For a grammar to behave correctly with respect to (24)–(32), the *interrogative-lex-rule* type should in fact be expanded not into just two but into three further subtypes (33).

(33)




The complication here compared to the analysis with nonlocal amalgamation has to do with the number of the arguments of different verbs. Now that the QUE constraints have to be placed directly on the arguments, covering both (26) and

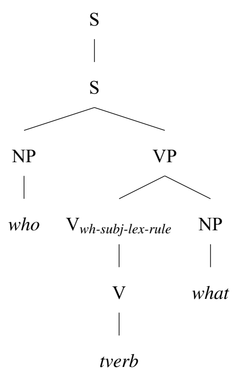
(27) as well as (29) cannot be done that easily. It can be done by having two rules, as suggested in (33), but note that the rules as presented in (34) and (35), without additional constraints, will both apply in e.g. (27), leading to spurious ambiguity (36a)–(36b).

(34) $$\begin{bmatrix} \textit{wh-subj-lex-rule} & \\ \text{SYNSEM|LOCAL|CAT|VAL|SUBJ} & \left\langle \begin{bmatrix} \text{NON-LOCAL|QUE|LIST} & \text{cons} \end{bmatrix} \right\rangle \end{bmatrix}$$

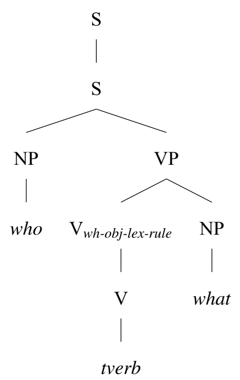
(35) $$\begin{bmatrix} \textit{wh-obj-lex-rule} & \\ \text{SYNSEM|LOCAL|CAT|VAL|COMPS} & \left\langle \begin{bmatrix} \text{NON-LOCAL|QUE|LIST} & \text{cons} \end{bmatrix} \right\rangle \end{bmatrix}$$

(36)

a.




b.




I would like the *wh-subj-lex-rule* to only apply where *wh-obj-lex-rule* cannot. I cannot however constrain the SUBJ list of the *wh-obj-lex-rule* to be empty, because I still need to license sentences with non-*wh* subjects (29) and also because constraining the SUBJ list of the *wh-obj-lex-rule* to be empty would violate a constraint on the lexical rule supertype. By the lexicalist assumption, lexical rules apply before phrase structure rules, and so the subject list of a verbs is necessarily nonempty, since the head-subject rule has not applied yet.

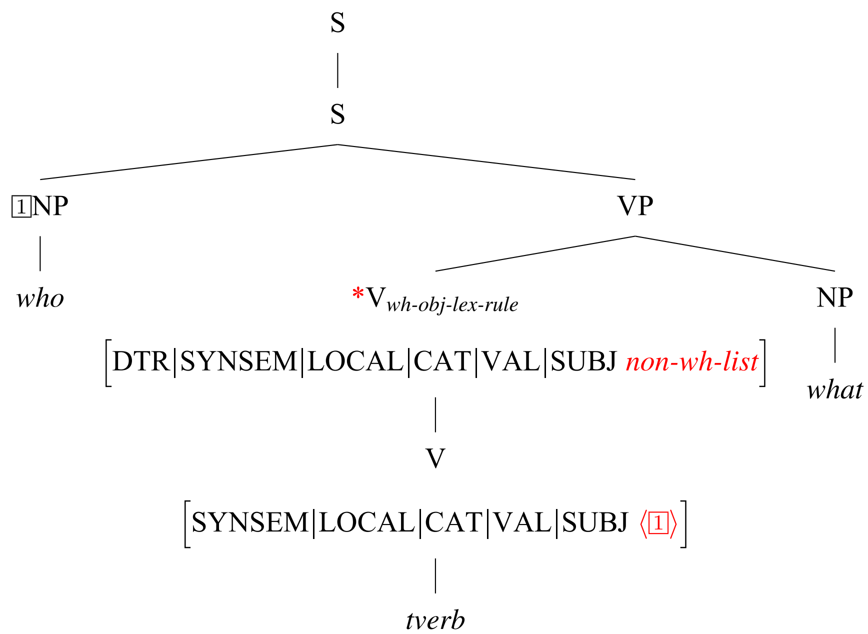
This can be addressed by using a *parameterized list* which here I call *non-wh-list* (37). Simply put, it is a list which stipulates that all elements on it, of which there is zero or more, are not *wh*-words.[14]

(37) $$\begin{bmatrix} \textit{non-wh-cons} & \\ \text{FIRST} & \begin{bmatrix} \textit{synsem} & \\ \text{NON-LOCAL|QUE|LIST} & \langle\,\rangle \end{bmatrix} \\ \text{REST} & \textit{non-wh-list} \end{bmatrix}$$

[14]For a full hierarchy needed for this parameterized list to work, see Zamaraeva 2021, p. 202.

I can use *non-wh-list* to constrain lexical rules so that they allow both empty lists and lists which do not contain *wh*-words. This way, *wh-obj-lex-rule* can insist that the subject is not a *wh*-word — that case would be for the *wh-subj-lex-rule* to take care of — but does not have to be empty. The unwanted second tree (36b) is then ruled out (38).

(38)




The complete set of interrogative lexical rules for a grammar of a language presented as data in (24)–(32) then looks like this (39)–(40).[15]

(39)
$$\begin{bmatrix} \textit{polar-lex-rule} & \\ \text{SYNSEM|LOCAL|CAT|VAL} & \begin{bmatrix} \text{SUBJ} & \left\langle \begin{bmatrix} \text{NON-LOCAL|QUE|LIST} & \langle\,\rangle \end{bmatrix} \right\rangle \\ \text{COMPS} & \textit{non-wh-list} \end{bmatrix} \end{bmatrix}$$

(40)
$$\begin{bmatrix} \textit{wh-subj-lex-rule} & \\ \text{SYNSEM|LOCAL|CAT|VAL|SUBJ} & \left\langle \begin{bmatrix} \text{NON-LOCAL|QUE|LIST} & \text{cons} \end{bmatrix} \right\rangle \end{bmatrix}$$

(41)
$$\begin{bmatrix} \textit{wh-obj-lex-rule} & \\ \text{SYNSEM|LOCAL|CAT|VAL} & \begin{bmatrix} \text{SUBJ} & \textit{non-wh-list} \\ \text{COMPS} & \left\langle \begin{bmatrix} \text{NON-LOCAL|QUE|LIST} & \text{cons} \end{bmatrix} \right\rangle \end{bmatrix} \end{bmatrix}$$

It requires three lexical rules and a separate hierarchy of parameterized list types.[14]

[15] All these rules are subtypes of the interrogative rule (33) and so their sentential force value is *ques*.

## 5 Future work

The argument presented above appeals primarily to elegance. In future work, the interaction of morphological rules with adjunct extraction can be explored with relevant data, and may provide further testing for the nonlocal amalgamation approach. Additionally, while the parameterized list helps get rid of spurious derivations in Analysis 2, considering a larger natural language test suite may reveal other spurious derivations or undesirable behavior in either analysis.

## 6 Conclusion

As shown in Zamaraeva & Emerson 2020 and Zamaraeva 2021, nonlocal amalgamation significantly complicates a system of cross-linguistic analyses such as the Grammar Matrix (Bender et al., 2002, 2010), particularly when it comes to the analyses of long-distance dependencies in languages with flexible word orders. However, in this work I show that at the same time, nonlocal amalgamation significantly simplifies the analysis of constituent questions in languages with morphological marking of questions, particularly those where there exist separate paradigms for polar and constituent questions (in addition to a paradigm for declarative forms of the verb).

What does this tension between two typologically different systems of analyses mean? There are different possibilities to consider.

The first one is that the tension illustrates some issues with the DELPH-IN formalism (particularly, its treatment of nonlocal features as lists with fixed length and order; see Zamaraeva & Emerson 2020 for details). In other words, the argument may be that nonlocal amalgamation should not pose any complications in theory, and that it poses them in practice is not a problem with the idea but with its implementation. While this conclusion is a possible one and it may well be that the DELPH-IN formalism could be improved in the future, it is important to consider the years of empirical success of the DELPH-IN formalism, particularly in the form of the English Resource Grammar (Flickinger, 2000, 2011) and its applications in research (e.g. Buys & Blunsom, 2017) and industry (e.g. Morgado da Costa et al., 2020). The Grammar Matrix (Bender et al., 2002, 2010) is a similar empirical success story, as its analyses are serving 517 typological profiles, as a system.[16] In other words, there is no reason to immediately conclude that the core elements of the formalism such as nonlocal lists should just be abandoned.

The second possible conclusion is that perhaps there is no need for a system of analyses which supports such different typological profiles as Russian and Makah. Here, we are approaching a rather big theoretical debate about whether there is any core set of elements which all languages absolutely must share, or if such a set does not necessarily exist. Reflecting on this debate goes beyond the goals

[16]Some of the profiles are similar to each other but the range is wide, due to the methodology of Matrix development (see Bender et al. 2010 and Zamaraeva 2021, Chapter 5).

of this paper but the evidence shown here could in principle be considered to serve the latter point of view. A weak version of this conclusion is that nonlocal amalgamation itself should not be part of the core but can be added as part of the customization system. This means a rather complex, nontrivial conpcept of customization though.

The third possible conclusion, which perhaps is also a weak version of the second one, is that the typological profiles involved (Russian with its multiple fronting, as discussed in Zamaraeva & Emerson 2020, and Makah with its distinct paradigms, as discussed here) are rare. This in turn can mean two things: First, perhaps rare typological profiles warrant more complexity. On the other hand, it could mean that such languages are not yet well analyzed, and trying to accommodate both of them in the same system requires first refining our understanding of such languages.

Yet another version of this conclusion is that the role of long-distance dependencies is only so prominent in syntactic analysis because English happens to have them. In other words, the elements of analysis that long-distance dependencies seem to require may not be as important for all grammars as we are used to think. This is not to say that a comprehensive theory of grammar should not support them, but rather that our attachment to the existing analyses may be overly influenced by the dominance of English as the test language. Put another way, while it seems obvious that it is the analysis of Makah (and languages like Makah) that we don't yet understand well enough and that should be improved, it may also be that revisiting the analysis of Indo-European languages in the context of a cross-linguistic system may be beneficial.

All the conclusions presented above confirm that systems of analyses such as the Grammar Matrix, which, with computational aid, force syntacticians to consider complex interactions between phenomena intra- and cross-linguistically, are serving their purpose by exposing tensions such as described here.

## Acknowledgments

I thank firstly the anonymous reviewers for their feedback. Part of this work was done at University of Washington. I thank Emily M. Bender and other DELPH-IN members for helpful discussion. The paper was concluded at University of A Coruña. My work at UDC was supported by Prof. Gómez-Rodríguez's funding from the European Research Council (ERC), under the European Union's Horizon 2020 research and innovation programme (FASTPARSE, grant agreement No 714150), from ERDF/MICINN-AEI (TIN2017-85160-C2-1-R, PID2020-113230RB-C21), from Xunta de Galicia (ED431C 2020/11), and from Centro de Investigación de Galicia "CITIC", funded by Xunta de Galicia and the European Union (ERDF - Galicia 2014-2020 Program), by grant ED431G 2019/01.

## References


Bender, Emily M., Scott Drellishak, Antske Fokkens, Laurie Poulson & Safiyyah Saleem. 2010. Grammar customization. *Research on Language & Computation* 8. 1–50.

Bender, Emily M. & Dan Flickinger. 2005. Rapid prototyping of scalable grammars: Towards modularity in extensions to a language-independent core. In *Proceedings of the 2nd international joint conference on natural language processing ijcnlp-05 (posters/demos)*, Jeju Island, Korea.

Bender, Emily M. Dan Flickinger & Stephan Oepen. 2002. The Grammar Matrix: An open-source starter-kit for the rapid development of cross-linguistically consistent broad-coverage precision grammars. In John Carroll, Nelleke Oostdijk & Richard Sutcliffe (eds.), *Proceedings of the Workshop on grammar engineering and evaluation at the 19th International Conference on Computational Linguistics*, 8–14. Taipei, Taiwan.

Bouma, Gosse, Robert Malouf & Ivan A. Sag. 2001a. Satisfying constraints on extraction and adjunction. *Natural Language & Linguistic Theory* 19(1). 1–65.

Bouma, Gosse, Gertjan Van Noord & Robert Malouf. 2001b. Alpino: Wide-coverage computational analysis of Dutch. In *Computational linguistics in the netherlands 2000*, 45–59. Brill Rodopi.

Buys, J. & P. Blunsom. 2017. Robust incremental neural semantic graph parsing. In *Acl*, 1215–1226.

Chung, Sandra. 1982. Unbounded dependencies in Chamorro grammar. *Linguistic Inquiry* 13(1). 39–77.

Chung, Sandra. 1994. Wh-agreement and "referentiality" in Chamorro. *Linguistic inquiry* 25(1). 1–44.

Ciortuz, Liviu. 2002. LIGHT—a constraint language and compiler system for typed-unification grammars. In *Annual conference on artificial intelligence*, 3–17. Springer.

Ciortuz, Liviu & Vlad Saveluc. 2012. Fluid construction grammar and feature constraint logics. In *Computational issues in fluid construction grammar*, 289–311. Springer.

Copestake, Ann. 2000. Appendix: Definitions of typed feature structures. *Natural Language Engineering* 6(01). 109–112.

Copestake, Ann. 2002. *Implementing typed feature structure grammars*, vol. 110. CSLI publications Stanford.

Copestake, Ann, Dan Flickinger, Carl Pollard & Ivan A. Sag. 2005. Minimal recursion semantics: An introduction. *Research on language and computation* 3(2-3). 281–332.

Morgado da Costa, L., R. Winder, Shu Yun Li, Benedict Christopher Lin Tzer Liang, Joseph Mackinnon & F. Bond. 2020. Automated writing support using deep linguistic parsers. In *Lrec*, 369–377.

Crysmann, Berthold & Woodley Packard. 2012. Towards efficient HPSG generation for German, a non-configurational language. In *Proceedings of the 24th*

*International Conference on Computational Linguistics*, 695–710.
Davidson, Matthew. 2002. *Studies in Southern Wakashan (Nootkan) grammar*. Buffalo, NY: University of New York at Buffalo dissertation.
Fan, Zhenzhen. 2018. *Building an HPSG Chinese grammar (Zhong)*: Nanyang Technological University dissertation.
Flickinger, Dan. 2000. On building a more effcient grammar by exploiting types. *Natural Language Engineering* 6(01). 15–28.
Flickinger, Dan. 2011. Accuracy v. robustness in grammar engineering. In Emily M. Bender & Jennifer E. Arnold (eds.), *Language from a cognitive perspective: Grammar, usage and processing*, 31–50. Stanford, CA: CSLI Publications.
Ginzburg, Jonathan & Ivan A. Sag. 2000. *Interrogative investigations*. Stanford: CSLI publications.
Goodman, Michael Wayne & Emily M. Bender. 2010. What's in a word? Refining the morphotactic infrastructure in the LinGO Grammar Matrix customization system. In *Workshop on morphology and formal grammar, paris*, .
Hölzl, Andreas. 2018. *A typology of questions in Northeast Asia and beyond: An ecological perspective*. Berlin: Language Science Press.
Hukari, Thomas E & Robert D Levine. 1996. Phrase structure grammar: The next generation. *Journal of Linguistics* 32(2). 465–496.
Maslova, Elena. 2003. *A grammar of Kolyma Yukaghir*, vol. 27. Walter de Gruyter.
Miyao, Yusuke & Jun'ichi Tsujii. 2008. Feature forest models for probabilistic HPSG parsing. *Computational linguistics* 34(1). 35–80.
Müller, Stefan. 2015. The CoreGram project: Theoretical linguistics, theory development and verification. *Journal of Language Modelling* 3(1). 21–86.
O'Hara, Kelly. 2008. *A morphotactic infrastructure for a grammar customization system*. University of Washington MA thesis.
Penn, Gerald. 2000. Applying constraint handling rules to HPSG. In *In proceedings of the workshop on rule-based constraint reasoning and programming, cl*, Citeseer.
Pollard, Carl & Ivan A. Sag. 1994. *Head-Driven Phrase Structure Grammar*. University of Chicago Press.
Ross, John Robert. 1967. *Constraints on variables in syntax.*: Massachusetts Institute of Technology dissertation.
Siegel, Melanie, Emily M. Bender & Francis Bond. 2016. *Jacy: An implemented grammar of Japanese*. CSLI Publications.
Van Noord, Gertjan et al. 2006. At last parsing is now operational. In *Taln*, .
Zamaraeva, Olga. 2021. *A cross-linguistic analysis of constituent questions for the Grammar Matrix*: University of Washington dissertation.
Zamaraeva, Olga & Guy Emerson. 2020. Multiple question fronting without relational constraints: An analysis of Russian as a basis for cross-linguistic modeling. In *Proceedings of the 27th international conference on Head-Driven Phrase Structure Grammar*, 157–177. Virtual conference.

# Part II
# Contributions to the Workshop

# Neg-phrases in Eton (Bantu): An HPSG-analysis

Julian Form

Goethe University Frankfurt a.M.

Proceedings of the 28th International Conference on
Head-Driven Phrase Structure Grammar

Online (Frankfurt/Main)

Stefan Müller, Nurit Melnik (Editors)

2021

Frankfurt/Main: University Library

pages 263–282

Keywords: HPSG, LRS, negative concord, Eton

Form, Julian. 2021. Neg-phrases in Eton (Bantu): An HPSG-analysis. In Stefan Müller & Nurit Melnik (eds.), *Proceedings of the 28th International Conference on Head-Driven Phrase Structure Grammar, Online (Frankfurt/Main)*, 263–282. Frankfurt/Main: University Library. DOI: 10.21248/hpsg.2021.14.

**Abstract**

This paper presents a study of so-called neg-phrases in Eton, a negative concord language spoken in Cameroon. These phrases strongly resemble negated noun phrases that consist of a negative determiner and a noun, however, I will show that Eton neg-phrases are built differently. Reconciling the non-negative approach to negative indefinites by Penka & Zeijlstra (2005) and the negative approach by Richter & Sailer (2004a,b, 2006), I will argue that Eton neg-phrases consist of an inherently negative modifier and a non-negative indefinite derived from a noun. Embedding the analysis in Lexical Resource Semantics, I will reveal the inherent negativity of Eton neg-phrases and account for their composition by using a lexical rule based on the semantic approach to noun phrases by Beavers (2003).

# 1 Introduction and background

Negative indefinites have received much attention in the literature in the studies on negation and crucially in examinations of negative concord (NC) languages. NC has been observed and studied in many different languages, for instance Italian (cf. Zeijlstra (2004), Godard & Marandin (2006), Giannakidou (2006), among many others) or Polish (cf. Richter & Sailer (2004a,b), for example) besides many other NC languages. The majority of the papers on NC languages is concerned with the question whether negative indefinites are inherently negative or not. Despite the negative indefinites' prominence being due to their tight relationship with NC, they have also attracted the interest of many researchers in recent years outside of NC languages (Penka & Zeijlstra (2005,2010), Zeijlstra (2011), Penka (2012), inter alia). These papers often concentrate on Germanic languages and their negative indefinites and again scrutinize the negative indefinites' (non-) negativity. However, in contrast to the prominently studied European languages as well as some Asian languages (see for instance Sells & Kim (2006) and Yoon (2008) for Korean or Kuno (2008) and Sano et al. (2009) for Japanese), African languages are vastly underrepresented in the studies of negative indefinites and negative items in general,[1] which is why my aim is to broaden the spectrum of languages that are analysed with regard to their negative words and include a language in the examination whose negation system has not been studied systematically yet. I will analyse Eton, a language spoken in Cameroon. Eton is a Bantu language which has, however, been largely disregarded in the literature so far and thus not much is known

[†]I would like to thank Haniel Enokah, Donald Ntsa and Ibrahim Ombede for their judgements and translations of Eton. Furthermore, I want to thank Mark van de Velde for helping me with any questions about the structure and properties of this language in general. I also highly value the comments made and advices given to me when presenting the earliest version of this paper at the workshop of the HPSG 2021 conference. Without Katharina Hartmann, this paper would not have been written and without Benedikt Weber, Sebastian Walter and Pascal Hohmann, this text would not look like it does. Finally, I am deeply indebted to Manfred Sailer who has not only helped me with the content, but also with the technical realisation of my ideas. All remaining errors are mine.

[1]The most obvious reason for that may be that, as claimed in van der Auwera & van Alsenoy (2016,2018), NC as well as negative indefinites are extremely rare in African languages.

about it. Eton lacks a written form, therefore, my writing of it is conventionalized. The only analysis of Eton has been done by van de Velde (2008) and I will basically follow his system and his distinctions of words and affixes.[2] Nevertheless, unlike him, I will ignore the tones despite Eton being a tonal language. This is because tones are not important for the phenomenon under discussion. Besides, Eton is an SVO and a NC language.

Although Eton does not have negative indefinite words,[3] there are constructions where a negative word precedes a noun, thereby creating a negative constituent. These combinations will henceforth be referred to as neg-phrases and be analysed in this paper. The neg-phrases are built out of the negative word *te*[4] and the nouns of the language. Due to Eton being a NC language, these phrases have to co-occur with the negative marker *aa* in pre- as well as postverbal position. This is shown in the examples in (1):[5]

(1) a. Te mod *(aa)-ti di.
NEG person 1.NM-PR eat
'Nobody/No person eats.'

b. Embolo *(aa)-ti di te jom.
Embolo 1.NM-PR eat NEG thing
'Embolo eats nothing/no thing.'

c. Ibrahim *(aa)-ti yen te parra.
Ibrahim 1.NM-PR see NEG preacher
'Ibrahim sees no preacher.'

In all cases, leaving out the negative marker would result in ungrammaticality. Thus, it seems like Eton is a strict NC language, following the distinction in Giannakidou (1998), however, I will just refer to it as NC language in general because there needs to be done further research to be able to finally conclude on this. In particular, my informants disagree on whether a sentence containing a pre- as well as a postverbal neg-phrase, besides the negative marker, is to be interpreted as a single negation (SN) or a double negation (DN).

In addition to occupying the pre- and postverbal position in simple SVO sentences, the neg-phrases can be used in fragment answers (see (2)):

[2]There may be some slight variations between the variety he describes and the one in this paper because of working with different speakers and the possibility of dialectal variation. However, these differences are irrelevant for the topic of this work.

[3]Sometimes in this paper, I will make a distinction between negative indefinites and negative indefinite words. The latter are a subclass of the former. Whilst negative indefinites consist of words and phrases, negative indefinite words are just words like *nobody*, *nothing* or *no*. Phrases like *no car*, for example, are not negative indefinite words, but only negative indefinites.

[4]van de Velde (2008, p. 285) describes it as a negative adverb.

[5]For a description of the abbreviations used in this text, see the glossary at the end of the paper.

(2) a. A: Za-ti yen Linda? B: Te mod.
Who.1-PR see Linda NEG person
'Who sees Linda?' 'Nobody/No person.'

b. A: Dze Ibrahim a-ti yen? B: Te jom.
What Ibrahim 1-PR see NEG thing
'What does Ibrahim see?' 'Nothing/No thing.'

As visible, the neg-phrase can build a fragment answer when the subject is asked for, as in (2a), as well as when the non-subject is asked for, as in (2b). In general, one can see that the neg-phrases can occur in contexts that are typical for negative indefinites of other frequently studied languages contributing the same meaning. Furthermore, their co-occurrence with the negative marker in non-fragmentary contexts is another property that is displayed by those negative indefinites in other NC languages as well.

However, Eton neg-phrases are not only interesting because of widening the scope of languages that are analysed with regard to their negative words, but they are also attractive due to two further points: First of all, they are helpful in the discussion about the (non-)negativity of negative indefinites in NC languages. As I will claim, Eton neg-phrases are inherently negative and therefore, they seem to provide further evidence for the inherent negativity of negative indefinites across NC languages worldwide that has often been claimed in HPSG over the years (cf. de Swart & Sag (2002) or Richter & Sailer (2004a,b, 2006)). The second reason why Eton neg-phrases are interesting is because of their composition. As I will show, *te* is not a negative determiner, but a negative modifier only contributing negation and no quantification. Thus, Eton neg-phrases are different from negated noun phrases (NPs) of other languages consisting of a negative determiner and a simple noun, as for example English *no man*. A detailed analysis will be done in Section 3.

The main goals of this paper are to provide convincing evidence for the inherent negativity of Eton neg-phrases and explain their composition. Besides, in the course of the analysis, further similarities between Eton neg-phrases, on the one hand, and negative indefinites from better-known languages, on the other hand, will be revealed. My analysis will reconcile several previous approaches. I will use the inherently negative approach commonly used in HPSG to model negative indefinites (cf. de Swart & Sag (2002) or Richter & Sailer (2004a,b, 2006)) as well as the non-negative approach that is used in other frameworks (cf. Zeijlstra (2004) and Penka & Zeijlstra (2005)) to describe Eton neg-phrases. Moreover, I will integrate the basic concept of Beavers (2003) which is needed for explaining the neg-phrases' construction. I will show that a reconciliation allows us to integrate the advantages of all sides into the analysis. The negative approach correctly predicts that Eton neg-phrases are inherently negative, whilst the decompositional/non-negative approach as well as my adaptation of the semantic approach to NPs by Beavers (2003) correctly predict the composition of the neg-phrases as being a combination of a negative operator and a non-negative indefinite. The overtness of *te* allows for a straightforward analysis of Eton neg-phrases in a surface-oriented framework like HPSG. In my examinations, I will use the methods of Lexical Resource Semantics (LRS) (Richter & Sailer (2004b)).

So, after this introduction, I will summarize the most important previous approaches in Section 2. Afterwards, I will scrutinize the neg-phrases in Section 3. In Section 3.1, I will examine the semantics of Eton neg-phrases, while in Section 3.2, I will model their composition. Finally, I will conclude this paper in Section 4.

# 2 Previous approaches

The study of negative indefinites has been extensive in NC as well as non-NC languages. This literature review will only give an overview of some of these works, differentiating between the non-negative approach, in which negative indefinites are treated as non-negative and the negative approach, whose proponents argue that these words are inherently negative.

## 2.1 The non-negative approach

The term 'neg-word'[6] originates from the work of Laka (1990) to describe negative indefinites in NC languages. Obviously, this term has now been extended to also refer to negative indefinites of non-NC languages. Since her work, many researchers have focussed on negative indefinites in NC languages. Ladusaw (1992) maintains that in NC languages, negative phrases[7] should be regarded as negative polarity item (NPI) indefinites, which never directly express negation. Nonetheless, he acknowledges that there are differences in licensing NPIs, such as *ever*, and licensing negative phrases. The expression of negation itself is done abstractly by a so-called [neg] feature. This feature is given to a category by a specifier or an adjoined sister. A DN reading of NC constructions is abolished by Ladusaw's constraint that the feature can only work on one node.

Ovalle & Guerzoni (2004) also argue that negation is assigned abstractly instead of being contributed by inherently negative items. They propose that negative indefinites are non-negative existential quantifiers that bear a negative conventional implicature. They further suggest that the distribution of non-sentence initial negative indefinites is due to the restriction that they must occur in the scope of negation or of another averidical expression, such as *before*, *without* or *doubt*. They maintain that preverbal negative indefinites are moved in their surface position and are licensed by an abstract negation which also accounts for their use in elliptical answers. This abstract negation, they say, is positioned higher in a syntactic tree than the preverbal negative marker, which explains DN readings in NC languages.

[6]Originally, those words were labelled 'n-word', but due to the pejorative connotation of this word, 'neg-word' or 'negative indefinite', as in this paper, are used nowadays.

[7]He uses this term to refer to negative indefinites. It is to be distinguished from the term 'neg-phrases', which I use to describe the constructions in Eton this paper is about.

Another interesting approach to NC and the contribution of negative indefinites has been developed by Zeijlstra (2004). He argues that negative indefinites are actually non-negative indefinites that are only syntactically marked for negation. In addition, he adds the restriction that NC is clause-bound. His proposal is that NC is syntactic agreement. The negative elements can either carry an [iNEG] feature or a [uNEG] feature, which stand for an *interpretable* or an *uninterpretable* negative feature. He explains that in non-strict NC languages, negative indefinites have a [uNEG] feature, which must agree with the [iNEG] feature that is either carried by the negative marker or an abstract negation operator. In strict varieties, only the negative operator has an interpretable negative feature, whereas in DN languages, all negative elements have the [iNEG] feature. Zeijlstra also provides an explanation of negative indefinites in elliptical contexts, such as fragmentary answers. He claims that in these contexts, the negative indefinites are licensed by the abstract negative operator with the feature [iNEG] that agrees with the negative indefinites' feature [uNEG]. In these cases, the negative indefinites evoke the presence of the abstract negative operator which NPIs cannot.

Despite analysing DN languages, the approach by Penka & Zeijlstra (2005), who follow the syntactic agreement approach by Zeijlstra (2004), will become important in this paper later, which is why I will shortly mention their core idea now. They suggest that even in DN languages, negative indefinites are not inherently negative. They base their assumptions on the observation that there are split-scope readings of these words where the negation and the indefinite take scope independently. This happens with modal verbs as well as with object intensional verbs, as can be seen in (3).

(3) Es muss kein Arzt anwesend sein. (Penka & Zeijlstra (2005, p. 3))
there must no physician present be

a. 'It is not required that there be a physician present.'
$\neg >$ must $> \exists$

b. *'There is no physician who is required to be present.'
$\neg > \exists >$ must

c. 'It is required that there be no physician present.'
must $> \neg > \exists$

A negative quantifier approach cannot account for these readings. Therefore, they claim that in DN languages, negative indefinites are combinations of an abstract negative operator and a non-negative indefinite that agree with each other. The authors state that the negative indefinites are already licensed by the negative operator in the lexicon in DN languages.

All of the approaches summarized in this subsection share the idea of a covert negative operator that licenses negative indefinites and is responsible for their negative contribution. Although this can explain the non-negative readings of negative indefinites in NC languages and account for split-scope readings, the assumption of a non-overt negative element is disadvantageous when working in a surface-oriented framework like HPSG.

## 2.2 The negative approach

Contrary to the approaches summarized so far, there are also numerous papers arguing for an inherently negative understanding of negative indefinites in NC as well as non-NC languages. Most prominently – in the HPSG framework –, de Swart & Sag (2002) argue that negative indefinites are negative quantifiers in general. Working in a polyadic quantifier framework, they explain that in a NC language, multiple negative quantifiers build one resumptive polyadic negative quantifier resulting only in a SN reading, whilst in DN languages, the quantifiers are iterated, which results in a DN reading. Formulated in another way, they define that a SN reading of multiple negative indefinites (NC) is a sequence of a certain number of concord items which are interpreted as a resumption of an anti-additive quantifier. On the other hand, DN readings are defined as an iteration of two anti-additive quantifiers. In principle, both options are available in every language, according to de Swart & Sag (2002). The choice between the two options depends on the general preference of different languages with regard to diachronic development. This means that NC languages prefer resumption, whereas DN languages prefer iteration of the negative indefinites. The choice depends on the development and the history of the languages.

This way of analysing negative indefinites in NC languages has found some support in studies of negation over the years. For example, Godard & Marandin (2006) as well as Henri (2018) follow the basic concepts developed in de Swart & Sag (2002) to describe negative indefinites in Italian or Mauritian, respectively. However, there is also another way of describing negative indefinites in NC languages in HPSG as inherently negative without deploying the polyadic quantifier approach.

Richter & Sailer (2004a,b, 2006) also argue for the inherent negativity of negative indefinites in NC as well as non-NC languages, but they work in LRS. Richter & Sailer (2004a) examine Polish and propose that its negative indefinites are inherently negative despite the obligatory presence of sentential negation due to the following contexts in which negative indefinites in Polish can stand alone and contribute negation (Richter & Sailer (2004a, p. 310)):

(4) a. Kogo widziałes? Nikogo.
Who have you seen? Nobody.GEN/ACC

b. Chçe poślubić albo Piotra, albo nikogo.
I want to marry either Piotr or nobody

c. Kocham ją jak [żadną inną].
I love her.ACC as [no other].ACC
'I love her more than (I love) any other (girl).'

One can see that in the short answer in (4a), the coordination in (4b) and the comparative in (4c), Polish negative indefinites contribute negation even though they occur alone. To ensure that in languages like Polish, two negative elements only yield a SN reading, Richter & Sailer (2004a, p. 315) formulate the Negation Complexity Constraint which says that there can be at most one negation that is a component of the semantic representation of the clause and has the main semantic constant of the sign's lexical head as its component. However, they need another rule that makes sure that the verb in a negative sentence is always accompanied by the negative marker. This is because of Polish being a strict NC language, so, negative indefinites cannot occur alone in negated sentences. They call this rule the NEG Criterion (Richter & Sailer (2004a, p. 316)).

The negative appraoches summarized here can account for the non-negative readings of negative indefinites in NC languages as well. Additionally, they do not have to assume invisible objects, which is why they are definitely superior to the non-negative approach concerning their suitability for a surface-oriented framework. In the upcoming investigation of Eton neg-phrases, I will follow the concepts of LRS put forth and developed in Richter & Sailer (2004b). I will also show that LRS has a significant advantage over the approach by de Swart & Sag (2002) in explaining split-scope readings. Following the works by Richter & Sailer (2004a,b, 2006), I argue that the negative marker *aa* and the neg-phrases in Eton agree. This is the reason why there is only a SN reading despite the presence of two negative elements.

# 3 An HPSG-analysis of Eton neg-phrases

Throughout the next two subsections, I will examine Eton neg-phrases in detail, combining the negative and the non-negative approach just summarized. I will argue that adapting the LRS analysis of NC languages suits Eton well due to the overtness of the elements involved and the advantages over other concepts. Moreover, I will propose that Eton neg-phrases are combinations of a negative operator and non-negative indefinites, as proposed by Penka & Zeijlstra (2005) for negative indefinites of DN languages. However, the non-negative indefinites the negative word combines with are, themselves, semantically complex following the treatment of determinerless NPs by Beavers (2003). In Section 3.1, I will start arguing for the inherent negativity of the neg-phrases and show that they can be modelled exactly like negative indefinites in other languages are modelled in LRS. In Section 3.2, I will focus on the parts that combine to build neg-phrases which will provide further evidence for their inherent negativity.

## 3.1 The semantics of Eton neg-phrases

Two similarities between negative indefinite words and Eton neg-phrases have already been mentioned in the introduction. The first one is their distribution and meaning. Just like negative indefinite words, Eton neg-phrases can occur pre- and postverbally and build fragment answers, as seen in the examples (1) and (2). In these cases, they contribute the exact same meaning. Another similarity is the participation of these elements in NC. Just like negative indefinites in well-known NC languages like Polish, the neg-phrases are licensed by the negative marker and agree with it to yield a SN reading. Finally, Eton neg-phrases can occur in contexts like the ones in (4) taken from Richter & Sailer (2004a, p. 310) without an additional negative marker showing their inherent negativity. Fragment answers have already been given in (2) and (5) illustrates the use of neg-phrases in a coordination.[8] Since I am not entirely sure about the underlying representation of (5), I only provide simplified glosses.

(5) Ibrahim a-ti je-na e-ba Haniel te mod mpaba.
Ibrahim 1-PR wants marry Haniel NEG person else
'Ibrahim wants to marry Haniel and no one/nobody else.'

Similar to the pattern in Polish or other NC languages like Italian, the neg-phrase *te mod*('nobody') can occur without the presence of the negative marker in a coordination still contributing negation. The second part of the coordination begins after *Haniel*. A conjunction is missing because Eton does not have an equivalent to the English *and*. In such cases, the two parts of the coordination simply follow each other without being connected by an overt conjunction particle. (cf. van de Velde (2008, p. 371)) The examples of Eton neg-phrases occurring without the negative marker *aa* provide convincing evidence for treating the neg-phrases as inherently negative. Therefore, I follow the concept by Richter & Sailer (2004a,b, 2006) and argue that Eton neg-phrases are inherently negative indefinites. (6a) shows a typical lexical entry for negative indefinites in LRS, according to Richter & Sailer (2006, p. 312) and (6b) shows the AVM for neg-phrases in Eton:

(6) a. Lexical entry of negative indefinites in LRS:

$$\begin{bmatrix} \text{PHON} & \langle \textit{personne/nikt/niemand} \rangle \\ \text{SYNSEM} & \textit{NP} \\ \text{LF} & \begin{bmatrix} \text{EXC} & \boxed{1}\ \exists x(\alpha \wedge \beta) \\ \text{PARTS} & \langle x, \boxed{1}, \text{human}'(x), \neg\gamma \rangle \end{bmatrix} \end{bmatrix}$$

**and** $\text{human}'(x) \triangleleft \alpha$
**and** $\boxed{1} \triangleleft \gamma$

b. Description of an Eton neg-phrase:

[8] The third context of Richter & Sailer (2004a) which are comparatives cannot be shown here because the Eton speakers I have worked with do not use neg-phrases in this context.

$$\begin{bmatrix} \text{PHON} & \langle \textit{te jom} \rangle \\ \text{HEAD} & \begin{bmatrix} \textit{noun} \\ \text{NEG} \ + \end{bmatrix} \\ \text{VAL} & \begin{bmatrix} \text{SUBJ} & \langle\rangle \\ \text{SPR} & \langle\rangle \\ \text{COMPS} & \langle\rangle \end{bmatrix} \\ \text{DR} & x \\ \text{PARTS} & \langle x, \text{thing}, \boxed{1} : \text{thing}(x), \exists, \boxed{2} : \exists x(\phi : \psi), \neg\alpha \rangle \\ \text{INC} & \boxed{1} \\ \text{EXC} & \boxed{2} \end{bmatrix}$$

**and** $\boxed{1} \triangleleft \phi$
**and** $\boxed{2} \triangleleft \alpha$

As shown in (6b), the AVM is similar to the entry of negative indefinites in LRS. The phrase contributes a discourse referent (DR), a predicate, the predicate applied to the DR, an existential quantifier, the existential quantification over the DR and some negation. The constraints in (6b) are the same as for the lexical entry by Richter & Sailer (2006). The first one says that the predication (so: $thing(x)$) is in the restrictor of the existential quantification, which itself is in the scope of the negation as per the second constraint. The reason why I chose the LRS type of modelling the neg-phrases is that it is more compositional than the approach by de Swart & Sag (2002) for example. The PARTS list in LRS is the accumulation of all elements that a word or phrase brings with it. Out of these elements, the semantic representation is built and results in the construction of phrases. In addition, one can see which elements are contributed by which sign. Although the approach by de Swart & Sag (2002) in the polyadic quantifier framework is also based on compositionality, the PARTS list in LRS is more detailed, which will become clear when looking at the following: Negative indefinites in the approach by de Swart & Sag (2002) are described as contributing a negative quantifier. In contrast, the PARTS list of a negative indefinite in LRS, as in the example (6a) above, contains a negative operator and an existential quantifier, thus, it is more detailed. This difference is extremely important when looking at split-scope readings. These are also possible in Eton, as can be seen in (7):

(7) Alex a-se kom te jom.
Alex 1-NEG.COP do NEG thing

a. 'It is not possible that Alex does something.'
$\neg >$ can $> \exists$

b. 'There is nothing, Alex can do.'
$\neg > \exists >$ can

c. 'It is possible that Alex does nothing.'
   can $> \neg > \exists$

According to Penka & Zeijlstra (2005), three readings are theoretically possible. These are given in (7a-c). The most salient reading is the one in (7a), where the modal intervenes between the negation and the existential quantifier. This is a major problem for de Swart & Sag (2002), as already mentioned, because the negation and the existential quantification are always tied together. In contrast, LRS does not face this problem. The second constraint in (6a-b) only says that the EXC is in the scope of the negation. When this NP combines with another element, such as a verb phrase (VP) containing a modal, it is not forbidden that other elements can also be in the scope of the negation. Furthermore, when this happens, no order is predetermined. Consequently, readings where the modal intervenes between the negation and the quantification can be accounted for in LRS.

### 3.2 The internal structure of Eton neg-phrases

After having given a description of a complete neg-phrase and having provided evidence for the inherent negativity of these phrases, I will proceed by looking at the parts that build the neg-phrase and model the combination formally. Obviously, the neg-phrases consist of two words, the negative element *te* and a noun. At first glance, one might think that they are combinations of a negative determiner and a noun and therefore be identical to negated NPs like *no man*. However, I will argue that this idea should be rejected.

The main reason for not treating *te* as a negative determiner is that it cannot only negate nouns, but it can also negate verbs. The following example taken from van de Velde (2008, p. 286) illustrates this:[9]

(8) mènè tè pám.
    'I'm not leaving.'

As one can see, the negative word *te* precedes the verb and negates the clause. As van de Velde (2008, p. 285) points out, it is not clear when the negative word is used in combination with verbs, nonetheless, (8) clearly indicates that it cannot be a negative determiner. Furthermore, the example provides further evidence for the inherent negativity of neg-phrases because of the negative contribution of *te* that is part of every neg-phrase. Besides, the sentence in (8) shows that the obligatory co-occurrence of neg-phrases with the negative marker *aa* is a peculiar property of these constructions because *te* alone does not have to be licensed. So, there is another characteristic of Eton neg-phrases that is reminiscent of negative indefinites across the world's languages.

[9]The tones are indicated in the example in (8) even though I generally ignore them. This is because the example is directly taken from van de Velde (2008).

Due to the ability of *te* to also negate verbs, I claim that the quantification that is part of the neg-phrases is contributed by the nouns. This seems even more plausible when considering that Eton neither has a definite nor an indefinite article. This means that in simple sentences like the ones in (9), the existential quantification is contributed by the NP anyway:

(9) a. Ibrahim a-ti yen yegle.
Ibrahim 1-PR see teacher
'Ibrahim sees a/the teacher.'

b. Yegle a-ti di.
teacher 1-PR eat
'A/the teacher eats.'

Following Sailer & Am-David (2016), I assume that the definite as well as the indefinite article contribute existential quantification. Since there is neither in Eton, the nouns contribute the quantification, however, there is an underlying process. The existential quantification is not inherent to the nouns because nouns generally do not contribute quantification by themselves. To be able to explain this, I follow the basic assumption made by Beavers (2003). He argues that determinerless NPs have an underspecified determiner semantics (D-semantics) which must be specified to fulfil the requirements of semantic well-formedness. The way this is achieved is presumably language specific, according to Beavers (2003). In Eton, we know from the examples in (9) that the articleless NPs receive an existential quantification interpretation. Consequently, the specification of the D-semantics is implemented by the addition of the existential quantifier that fulfils the requirement of the missing semantics. Consequently, Eton neg-phrases consist of a negative operator and a non-negative indefinite that is derived from a noun. The description of the non-negative indefinite is given in the following example:

(10) Description of an indefinite nominal projection that can be combined with *te*:

$$\begin{bmatrix} \text{PHON} & \langle \textit{jom} \rangle \\ \text{HEAD} & \begin{bmatrix} \textit{noun} & \\ \text{NEG} & \text{-} \end{bmatrix} \\ \text{VAL} & \begin{bmatrix} \text{SUBJ} & \langle\rangle \\ \text{SPR} & \langle\rangle \\ \text{COMPS} & \langle\rangle \end{bmatrix} \\ \text{DR} & \boxed{1} : x \\ \text{PARTS} & \left\langle \boxed{1}, \text{thing}, \boxed{2} : \text{thing}(x), \exists, \boxed{3} : \exists x(\phi : \psi) \right\rangle \\ \text{INC} & \boxed{2} \\ \text{EXC} & \boxed{3} \end{bmatrix}$$

**and** $\boxed{2} \lhd \phi$

As an example for a non-negative indefinite, I chose *jom* ('thing'). Its HEAD information tells us that it is non-negative. Moreover, the indefinite does not have any valency requirements. The DR value of the indefinite is some variable $x$. On the indefinite's PARTS list, there are the following elements: The DR (referred to by the tag $\boxed{1}$), the predicate, the predicate applied to the DR (referred to by the tag $\boxed{2}$), the existential quantifier and the existential quantification over the DR (referred to by the tag $\boxed{3}$). The INC of the non-negative indefinite is the predicate applied to the DR and the EXC is the existential quantification over the DR. Finally, there is a constraint saying that the INC of the indefinite is in the restrictor of the existential quantification over its DR. This description follows the general principles of LRS and is thus similar to the lexical entries used in the corresponding literature, for example in Richter & Sailer (2004a, p. 312) when modelling indefinites.

Now, it is time to look at the process leading to the existence of the non-negative indefinites that combine with *te*. Because simple nouns in Eton do not need any overt determiner, they just have an underspecified D-semantics, following the conception of Beavers (2003). However, in contrast to his purely semantic approach, I argue that the noun still selects for a determiner. The following lexical rule in (11) integrates Beavers' (2003) notion into LRS:

(11) Input:

$$\begin{bmatrix} \text{PHON} & \langle \boxed{1} \rangle \\ \text{HEAD} & \textit{noun} \\ \text{VAL} & \begin{bmatrix} \text{SUBJ} & \langle\rangle \\ \text{SPR} & \left\langle \begin{bmatrix}\text{DR } x\end{bmatrix} \right\rangle \\ \text{COMPS} & \langle\rangle \end{bmatrix} \\ \text{DR} & x \\ \text{PARTS} & \boxed{2} \\ \text{INC} & \boxed{3} \\ \text{EXC} & Qx(\phi : \psi) \end{bmatrix}$$

**and** $\boxed{3} \triangleleft \phi$

Output:

$$\begin{bmatrix} \text{PHON} & \langle \boxed{1} \rangle \\ \text{HEAD} & \textit{noun} \\ \text{VAL} & \begin{bmatrix} \text{SUBJ} & \langle\rangle \\ \text{SPR} & \langle\rangle \\ \text{COMPS} & \langle\rangle \end{bmatrix} \\ \text{DR} & x \\ \text{PARTS} & \boxed{2} \oplus \left\langle \exists, \boxed{4} : \exists x(\phi : \psi) \right\rangle \\ \text{INC} & \boxed{3} \\ \text{EXC} & \boxed{4} \end{bmatrix}$$

**and** $\boxed{3} \triangleleft \phi$

As can be seen, the simple noun in the input selects for a specifier as indicated by its non-empty SPR list. On its PARTS list, there is no existential quantification yet and its EXC value is an underspecified quantification just like Beavers (2003) proposes. After undergoing the process however, the phrase is fully saturated. Its SPR list has been emptied and it has received existential quantification that has been added to its PARTS list and specified the underspecified quantifier in the EXC value. This lexical rule is applied when there is no other element that can specify the underspecified quantifier semantics of the noun and empty its SPR list. This means when there is no overt quantifier or marker, which exist in Eton (cf. van de Velde (2008)), combining with a noun, the lexical rule in (11) is applied. We do not have to formulate a principle for this because as can be seen in (11), the phonology of the noun does not change when undergoing this process. This is only the case when the noun combines with the non-overt article.

Having explained how the quantification is contributed to neg-phrases, I will proceed by giving a lexical entry of *te* that contributes the negation to the neg-phrases. Because of not being a determiner, I propose that *te* is negative modifier.

(12) a. Lexical entry for *te*:

$$\left[\begin{array}{ll} \text{PHON} & \langle \textit{te} \rangle \\ \text{HEAD} & \left[\begin{array}{ll} \textit{word} & \\ \text{NEG} & + \\ \text{MOD} & \boxed{1}\left[\text{DR} \ \boxed{2}\right] \end{array}\right] \\ \text{VAL} & \left[\begin{array}{ll} \text{SUBJ} & \langle\rangle \\ \text{SPR} & \langle\rangle \\ \text{COMPS} & \langle\rangle \end{array}\right] \\ \text{DR} & \boxed{2} \\ \text{PARTS} & \langle \boxed{2}, \boxed{3} : \neg\alpha \rangle \\ \text{INC} & \boxed{3} \\ \text{EXC} & \boxed{3} \end{array}\right]$$

b. Restriction on *te*: *Te* can only modify elements that contribute existential quantification.

Because *te* cannot only modify nouns, but verbs too, its part of speech is not specified. It is simply described as a word. *Te*'s inherent negativity is indicated by the positive NEG value and having the negation on its PARTS list. It does not have any valency requirements and is a modifier modifying some element that is referred to by a tag, as visible in the HEAD information. The modifier shares the DR value with the element it will modify. According to our current knowledge, this can either be some variable, for example $x$, referring to a noun or the event variable $e$ referring to a verb. The INC and EXC of the negative modifier are identical and referred to by the tag $\boxed{3}$, so, the negation. As one can see, there is no quantification on the PARTS list of the negative word *te* since I claim that it is contributed by the nouns.

To restrict the distribution of *te*, I added the rule in (12b) that the negative modifier can only modify elements contributing existential quantification. Since verbs as well as the indefinites of neg-phrases fulfil this criterion, *te*'s occurrences are explained. Furthermore, this rule enforces the lexical rule in (11) because if the nouns did not undergo this process, they would not contribute existential quantification and could therefore not combine with the negative modifier.

The proposed composition of Eton neg-phrases is exactly what Penka & Zeijlstra (2005) assume for negative indefinites. Thus, we see another similarity between negative indefinites of frequently studied languages and Eton neg-phrases. In contrast to the negative operator they assume, *te* is overt and does not license the neg-phrase, since the nouns can also occur alone, but it is crucial for their negative meaning and contribution. So even though Penka & Zeijlstra (2005) work on negative indefinites in DN languages suggesting the combination of a negative operator and a non-negative indefinite, we see that in LRS, negative indefinites are modelled like that crosslinguistically.[10] It is only that in LRS so far, researchers have not focussed on the composition of the negative indefinites, but only indicated on the PARTS list that there is the negative operator and the indefinite part of the word. The difference of course is that in LRS in contrast to Penka & Zeijlstra (2005), the negation is assumed as being inherent to the word. In Eton, one also has to assume the negation to be inherent to the neg-phrases because of the word *te*. Thus, although Penka & Zeijlstra (2005) work on negative indefinites in DN languages and Eton being a NC language, the similarities between the composition they propose and Eton neg-phrases are meaningful. What is special about Eton neg-phrases is that one can reconstruct this composition of the negative operator combining with the indefinite. Besides, this again highlights the strength of LRS. I mentioned earlier that the LRS approach is superior to the polyadic qauntifier approach by de Swart & Sag (2002) because it can account for split-scope readings where the negation and the existential quantification are separated. Due to Eton neg-phrases consisting of a negative operator and a non-negative indefinite instead of being built out of a negative quantifier and a noun, this separation becomes even more favourable which is only possible in LRS.

Having provided all neceessary steps for the internal structure of a neg-phrase in Eton, I will now look at the explicit combination in the context of a sentence. The final combination of the negative word and the indefinite is a head-modifier phrase. In (13a), I repeat the example sentence in (1b) containing a neg-phrase and in (13b), I provide a simplified tree diagram of the utterance including the head-modifier phrase resulting in the neg-phrase:[11]

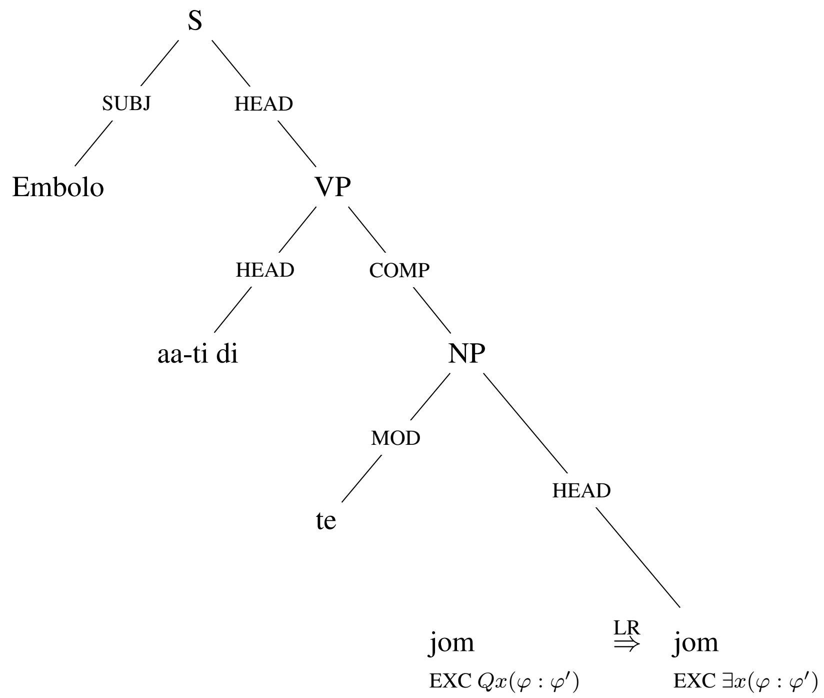
(13) a. Embolo aa-ti di te jom.
Embolo 1.NM-PR eat NEG thing

[10] Actually, the combination of a negative operator and a non-negative indefinite is also proposed for non-NC languages by Zeijlstra (2004). However, in contrast to Penka & Zeijlstra (2005), the negative operator is purely syntactic, whilst in Penka & Zeijlstra (2005), it is argued that this negative operator already licenses the negative indefinites in the lexicon, which is why it cannot be purely syntactic. This is the reason why I prefer to refer to Penka & Zeijlstra (2005).

[11] Ignoring the details of the internal structure of Eton VPs, I simply treat the combination *aa-ti di* as a unit. This is why (13b) is only a simplified tree.

'Embolo eats nothing.'

b. Tree diagram of (13a):




As visible in (13b), the simple noun at first becomes a non-negative indefinite by the application of the lexical rule defined in (11). Afterwards, *te* combines with *jom* in a head-modifier phrase before the neg-phrase combines with the VP forming a head-complement phrase. Finally, this newly formed VP combines with *Embolo* into a head-subject phrase to build a sentence.

## 4 Conclusion

In this paper, I have shown that despite the non-existence of negative indefinite words in Eton, there are constructions that also belong to the class of negative indefinites, the neg-phrases. Neg-phrases are semantically identical to negative indefinites from other languages, occur in the same environments as those and participate in NC as well. Construction-wise, they also show the same behaviour as negative indefinites from other languages in being a combination of a negative operator and a non-negative indefinite. (cf. Zeijlstra (2004) and Penka & Zeijlstra (2005))

My analysis has shown that a reconciliation of the non-negative approach by Penka & Zeijlstra (2005) and the negative approach by Richter & Sailer (2004a,b, 2006) is perfect for capturing the characteristics of Eton neg-phrases. Whereas the non-negative approach correctly predicts the composition of these phrases, the negative approach can account for the negativity of the neg-phrases. The negative contribution of neg-phrases occurring without the negative marker as well as the overtness of the negative modifier *te* clearly favors an HPSG-analysis due to the surface orientation of this framework. Moreover, the approach by Beavers (2003) was extremely helpful in explaining the behaviour and characteristics of NPs in Eton and allowed me to show that the quantification is contributed by the noun turning to an indefinite instead of by the negative modifier.

The analysis of Eton neg-phrases I provided can potentially help in the still ongoing discussion about the (non-) negativity of negative indefinites in NC as well as non-NC languages. Because of Eton neg-phrases clearly belonging to the class of negative indefinites that are examined in the studies of NC across various languages, the stance of treating negative indefinites as inherently negative, in general, is supported by the constructions analysed in this paper. LRS can account for the distribution and the behaviour of negative indefinite words as has been shown in previous works by Richter & Sailer (2004a,b, 2006) as well as for the characteristics of Eton neg-phrases.

At the end of this paper, I would like to make some suggestions for future research. Upcoming work should definitely focus on the exact properties and occurrences of the negative modifier *te*, especially outside of neg-phrases. A detailed lexical entry that can account for all of its uses is desirable. Furthermore, the preverbal negative marker *aa* and its properties have been left aside in this paper, but future work should analyse it due to its interplay with the neg-phrases on the one hand, but also because of its general properties. In addition, utterances where several neg-phrases co-occur in Eton are still mainly unexplored and in need of further investigations. Finally, as mentioned at the beginning of this paper, Eton is a tonal language and due to me ignoring the tones here, future research can hopefully provide sufficient phonetic descriptions of the neg-phrases and the surrounding elements when picking up this topic, following the groundwork laid in van de Velde (2008).

## Glossary

**1** agreement prefix of agreement pattern one.

**ACC** accusative.

**COP** copula.

**GEN** genitive.

**NEG** negative element.

**NM** negative marker.

**PR** present.

## References


van der Auwera, Johan & Lauren van Alsenoy. 2016. On the typology of negative concord. *Studies in Language* 40(3). 473–512.

van der Auwera, Johan & Lauren van Alsenoy. 2018. More ado about nothing: On the typology of negative indefinites. In Ken Peter Turner & Laurence Horn (ed.), *Pragmatics, Truth and Underspecification: Towards an Atlas of Meaning*, 107–146. Leiden/Boston: Brill.

Beavers, John. 2003. More head and less categories: A new look at noun phrase structure. In *International Conference on Head-Driven Phrase Structure Grammar (HPSG)*, vol. 10, 47–67.

Giannakidou, Anastasia. 1998. *Polarity sensitivity as (non) veridical dependency*. Amsterdam: John Benjamins Publishing Company.

Giannakidou, Anastasia. 2006. N-words and negative concord. In Martin Everaert & Henk van Riemsdijk (eds.), *The Blackwell Companion to Syntax*, vol. 3, 327–391. Oxford: Blackwell Publishing 1st edn.

Godard, Daniele & Jean-Marie Marandin. 2006. Reinforcing negation: The case of Italian. In *International Conference on Head-Driven Phrase Structure Grammar (HPSG)*, vol. 13, 174–194.

Henri, Fabiola. 2018. A lexicalist account of negation and negative concord in Mauritian. In Viviane Déprez & Fabiola Henri (eds.), *Negation and Negative Concord: The View from Creoles*, 69–100. Amsterdam: John Benjamins Publishing Company.

Kuno, Masakazu. 2008. Negation, focus, and negative concord in Japanese. *Toronto Working Papers in Linguistics* 28. 195–211.

Ladusaw, William A. 1992. Expressing negation. In *Semantics and Linguistic Theory Conference (SALT)*, vol. 2, 237–260.

Laka, Itziar. 1990. *Negation in syntax: On the nature of functional categories and projections.*: Massachusetts Institute of Technology dissertation.

Ovalle, Luis A. & Elena Guerzoni. 2004. Double negatives, negative concord and metalinguistic negation. *Chicago Linguistics Society (CLS)* 38(1). 15–30.

Penka, Doris. 2012. Negative features on negative indefinites: Evidence from split scope. *Journal of Semantics* 29(3). 373–402.

Penka, Doris & Hedde Zeijlstra. 2005. Negative indefinites in Dutch and German. (manuscript).

Penka, Doris & Hedde Zeijlstra. 2010. Negation and polarity: an introduction. *Natural Language and Linguistic Theory* 28(4). 771–786.

Richter, Frank & Manfred Sailer. 2004a. Polish negation and lexical resource semantics. *Electronic Notes in Theoretical Computer Science* 53. 309–321.

Richter, Frank & Manfred Sailer. 2004b. Basic concepts of lexical resource semantics. In Arne Beckmann & Norbert Preining (eds.), *ESSLLI 2003: Course Material I (Collegium Logicum)*, vol. 5, 87–143. Wien: Kurt Gödel Society.

Richter, Frank & Manfred Sailer. 2006. Modelling typological markedness in semantics: The case of negative concord. In *International Conference on Head-Driven Phrase Structure Grammar (HPSG)*, vol. 13, 305–325.

Sailer, Manfred & Assif Am-David. 2016. Definite meaning and definite marking. In *Joint Conference on Head-Driven Phrase Structure Grammar and Lexical Functional Grammar (HeadLex)*, 641–661.

Sano, Tetsuya, Hiroyuki Shimada & Takaomi Kato. 2009. Negative concord vs. negative polarity and the acquisition of Japanese. In *Conference on Generative Approaches to Language Acquisition North America (GALANA)*, vol. 3, 232–240.

Sells, Peter & Shin-Sook Kim. 2006. Korean NPIs scope over negation. *Language Research* 42(2). 275–297.

de Swart, Henriette & Ivan A. Sag. 2002. Negation and negative concord in Romance. *Linguistics and Philosophy* 25(4). 373–417.

van de Velde, Mark L. O. 2008. *A grammar of Eton*. Berlin: de Gruyter.

Yoon, Suwon. 2008. From non-specificity to polarity. In Moran, Steven and Tanner, Darren S. and Scanlon, Michael (ed.), *Proceedings of the 24th Northwest Linguistics Conference (NWLC)*, vol. 27, 167–176. Seattle: University of Washington.

Zeijlstra, Hedde. 2004. *Sentential negation and negative concord*: University of Amsterdam dissertation.

Zeijlstra, Hedde. 2011. On the syntactically complex status of negative indefinites. *The Journal of Comparative German Linguistics* 14(2). 111–138.

# Saying and shaking ‘No’

Andy Lücking
Université de Paris, Goethe University Frankfurt

Jonathan Ginzburg
Université de Paris

Proceedings of the 28th International Conference on
Head-Driven Phrase Structure Grammar

Online (Frankfurt/Main)

Stefan Müller, Nurit Melnik (Editors)

2021

Frankfurt/Main: University Library

pages 283–299

Keywords: negation, head shake, KoS, positive and negative appraisal, answer particle

Lücking, Andy & Jonathan Ginzburg. 2021. Saying and shaking ‘No’. In Stefan Müller & Nurit Melnik (eds.), *Proceedings of the 28th International Conference on Head-Driven Phrase Structure Grammar, Online (Frankfurt/Main)*, 283–299. Frankfurt/Main: University Library. DOI: 10.21248/hpsg.2021.15.

**Abstract**

In many instances, the head shake can be used instead of or in addition to verbal ‘No’. Based on previous work on negation in dialogue, we observe head shaking as answer particles and as responding to an implicit or an exophoric (i.e., real world situation) antecedent. Exophoric head shake, however, seems to come in two flavours: with positive and with negative emotional valuation of the antecedent situation. We provide semantic analyses for all three uses (and a head nod) within an HPSG version which is implemented in Type Theory with Records and the dialogue framewok KoS. In particular, we extend on previous work by grounding “exophoric negation” in positive or negative appraisal. Finally, we briefly speculate about differences between verbal ‘No’ and head shaking due to (the lack of) simultaneity.

## 1 Introduction

The particle ‘No’ is the prime means for expressing negation in discourse. Probably its most prominent used is answering a polar question:

(1) a. A: (1) Do you want some coffee? / (2) You don’t want some coffee?

b. B: No

Also a head shake can be used in this context, either in addition to or instead of ‘No’ (Kendon, 2002) (we use the symbol ‘’ to represent a head shake):

(2) a. A: (1) Do you want some coffee? / (2) You don’t want some coffee?

b. B: 

The interchangeability of ‘No’ and head shake seems to be licensed in other contexts as well. Further uses of “No” discussed by Tian & Ginzburg (2016) are called ‘“No” with exophoric antecedent’ and ‘“No” with implicit antecedent’. Both uses are exemplified in (3) and (4), respectively. The adult speakers in (3) indicate negative appraisal/classification (Scherer & Ellgring, 2007; Barrett, 2017) of the observed events (example (3a) arguably involves the projection of a possible outcome in the given context). Hence, the negation particle involves an exophorically provided antecedent (namely the observed event).

(3) a. (*A child is about to touch a socket*) Adult: No!

b. (*A discovers that the beer cooler is empty*) A: No!

†This work is supported by a public grant overseen by the French National Research Agency (ANR) as part of the program ‘Investissements d’Avenir’ (reference: ANR-10-LABX-0083). It contributes to the IdEx Université de Paris – ANR-18-IDEX-0001

B in the discourse in (4) makes A think that B split with his or her girlfriend (4b). A develops a corresponding belief (4c). This belief $p =$ *that the girlfriend and B split* is the argument (implicit antecedent) of B's negation (4d).

(4) a. A: How's your girlfriend?

b. B: She is no longer my girlfriend.

c. A: Ah, I'm sorry.

d. B: No, she is my wife now.

Both occurrences of *No* in (3) and (4) can be replaced by the head shake without a change in meaning:

(3′) a. (*A child is about to touch a socket*) Adult: 

b. (*A discovers that the beer cooler is empty*) A: 

(4′) d.  She is my wife now.

That is not to say that head shaking and saying 'No' are fully equivalent; there is a difference in the medium of communication. Head shaking, when addressing an interlocutor, requires joint visual attention. For instance, for the adult preventing the child from reaching the socket the child have to be aware of the adult's head shake (and interpret it as referring to its action). Spoken communication proceeds on the acoustic channel, which requires auditive perception. Given this proviso, the above examples provide evidence that the head shake and the particle 'No' are both form variants of the same lexical resources (this in cultures where the head shake is associated with negation and not with affirmation, as it is in Bulgaria and, with some modifications, Greece, Turkey, and Southern Italy; Jakobson, 1972). It seems that the conjecture of Kendon (2002), namely that the uses of the head shake all share a negative kernel, can be corroborated.

A head shake can be used by a speaker to emphasize negative utterances. An example is given by Bill Clinton in (5).[1] Note that three chunks of head shake gestures are produced, one for each of the negated verbal sub-utterances (*never ... not ... never*). Repetition seems to be used as a temporal means of aligning head movements and the scope of negation.[2]

[1] The speech can be retrieved from the University of Virginia's Miller Center of Public Affairs, where the relevant section starts around 6 min 33 sec: https://millercenter.org/the-presidency/presidential-speeches/january-26-1998-response-lewinsky-allegations.

[2] Aligning gestures with the scope of verbal negation is known from manual gestures. Harrison (2010) observes that the stroke of the 'palm down horizontal across body' gesture (i.e., the hand is moved across the body, opened and the palm turned down; then the hand is moved along the horizontal axis)—a gesture that frequently co-occurs in negative contexts—is usually produced on the negation particle and the post-stroke hold is aligned with its scope.

(5) *I never told anybody to lie (.) not a single time (..) never*
[repeated ] (.) [repeated ] (..) 

The negative particles in (5), *never* (two times) and *not*, establish a negative context in which head shaking can be used in an affirmative way (that is, affirming the negative claims). In the following, we focus on the head shake as an answer particle and as expressing affirmation in negative contexts, as exemplified above. We first summarize the linguistic means we think are needed to analyze head shake (and verbal ‘No’) in Sec. 2. Sec. 3 then introduces a formal framework that lives up to the requirements. The formal tools are applied to the above-given examples in Sec. 4. The analyses extend on previous work, most notably on Tian & Ginzburg (2016). Discussing head shake in negative contexts reveals uses of the head shake which are dissociated from its accompanying speech. We show how to account for them. Finally, we provide examples for the head shake in *positive contexts*. We unify both, negative and positive head shakes, into an appraisal-based analysis, which we call *noetic* head shakes. We conclude in Sec. 5.

## 2 Requirements

In order to account for the uses of head shake and ‘No’ observed in Sec. 1 in terms of linguistic theory, one needs at least

a. a dialogical framework that defines speakers and illocutionary interactions,

b. distinguishes negative and positive propositions,

c. offers a means for representing appraisals (noetics),

d. and provides access to the exophoric context.

Posing a polar question is a speech act, or, as we prefer to say, an illocutionary move in dialogue. Hence, a dialogue framework is the natural formal-linguistic method for analysing head shaking (a.). The semantic ontology of the linguistic framework has to distinguish between positive and negative propositions used as propositional kernels of polar and other questions (b.). Not only is the content of head shake and verbal ‘No’ sensitive to the polarity of the question—see examples (1) and (2)—, it is also needed for explaining the variance of the answer particles *oui* (affirming a positive question) and *si* (denying a negative question) in French, or *ja* (affirming a positive question) and *doch* (denying a negative question) in German.

As attested in exophoric (3), ‘negating a situation’ seems to involve or rest on an emotional evaluation of that situation. Although one could model sentiment in terms of speaker presuppositions, interfacing to a more systematic treatment of appraisal would be preferable (c., d.).

Finally, a representational means for transcribing the head shake in terms of a sign-like structure is needed in order to make head movements accessible for grammar modelling in HPSG (see Lücking, 2020 for an overview), respectively $\text{HPSG}_{\text{TTR}}$, a HPSG variant expressed in term of a Type Theory with Records (Cooper, 2008; Ginzburg, 2012), which we use for the sake of formal uniformity, as will become clear shortly.

The theoretical framework we use is KoS (Ginzburg, 2012). KoS already provides the structure and items needed for requirements a.–d. A basic introduction is given in the following section.

## 3 Background

KoS is a variant of a dynamic update semantics. On a dynamic semantic view, the meaning of an utterance is its update potential, its change of the present context. The simplest model of context, going back to Montague (1974) is one which specifies the existence of a speaker, addressing an addressee at a particular time. This can be captured in terms of the type in (6).

(6) $$\begin{bmatrix} \text{spkr} & : & \mathit{Ind} \\ \text{addr} & : & \mathit{Ind} \\ \text{u-time} & : & \mathit{Time} \\ \text{c}_{\text{utt}} & : & \text{addr(spkr,addr,u-time)} \end{bmatrix}$$

The object in (6) is *record type* from Type Theory with Records (TTR, Cooper, 2012; Cooper & Ginzburg, 2015; Cooper, 2021), a structured set of fields consisting of labels (left to the colon) and (simple or complex) types (right to the colon). Record types classify situations. The type in (6), for instance, classifies situations (*records*) with two individuals and one is talking to the other.[3] If there is such a record, the record type is non-empty. Such a record, a *witness* for (6), is shown in (7):

(7) $$\begin{bmatrix} \text{spkr} & = & a \\ \text{addr} & = & b \\ \text{u-time} & = & t_4 \\ \text{c}_{\text{utt}} & = & e_0 \end{bmatrix}$$

The record type classifies the record if and only if the following *judgements* (indicated by a colon) hold: $a$, $b$ : *Ind*, $t_4$ : *Time*, and $e_0$ : addr($a$,$b$,$t_4$)—see the above-given references for more complete expositions; an exposition from the perspective of HPSG is given in Lücking et al. (2019).

[3]We are simplifying a bit since *addressing* need not be achieved just by speaking, but also by non-vocal signalling.

However, over the last decades it has become clearer how much more pervasive reference to context in interaction is. The visual situation is a key component in interaction from birth (see Tomasello, 1999, Chap. 3). Expectations due to illocutionary acts—one act (querying, assertion, greeting) giving rise to anticipation of an appropriate response (answer, acceptance, counter–greeting), also known as adjacency pairs (Schegloff, 2007). Extended interaction gives rise to shared assumptions or *presuppositions* (Stalnaker, 1978), whereas epistemic differences that remain to be resolved across participants—*questions under discussion* are a key notion in explaining coherence and various anaphoric processes (Ginzburg, 2012; Roberts, 1996). These considerations among several additional significant ones lead to positing a significantly richer structure to represent each participant's view of publicized context, the *dialogue gameboard* (DGB), whose basic make up is given in (8), following the recent version including *mood* described by Ginzburg et al. (2020):

(8)
$$\mathit{DGBType} := \begin{bmatrix} \text{spkr} & : & \mathit{Ind} \\ \text{addr} & : & \mathit{Ind} \\ \text{utt-time} & : & \mathit{Time} \\ \text{c-utt} & : & \text{addressing(spkr, addr, utt-time)} \\ \text{facts} & : & \mathit{Set}(\mathit{Prop}) \\ \text{vis-sit} & = & \begin{bmatrix} \text{foa} & : & \mathit{Ind} \vee \mathit{Sit} \end{bmatrix} : \mathit{RecType} \\ \text{pending} & : & \mathit{List}(\mathit{LocProp}) \\ \text{moves} & : & \mathit{List}(\mathit{IllocProp}) \\ \text{qud} & : & \mathit{poset}(\mathit{Question}) \\ \text{mood} & : & \mathit{Appraisal} \end{bmatrix}$$

Here *facts* represents the shared assumptions of the interlocutors—identified with a set of propositions. *Vis-sit* represents the visual situation of an agent, including his or her focus of attention (*foa*), which can be an object (*Ind*), or a situation or event (*Sit*). The remaining fields concern locutionary and illocutionary interaction: Dialogue moves that are in the process of being grounded or under clarification are the elements of the *pending* list; already grounded moves are moved to the *moves* list. Within *moves* the first element has a special status given its use to capture adjacency pair coherence and it is referred to as *LatestMove*. The current question under discussion is tracked in the *qud* field, whose data type is a partially ordered set (*poset*). *Mood* tracks public displays of emotion, crucial for *inter alia* laughter and smiling (Ginzburg et al., 2020). Mood will be needed in order to model noetic negation. The value of mood is a structure of type *Appraisal*, which is built after the *Component Process Modell* of Russell (2003):

(9)
$$Appraisal := \begin{bmatrix} \text{pleasant} & : & \begin{bmatrix} \text{pred} = \text{pleasant} : \textit{EmotivePred} \\ \text{affect} : \begin{bmatrix} \text{pve} & : & \mathbb{N} \\ \text{nve} & : & \mathbb{N} \end{bmatrix} \end{bmatrix} \\ \text{responsible} & : & \textit{RecType} \\ \text{power} & : & \begin{bmatrix} \text{pred} = \text{powerful} : \textit{EmotivePred} \\ \text{control} : \mathbb{N} \end{bmatrix} \end{bmatrix}$$

Basically, (9) captures the degree of pleasantness of an agent towards an emotion-triggering responsible (a record of some record type), which can be either positive (*pve*, pleasant) or negative (*nve*, unpleasant). The scalar predicate *powerful* specifies the degree of control an agent possesses in relation to the trigger. Appraisal is updated according to *PleasantnessInc*, where the polarity of the update (i.e., whether it contributes to pleasantness or unpleasantness) depends on the value of $\delta$, weighted by $\varepsilon$ (see Ginzburg et al., 2020, p. 31):

(10) $\textit{PleasantnessInc}(\delta, \varepsilon) :=$
$$\begin{bmatrix} \text{pre:} \begin{bmatrix} \text{LatestMove.cont} : \textit{IllocProp} \end{bmatrix} \\ \text{effect} : \begin{cases} \delta < 0 & : \begin{bmatrix} \text{Mood.pleasant.affect.pve} = \\ \quad \text{pre.Mood.pleasant.affect.pve} - (1-\varepsilon) \times \delta : \mathbb{N} \\ \text{Mood.pleasant.affect.nve} = \\ \quad \text{pre.Mood.pleasant.affect.nve} + \varepsilon \times \delta : \mathbb{N} \end{bmatrix} \\ \text{else} & : \begin{bmatrix} \text{Mood.pleasant.affect.pve} = \\ \quad \text{pre.Mood.pleasant.affect.pve} + \varepsilon \times \delta : \mathbb{N} \\ \text{Mood.pleasant.affect.nve} = \\ \quad \text{pre.Mood.pleasant.affect.nve} - (1-\varepsilon) \times \delta : \mathbb{N} \end{bmatrix} \end{cases} \end{bmatrix}$$

The pleasantness update in (10) exemplifies the general mechanism from KoS which describes the evolution of context in interaction. Coherent interaction proceeds according to *conversational rules* which allow to update a previous dialogue state (pre) according to the illocutionary move made by a participant into the new dialogue state (effect). Two (comparatively simple) rules which will be used below are given in (11).

(11) a. Ask QUD-incrementation: given a question $q$ and ASK(A,B,$q$) being the LatestMove, one can update QUD with $q$ as MaxQUD.
$$\begin{bmatrix} \text{pre} & : & \begin{bmatrix} \text{q} & : & \text{Question} \\ \text{LatestMove} = \text{Ask(spkr, addr, q)} & : & \text{IllocProp} \end{bmatrix} \\ \text{effects} & : & \begin{bmatrix} \text{QUD} = \left\langle \text{q, pre.QUD} \right\rangle & : & \text{poset(Question)} \end{bmatrix} \end{bmatrix}$$

b. Assert QUD-incrementation: a straightforward analogue for assertion of (11a): given a proposition $p$ and ASSERT(A,B,$p$) being the LatestMove, one can update QUD with $p$? as MaxQUD.

$$\begin{bmatrix} \text{pre} & : & \begin{bmatrix} \text{p} & : & \text{Prop} \\ \text{LatestMove = Assert(spkr, addr, p)} & : & \text{IllocProp} \end{bmatrix} \\ \text{effects} & : & \begin{bmatrix} \text{QUD} = \left\langle \text{p?, pre.QUD} \right\rangle & : & \text{poset(Question)} \end{bmatrix} \end{bmatrix}$$

The dialogue gameboard (8) as well as the conversational rules make use of *locutionary* and *illocutionary propositions* (types *LocProp* respectively *IllocProp*). Both are special kinds of propositions. Due to clarification interaction, among others, in KoS propositions are modelled as Austinian (Austin, 1950; Barwise & Etchemendy, 1987) propositions, that is, pairs of situations and situation types: $\begin{bmatrix} \text{sit} & : & \mathit{Rec} \\ \text{sit-type} & : & \mathit{RecType} \end{bmatrix}$. A locutionary proposition is a speech event (the record) and its classification by a grammatical type: $\begin{bmatrix} \text{sign} & : & \mathit{Rec} \\ \text{sign-type} & : & \mathit{RecType} \end{bmatrix}$. An illocutionary proposition is the content of a locutionary proposition used within a dialogue move (the illocution defines the kind of move).

Now what about negative and positive propositions? This distinction is hard to make, for instance, within a possible world semantics which regards propositions to be sets of possible worlds. On such an account, a negative proposition would be the complement set of the set of worlds belonging to the negated proposition. Thus, there are two sets of possible worlds but there is no way of determining which is a 'negative' one. Following Cooper & Ginzburg (2015, Sec. 7.1), the type-theoretic account provides a straightforward way of introducing negative (and positive) propositions:

(12) a. If $T$ is a type, then $\neg T$ is a type.

b. $\mathit{RecType}^{\neg}$ is the type of negative record types.

c. $T : \mathit{RecType}^{\neg}$ iff $T = \neg T'$ and $T'$ is a type.

Negative types are licensed by negation particles in speech. Both negative and positive types (of propositions) are needed for analysing head shake uses (see Sec. 4 below). The negation mechanism of negative types does not rest on truth value flipping but on *preclusion*: a situation is of negative type, $s : \neg T$, iff the situation is of a positive type $T'$ which precludes $T$. This is the case if the union of the extensions of $T$ and $T'$ is empty (i.e., there is no $s$ such that $s : T$ *and* $s : T'$), or if $T$ is a negative type itself such that $T = \neg T'$ (recursion condition). Note that the latter ensures that $T$ is equivalent to $\neg\neg T$, although the polarity between two types remains distinct: $T$ is a positive type (assuming that $T$ is not formed according to (12a)) and $\neg\neg T$ a negative one. Encoding negativity in semantics, not in truth-value flipping, is in line, we argue, with the additional processing load imposed by negation (see, e.g., Kaup, 2006). A negative Austinian proposition (*NegProp*) is defined as a paring of a situation and a negative situation type (cf. Cooper & Ginzburg, 2015, Sec. 7.1): $\begin{bmatrix} \text{sit} & : & \mathit{Rec} \\ \text{sit-type} & : & \mathit{RecType}^{\neg} \end{bmatrix}$. Positive propositions (*PosProp*) are defined in the obvious, similar way.

# 4 Analysing head shake uses

For representing head shakes we adopt the simple but useful representation format presented by Crasborn (2014), where head movements are transcribed along three dimensions, *Type*, *Start direction*, *Repetition*:[4]

(13)

| *Type* | *Start direction* | *Repetition* |
|---|---|---|
| N(od), S(hake) | L(eft), R(ight) | $1, 2, 3, \ldots \in \mathbb{N}$ |

For instance, shaking the head seven times in a row where head movement initiates to the head shakers' right side is glossed 'SR7' (which is what Clinton does in his first head shake repetition in (5)).

In Sec. 4.1 we look at head shakes used as answering polar questions. In Sec. 4.2 we show how head shake simultaneous with speech lead to a contradiction, or to an exophoric but dissociated interpretation. Exophoric uses are further discussed in Sec. 4.3, where positive and negative valenced head shakes are distinguished.

## 4.1 Answering polar questions

Lexical entries and phrasal rules are construed as types for interaction, they refer directly to the DGB via the field *dgb-param*. In particular, all signs have dgb-params that include the addressing condition (6). For instance, the lexical entry for the head shake that answers a polar question as in (2) virtually is the same as the lexical entry of 'No' used in that way, too, and following Tian & Ginzburg (2016), is given in (14).

[4]We adopt only the kinematic representation, not the functional one since the latter is absorbed by our semantic representations. A complete head movement is one instance of a back-and-forth rotation around an axis (vertical in case of nodding, horizontal in case of head shaking).

(14)
$$\begin{bmatrix} \text{shape} = \text{S}xy : \textit{HeadMovement} \\ \text{dgb-params} : \begin{bmatrix} \text{spkr} : \textit{Ind} \\ \text{addr}: \textit{Ind} \\ \text{u-time}: \textit{Time} \\ \text{c1} : \text{addr(spkr, addr, u-time)} \\ p : \textit{Prop} \\ \text{MaxQUD} = p? : \text{PolarQuestion} \end{bmatrix} \\ \text{content} = \text{Assert(spkr,addr, u-time,NoSem(}p\text{))} : \textit{IllocProp} \end{bmatrix}$$

Here 'S', following (13), represents the decisive feature of a shaking movement performed by the head, $x$ and $y$ underspecify its start direction and repetition, respectively. We are not aware of any evidence that the start direction of a head shake has any semantic effect. Repetition leads to obvious emphasis. However, following work on manual co-speech gesture (Harrison, 2010), repetitions can temporally align head shakes with verbal negation scope, as observed in (5).

The semantics of 'NoSem($p$)' is sensitive to the polarity of the proposition it applies to. To this end, positive (*PosProp*) and negative (*NegProp*) propositions have to be distinguished (cf. Sec. 3). If a negative particle (*not*, *no*, *n't*, *never*, *nothing*) is part of the constituents of a proposition $\neg p$, then $\neg p$ is of type *NegProp* ($\neg p$ : *NegProp*). The corresponding positive proposition—the one with the negative particle removed, so to speak—is $p$ ($p$ : *PosProp*). With this distinction at hand, *NoSem* works as follows:

(15)
$$\text{NoSem}(p) = \begin{cases} \neg p & \text{if } p : \textit{PosProp} \\ p & \text{if } p : \textit{NegProp} \end{cases}$$

(Note that the result of 'NoSem($p$)' is always of type *NegProp*; $p$ : *NegProp* means that $p = \neg q$, which *NoSem* leaves unchanged, as expressed in the second condition of (15).)

The head nod can be analysed along analogous lines. The form is given by a possibly repeated nod, the polar sensitivity is captured in terms of 'YesSem'; the corresponding lexical entry is given in (16):

(16)
$$\begin{bmatrix} \text{shape} = \text{N}xy : \textit{HeadMovement} \\ \text{dgb-params} : \begin{bmatrix} \text{spkr} : \textit{Ind} \\ \text{addr}: \textit{Ind} \\ \text{u-time}: \textit{Time} \\ \text{c1} : \text{addr(spkr, addr, u-time)} \\ p : \textit{Prop} \\ \text{MaxQUD} = p? : \text{PolarQuestion} \end{bmatrix} \\ \text{content} = \text{Assert(spkr, addr, u-time, YesSem(}p\text{))} : \textit{IllocProp} \end{bmatrix}$$

The semantics of *YesSem* is *not* just the mirror image of *NoSem* but rather an identity function and given in (17):

(17) $$\text{YesSem}(p) = \begin{cases} p & \text{if } p : \mathit{PosProp} \\ p & \text{if } p : \mathit{NegProp} \text{ (preferred over } \neg p) \end{cases}$$

The second condition in (17) amounts to a confirmation of a negative question, albeit as a preferred interpretation, as illustrated a (18) and (19).

The opposition between head shaking and nodding implements a binary system. Its 'two-sidedness' apparently gives rise to a truth-based answering system (or a positive–negative system in the original terms of Pope, 1972, p. 115). Adopting the response examples for positive questions from (Krifka, 2013, p. 2) provides support for this assumption, as testified with both verbal and nonverbal response items (the icon '' represents a head nod):

(18) A: Did you steal the cookie?

a. B: Yes. / (= B did steal the cookie.)

b. B: No. / (= B did not steal the cookie.)

However, things get less clear with negative questions. According to Krifka (2013), all four combinations of answer fragments 'Yes' and 'No', and agreement respectively disagreement are possible (i.e., (19a).(i) and (ii) and (19b).(i) and (ii)), according to our *NoSem* and *YesSem* the situation is more tidy (the answers in (i) are strongly preferred over those in (ii), indicated by '?'). Apparently, there is some variance in speaker judgements, which is also attested in the study of Berry et al. (2017) (on the German language).

(19) A: Did you not steal the cookie?

a. B: Yes. / ((i) *Yes, I didn't.*, (ii) ?*Yes, I did.*.)

b. B: No. / ((i) *No, I didn't.*, (ii) ?*No, I did.*.)

This raises the question how head movements are interpreted in a polarity-based answering systems (agreement–disagreement systems in the original terms of Pope, 1972, p. 115) such as German, French, or Swedish. For German, the pattern for responding to a positive question is the same as for English, since the affirmative alternative *doch* is excluded:

(20) A: Hast Du den Keks gestohlen? ('Did you steal the cookie?')

a. B: Ja. /  (= B did steal the cookie.)

b. B: Nein. /  (= B did not steal the cookie.)

c. #B: Doch.

*Doch* is allowed in a negative context, where it rejects a negative proposition. This is shown in (21), where *Ja* ‘Yes’ and *Nein* ‘No’ are interpreted in terms of *YesSem* respectively *NoSem*. The only way to reject the proposition requested by the negative question is to use *doch* (although (21b) seems to be better than (21a)). While the particle can be used alone or accompanied a head nod, neither head movement gives rise to its response function (21c).

(21) A: Du hast nicht den Keks gestohlen? (‘Did you not steal the cookie?’)

a. B: Ja. /  (B did not steal the cookie.)

b. B: Nein. /  (B did not steal the cookie.)

c. B: Doch. / Doch +  (B stole the cookie.)
# Doch +  / #  / # 

The examples in (21) suggest that the binary form system of head shaking and nodding is restricted to a binary functional system, too, being (at least closely) equivalent to verbal ‘Yes’ and ‘No’. The head nod may inherit the rejective force of *doch* when accompanying it. Interestingly, this does not seem to be possible for head shaking, further supporting the truth-based working of horizontal and vertical head movements.

## 4.2 (Alleged) Contradictions and dissociated uses

In using head shake or head nod as polar answer elements, the gesturer reacts to a previous question usually posed by an interlocutor. However, head movements can also be used by a speaker simultaneous to speech. An example is given in (22):

(22) I believe you


The head shake in (22) is produced in the context of a positive proposition. According to a variant of *NoSem* which generalises over polar questions, the head shake negates that proposition—hence a contradiction arises. However, the contradictory flavour can be avoided if the head shake is likened to exophoric uses of verbal ‘No’ (cf. Sec. 1). In that case, it does not operate on some proposition, but expresses an attitude towards some external situation—in (22) that situation happens to be the belief state described by the speaker. The cranial movement can be interpreted in a way that the speaker shakes her head about the very fact that she indeed believes the addressee (the addressee might, for example, be a person which is known for his untrustworthiness). Note that this reinterpretation restores coherence but requires that speech and accompanying head shake become *dissociated*—in contrast to simultaneous saying 'No' and shaking the head they do not refer to the same state of affairs. Such dissociations are an assumption argued for in some detail with respect to speech laughter by (Mazzocconi et al., 2020), hence they seem to constitute a general but seldomly reported pattern of multimodal communication.

If more context is added, disassociated uses can get more complex. Consider (23):

(23) *(Context: Claims that B stole 500€)*

a. B: They say I stole the money. I didn't.

b. A: I believe you.

One can understand A as both verbally expressing his belief in B's protestation of innocence, whereas the head shake affirms the negative proposition B makes ¬Stole(B, 500€) (when related to the second sentence uttered by B), or expresses that A is upset about what 'they' did (when related to B's initial uttered sentence—what we refer to as a *noetic* use).

### 4.3 Noetic uses

Noetic uses stand out since they appeal to expressing attitudes. The dissociated uses in previous section already provided examples since they involve the evaluation of a situation. Here we want to take a closer look on evaluative head shakes and argue that they can be triggered by both negative *and* positive appraisal. We then spell out a mood-based semantics for noetic head shake.

The negative use is verbally expressed by 'I can only shake my head at that' and is exemplified in (24).

(24) (*A tennis player is throwing a ball at the ball kid*)
Have you seen this? What a shame!

The head shake in (24) signals that the speaker evaluates the observed situation in a negative way. Positive appraisal is exemplified in (25):

(25) (*A tennis player serves the 7th ace in a row*)
Wow! What a player!

The head shake in (25) expresses amazement concerning the athletic achievement. So it can be understood as a way of signalling disbelief. Disbelief in turn is a notion which rests on some sort of negation, corroborating Kendon's (2002) conjecture that the head shake involves some sort of negative context at first glance. However, the disbelief in (25) is rooted in a rather positive mood. Both uses, positive and negative amazement, can be captured in a single lexical entry which operates on KoS' *mood* field and the *PleasantnessInc* updates (cf. (10) from Sec. 3; we simplify over power which does not seem to contribute much here):

(26)
$$\begin{bmatrix} \text{form} : \texttt{headshake} \\ \text{dgb-params} : \begin{bmatrix} \text{spkr} : \textit{Ind} \\ \text{vis-sit} : \begin{bmatrix}\text{foa} : \textit{Rec}\end{bmatrix} \\ \delta : \mathbb{N} \\ \text{c2} : \text{Arousal}(\delta, \text{form}) \\ \text{L} : \textit{Type} \\ \text{p} = \begin{bmatrix} \text{sit} = \text{foa} \\ \text{sit-type} = \text{L} \end{bmatrix} : \textit{Prop} \end{bmatrix} \\ \text{cont} = \text{Amaze}(\text{spkr}, \text{p}, \delta) : \textit{Prop} \end{bmatrix}$$

Depending on the polarity of $\delta$, the update of publicly displayed face according to (10) will be positive or negative. Thus, we ascribe the exophoric act of negating a situation to appraisal (an emotional stance towards that situation)—an account which is already implicit in analysing exophoric 'No' in Tian & Ginzburg (2016).

The basic treatment we have sketched here for head shaking applies to laughter, smiling, and related facial gestures. Ginzburg et al. (2020) argue that laughter and smiling have two basic meanings, one that expresses the incongruity of an event, the other that an event is pleasant for the speaker. From the noetic head shakes we can make the prediction that laughter will only co-occur with positive head shake—a testable prediction of the account of negation in discourse presented here.

Finally, it is noteworthy that the parallelism between 'No' and head shake breaks down with noetic uses: in examples such as (24) or (25) it seems to be possible to say 'No' *before* the amazed *What a …* interjection, but not *after* it. In speech the attitude seems to have to precede its object, while in multimodal interactions both can be uttered simultaneously.

## 5 Conclusion

We observed different uses of head shakes in dialogue which seem to be equivalent to verbal 'No'. Both can be used as answer particles to a polar question, a use of 'No' whose semantics has been spelled out by Tian & Ginzburg (2016). Like 'No', the head shake can also be used in an exophoric way, reacting to a real world situation. We argue that the reaction consists in appraisal. We identify two polar variants: a positively and a negatively valenced head shake, both captured under the term *noetic* head shake. In future work also responses to positive and negative *assertions* have to be looked at, which are known to exhibit far more flexibility than polar questions, in particular in polarity-based answer systems (Karagjosova, 2001). Besides looking at further head shake uses (Kendon, 2002 identifies eight uses, most of which are distinguished by linguistic context and can be dealt with in our system), the issue of timing seems to be of genuine impact: communicating on different channels allows for the simultaneous production of signals. It seems as though simultaneous multimodal utterances can be 'translated' to serialized speech alone, but not in any order of words—a conjecture that needs to be investigated more carefully.

## References

Austin, John L. 1950. Truth. In *Proceedings of the aristotelian society. supplementary*, vol. xxiv, 111–128. Reprinted in John L. Austin: *Philosophical Papers*. 2. ed. Oxford: Clarendon Press, 1970.

Barrett, Lisa Feldman. 2017. The theory of constructed emotion: an active inference account of interoception and categorization. *Social cognitive and affective neuroscience* 12(1). 1–23. doi:https://doi.org/10.1093/scan/nsw154.

Barwise, Jon & John Etchemendy. 1987. *The liar*. New York: Oxford University Press.

Berry, Claus, A. Marlijn Meijer, Sophie Repp & Manfred Krifka. 2017. Puzzling response particles: An experimental study on the German answering system. *Semantics and Pragmatics* 10. 19. doi:http://dx.doi.org/10.3765/sp.10.19.

Cooper, Robin. 2008. *Type theory with records and unification-based grammar* 9–33 (Trends in Linguistics: Studies and Monographs 201) Mouton de Gruyter.

Cooper, Robin. 2012. *Type theory and semantics in flux* 271–323 (Handbook of Philosophy of Science 6) Elsevier.

Cooper, Robin. 2021. From perception to communication: An analysis of meaning and action using a theory of types with records (TTR). https://github.com/robincooper/ttl. Unpublished book draft.

Cooper, Robin & Jonathan Ginzburg. 2015. *Type theory with records for natural language semantics* chap. 12, 375–407. Wiley-Blackwell 2nd edn.

Crasborn, Onno. 2014. Annotating form + function of head movements. http://signnonmanuals.aau.at/sites/default/files/pdf/Crasborn_SignNonmanuals_Klagenfurt_2014_headmovement.pdf.

Ginzburg, Jonathan. 2012. *The interactive stance: Meaning for conversation*. Oxford University Press.

Ginzburg, Jonathan, Chiara Mazzocconi & Ye Tian. 2020. Laughter as language. *Glossa* 5(1). 104. doi:10.5334/gjgl.1152.

Harrison, Simon. 2010. Evidence for node and scope of negation in coverbal gesture. *Gesture* 10(1). 29–51. doi:10.1075/gest.10.1.03har.

Jakobson, Roman. 1972. Motor signs for 'yes' and 'no'. *Language in Society* 91–96.

Karagjosova, Elena. 2001. Towards a comprehensive meaning of German *doch*. In Christina Striegnitz (ed.), *Proceedings of the sixth esslli student session*, 131–141.

Kaup, Barbara. 2006. What the psycholinguistic negation research tells us about the nature of the working-memory representations utilized in language comprehension. In Hanna Pishwa (ed.), *Language and memory: Aspects of knowledge representation* (Trends in Linguistics. Studies and Monographs [TiLSM] 173), chap. 10, 313–355. Berlin: De Gruyter.

Kendon, Adam. 2002. Some uses of the head shake. *Gesture* 2(2). 147–182.

Krifka, Manfred. 2013. Response particles as propositional anaphors. In Todd Snider (ed.), *Proceedings of salt 23*, 1–18. doi:10.3765/salt.v23i0.2676. http://journals.linguisticsociety.org/proceedings/index.php/SALT/article/view/2676.

Lücking, Andy. 2020. Gesture. In Stefan Müller, Anne Abeillé, Robert D. Borsley & Jean-Pierre Koenig (eds.), *Head-Driven Phrase Structure Grammar: The handbook*, Berlin: Language Science Press. https://langsci-press.org/catalog/book/259.

Lücking, Andy, Jonathan Ginzburg & Robin Cooper. 2019. Grammar in dialogue. In Stefan Müller, Anne Abeillé, Robert D. Borsley & Jean-Pierre Koenig (eds.), *Head-Driven Phrase Structure Grammar: The handbook*, Berlin: Language Science Press. https://langsci-press.org/catalog/book/259.

Mazzocconi, Chiara, Ye Tian & Jonathan Ginzburg. 2020. What is your laughter doing there: a taxonomy of the pragmatic functions of laughter. *IEEE Transactions of Affective Computing* .

Montague, Richard. 1974. Pragmatics. In Richmond Thomason (ed.), *Formal philosophy*, New Haven: Yale UP.

Pope, Emily. 1972. *Questions and answers in English*: MIT dissertation.

Roberts, Craige. 1996. Information structure in discourse: Towards an integrated formal theory of pragmatics. *Working Papers in Linguistics-Ohio State University Department of Linguistics* 91–136. Reprinted in Semantics and Pragmatics, 2012.

Russell, James A. 2003. Core affect and the psychological construction of emotion. *Psychological Review* 110(1). 145–172. doi:10.1037/0033-295X.110.1.145.

Schegloff, Emanuel A. 2007. *Sequence organization in interaction*. Cambridge: Cambridge University Press.

Scherer, Klaus R & Heiner Ellgring. 2007. Multimodal expression of emotion: Affect programs or componential appraisal patterns? *Emotion* 7(1). 158.

Stalnaker, Robert C. 1978. Assertion. In P. Cole (ed.), *Syntax and semantics, volume 9*, 315–332. New York: AP.

Tian, Ye & Jonathan Ginzburg. 2016. No i am: What are you saying “no” to? In *Sinn und bedeutung 21*, .

Tomasello, Michael. 1999. *The cultural origins of human cognition*. Cambridge, MA: Harvard University Press.

# Negation and its bearing on creole genesis

Fabiola Henri
The State University of New York at Buffalo
LLF (UMR 7110)

Proceedings of the 28th International Conference on
Head-Driven Phrase Structure Grammar

Online (Frankfurt/Main)

Stefan Müller, Nurit Melnik (Editors)

2021

Frankfurt/Main: University Library

pages 300–318

Keywords: negation, creole genesis, typology, Jespersen Cycle, grammaticalization

Henri, Fabiola. 2021. Negation and its bearing on creole genesis. In Stefan Müller & Nurit Melnik (eds.), *Proceedings of the 28th International Conference on Head-Driven Phrase Structure Grammar, Online (Frankfurt/Main)*, 300–318. Frankfurt/Main: University Library. DOI: 10.21248/hpsg.2021.16.

**Abstract**

For the past 20 years, the question of a 'creole prototype' has been at the center of heated debates. Among features that are claimed to be typical of creole formation is the placement of negation, which usually appears preceding tense, aspect and mood markers (e.g. McWhorter, 2018). In this paper, I examine diachronic data, in particular, French compound tenses and show that the position of negation in at least French-related creoles is nothing but the result of regular grammaticalization given input. As such the expression of negation typically exemplifies coalescence of the already grammaticalized negator *pas* into an inflectional exponent in the creoles.

# 1 Introduction

Creolistics has been punctuated by heated debates regarding the typological and genetic status of creoles (and pidgins) since their inception, and more so, in the past 20 years with the revival of the *pidgin-creole life cycle*, which describes these languages as unnatural language formations starting anew following 'a break in transmission' (Bickerton, 1981; Thomason & Kaufman, 1988; McWhorter, 1998, 2001; McWhorter & Parkvall, 2002; McWhorter, 2018; Bakker et al., 2011; Bakker, 2015, among others). According to this theory, creole languages are 'exceptional' insofar as they exhibit prototypical features not found in other languages e.g. copula omission, generalization of the infinitive, absence of case distinctions and preverbal negation, signaling a process of pidginization (McWhorter, 2018, Chapter 1). McWhorter proceeds to explain that since the European sources from which the creoles derive, have their negative marker appear after the verb, they cannot have contributed to the structural distribution illustrated in the following examples (§1.2.4).

(1) a. Mwen pa konnen. (Haitian Kréyol)
1SG.WK NEG know.LF
'I don't know.'
b. Mi no sabi. (Sranan)
1SG NEG know
'I don't know.'
c. Mie no weet (Negerhollands)
1SG NEG know
'I don't know.'
(Holm, 1988, 171)[1]

This grammar-internal change "submits more gracefully to an analysis as results of

†I would like to thank the audience of the 2021 HPSG conference for their comments and questions, in particular Emily Bender, Jean-Pierre Koenig and Manfred Sailer. I am grateful to Anne Abeillé and Stefan Müller for their valuable comments and suggestions on this paper.

[1]Initially cited in Diggelen (1978).

the failure to acquire the lexifier negation strategy, and its replacement by a strategy typical of pidgins (. . .)" (p.13).

This kind of analysis shows a blatant misunderstanding, even dismissal, of the input data since as previously demonstrated (Henri, 2018), negation always precede nonfinite main verbs in the lexifier languages e.g. English (2-a) and French (2-b)-(2-d); granted though that in the case of French, negation follows finite forms. Notice however that compound tenses (passé composé and periphrastic future) counts among the mostly used tenses in French next to the present indicative. This means that together they make a big proportion of constructions where negation precede the main verb.

(2) a. I don't know.
b. T'as pas connu cet homme
2SG.WK'AUX.2SG.PRS NEG know.PPART this man
'You did not know this man.'
c. T'as pas mangé.
2SG.WK'avoir.2SG.PRS NEG eat.PPART
'You didn't eat.'
d. Tu vas pas venir.
2SG.WK aller.2SG.PRS NEG come.INF
'You won't come.'

In fact, Dryer (1988) argues that cross-linguistically, negation mostly appears preverbally; a position that is claimed within creole exceptionalism to be typical of only creoles and pidgins.

Based on observations from diachronic data from Mauritian Kreol[2], I argue that negation evolved from an already grammaticalized lexeme in French to a purely inflectional marker in the French offsprings. In addition, I review the distribution of negation in so-called French compound tenses (*temps composés et surcomposés*) and show that the position and status of negation in French-related creoles naturally follows from their initial distribution within these constructions.

## 2 Synchronic distribution of negation in French-related creoles

While French-related creoles usually feature a preverbal negator as exemplified for Haitian Kréyol (1-a), they may also show different instances of post-verbal negation morphologically and/or semantically conditioned. In Louisiana Creole, long verb forms expressing either a past tense[3] have a preverbal negator compared to the short form encoding the present indicative where negation is postposed to the

[2] Henceforth Mauritian.

[3] Similar to French, the long form also encodes the 2PL or 2SG.F present imperative and the short form, the 2SG present imperative.

verb. In the presence of TAM markers, negation is also attracted to the preverbal position (Henri & Klingler, 2014).

(3) Louisiana Creole

TNS > MOOD > NEG > ASP > $V_{LF}$ or $V_{SF}$ > NEG

a. Mo te pe e fe aryen.
1SG PST NEG PROG do.LF nothing
'I wasn't doing anything.' (Klingler, 2003)

b. Jan lav pa son figi.
John wash.SF NEG 3SG.POSS face
'John doesn't wash his face.'

In Mauritian, negation may appear in a postverbal position with neg-raising verbs (Henri, 2022). In this position and similar to Louisiana Creole, the short form of the verb is selected, showing that structurally speaking, negation behaves as complements as is the case in French (Abeillé & Godard, 1997).

(4) Mauritian

a. Nou pa ti ava pe diskit lor saki nou pe diskite.
1PL NEG PST IND.IRR PROG discuss on what 1PL PROG discuss.LF.
'We would not be discussing what we're discussing.'

b. Mo pans pa zot ti pe asiz enn met distans.
1SG think.SF NEG 2/3PL PST PROG sit.SF one meter distance
I don't think they were sitting 1 meter apart.

c. Mo pa ti panse zot pe asiz enn met distans.

d. *Mo ti pans pa zot pe asiz enn met distans.

The difference between Louisiana Creole, on the one hand and, Mauritian and Haitian, on the other is the fact the past tense marker *te/ti* appear postposed to negation in the former and preposed in the latter languages. Such distinction is customarily explained in terms of creolization. Compared to Mauritian and Haitian, Louisiana Creole is described as a semi-creole due to the inflectional vestiges it retained from French (Rottet, 1992).

The kind of peculiar process suggested to occur in the case of these contact languages seem unwarranted if we adopt a view of language change as a complex adaptive system (Mufwene et al., 2017), whereby the outcome is determined by input and the context in which it emerges; both of which may differ according to the variety of input and the languages in contact in the learning environment. To better understand the grammaticalization of the negative marker in the creoles, we first examine the case of periphrastic and compound tenses in French and its (regional) varieties that shaped the creoles at hand.

## 3 French periphrases

French has a series of inflectional and verbal periphrases which substitute to synthetic verb forms in French, most of which are constructed with the auxiliary *avoir* 'have' e.g. the present perfect tense (passé composé) for the simple past (Abeillé & Godard, 2021, Chapter III-2). In fact, in many varieties of French, the auxiliary *avoir* seems to have been extended to the small class of verbs initially selecting the auxiliary *être* 'be' (5-a). Note that among possible past tenses in French — passé simple, imparfait and passé composé — the passé composé (present perfect) is the first acquired and most widely used in both speech and writing Levesque (2010). In addition, the use of the auxiliary *avoir* in some cases influences the choice of the main verb as in (5-b), where the main verb *être* replaces the verb *aller* 'go'. Note that in (5-b), the verb in the past participle is followed by a predicative phrase, here a prepositional phrase.

(5) Abeillé & Godard (2021, p.278)

a. (...) j'ai descendu dans le tunnel.
 1SG.WK'AVOIR.1SG.PRS descend.PPART in the tunnel
 'I went down the tunnel'

b. J'ai été à la piscine hier
 1SG.WK'AVOIR.1SG.PRS ÊTRE.PPART to the pool yesterday
 'I went to the pool yesterday.'

These inflectional periphrases may serve as basis for compound tenses (passé surcomposé) which appears around the XV$^{th}$ century to refer to an anterior past (Ayres-Bennett & Carruthers, 1992; Borel, 2018). These constructions, also characteristic of many regional varieties of French combine two auxiliaries, the first *avoir* followed by *être* (7) or *avoir* (6-b) and the past participle (Abeillé & Godard, 2021).

(6) Abeillé & Godard (2021, p.279)

a. Lorsqu'il a été parti, elle
 when'3SG.M.WK avoir.3SG.PRS être.PPART go.PPART, 3SG.F.WK
 s'est sentie soulagée
 3SG.REFL'be.3SG.PRS feel.F.PPART relieve.F.PPART
 'When he had left, she felt relieved.'

b. Quand il a eu fini son
 when 3SG.M.WK avoir.3SG.PRS âvoir.PPART finish.PPART his
 travail, il s'est endormi
 work, he fell asleep
 'When he had done working, he fell asleep.'

As Alleyne (1996) observes[4], the tense marker *te/ti* stems from a form the verb to

[4] See also Chaudenson (2003) and DeGraff (2005)

'be', either the PST.IPFV (étais/était/étaient) or the PPART (été) [ete].

(7) DeGraff (2005, p.321)

a. Il était malade.
3SG.M be.3SG.PST.IPFV sick
'He was sick.'

b. Il a été malade.
3SG.M avoir.3SG.PRS be.PPART sick
'He has been sick.'

The passé composé of the verb to 'be' with predicative complements (5-b), (7-b) bears a striking resemblance with the double compound selecting a main verb in (7). The present perfect (7-b), (5-b), the imperfect (7-a) and compound tenses in French all encode an event that occurred in the past, with present relevance for the former as opposed to the latter tenses, which are interpreted as distant pasts. Transposed within the French-lexified creoles, [ete] → [ti/te] takes on the past anterior meaning while the perfect is encoded by the perfect/completive *(f)inn* in languages like Mauritian (8-b)-(8-c).

(8) a. An té mété pima adan sa. (Guadeloupean Kréyòl)
1SG.WK PST put.LF pepper in it
'I had put pepper in it.' (Henri et al., 2020)

b. Mo ti dormi. (Mauritian)
1SG.WK PST sleep.LF
'I slept.'

c. Mo ti'nn dormi.
1SG.WK PST'PRF sleep.LF
'I had slept.'

With negation, Chaudenson (2003, p.181) observes that *pas*, would appear following the first auxiliary (9) and DeGraff (2005) further hypothesize that the following reanalysis by the language learner may be posited (10):

(9) a. je (ne) suis pas après faire,
b. je (ne) suis pas à faire,
c. j(e n')ai pas fini de faire,
d. je (ne) suis pas pour faire.

(10) Fr. *n'a(s) pas / n'es(t) pas* → Early Creole *(na) pa*[5] → Modern Creole *pa*

Combining these observations, one may clearly see how negation has surfaced to scope over the tense marker; the inflectional and verbal periphrases serving as partial template to the TAM system of many French-related creoles.

(11) a. NEG > TNS > MOOD > ASP

[5]I would rather suggest that [napa] lexicalizes to a single morpheme and further reduces to [pa] in Mauritian at least.

b. Il (n')a pas été à la piscine hier.
3SG.WK NE'.avoir.3SG.PRS NEG be.PPART to the pool yesterday
'He didn't go to the pool yesterday.'

In addition, French has a number of verbal periphrases exhibiting a number of patterns. The first member of the construction is a verb that expresses aspect e.g. the periphrastic future (12-a) which has almost taken over the synthetic future (Abouda & Skrovec, 2017) or *finir de* 'finish to' for the completive (12-b).

(12) a. Il va venir bientôt.
3SG.M.WK aller.3SG.PRS come.INF soon
'He will come soon.'
b. Jean a fini de travailler.
John avoir.3SG.PRS finish PREP work.INF.
'John has finished working.'

Next to (12-a)-(12-b), are also the well documented varieties of verbal periphrases used in Northern America (Louisiana and Quebec), which served as input to the TAM system that emerged in the French-related creoles (Chaudenson, 2003, p.178).

(13) a. être après (à) INF
b. être pour INF

(14) Abeillé & Godard (2021, Chapter XI-3)
a. (...) mes parents sont après me maganer.
my parents être.3PL.PRS after 1SG.OBJ use.INF
' my parents are using me.'
b. (...) qu'elle était pour avoir un petit bébé?
COMP'3SG.F.WK être.IPFV for have.INF a little baby
'(...) that she will have a baby?'

To confirm this grammaticalization path, we next investigate diachronic data for Mauritian.

## 3.1 Diachronic data

While diachronic data is usually scarce for creole languages and would not provide good bases for statistical analyses, the small inventory available still provide enlightening data to uncover the processes of language change from French to creole. (Baker et al., 2007) compiled 60 texts of around 100 000 words. These consist of travel notes, court proceedings, folk tales, poems, newspaper, sirandanes, songs, proverbs and were written between 1721 and 1929. Described as Mauritian texts, many of these are in fact speech from white settlers on the island.

(15) 1769 Bernardin de St Pierre, Voyage à l'Ile de France
(published in 1773)
Le patron me dit dans son mauvais patois :

<CM> ça n’a pas bon, Monsié</CM>
Je lui demandai s’il y avoit quelque danger, il me répondit :
<CM> Si nous n’a pas gagné malheur, ça bon</CM> (I, 257)[6][7]

The presence of negation within compound tenses are pretty notable. Like Haitian Creole, Mauritian negation [pa] is the reduced form of [napa], composed initially of N’aux + PAS.

(16) a. Pardonne moy, Monsieur, moy n’apa été batté ça Blanc là. (1777_Affaire La Douceur )
b. Mon licaire dire moi qui mo na pas été sivré son Commandement (1828_Lambert)
c. N’a pas té bisoin dire cinois dix fois (...)
(1925_Soulsobontemps)
d. (...) n’a rien sautres pretes na pas été instruire sautres, nous vivres comme bête (1816_Le Brun)

In these creoles, N’aux disappears perhaps due to its bleached meaning and weak tense marking, the anterior being expressed by the second auxiliary [ete].

| | Type freq. | Token freq. |
|---|---|---|
| napa | 9 | 954 |
| pa | 3 | 13 |

Table 1: Data extracted from Baker et al. (2007)

Other French-lexified creoles seem to have followed a similar grammaticalization path leading to the pre-TAM negation. In other words, these creoles have inherited and further grammaticalized the major constructions used to express tense, mood and aspect in their respective linguistic ecologies. This of course doesn’t exclude any novel formation or inheritance from the substrates.

## 4 The morphological status of *pa*

French-lexified creoles further grammaticalize the French negator *pas*, itself grammaticalized from the noun ‘step’ as a result of cyclic weakening and strengthening of negative expressions à la Jespersen (1922).

[6]The boss told me in his bad patois: “This is not good, Sir”. I asked him if there was any danger, he replied: “If were are not struck by bad luck, it’s good.”

[7]The term patois first appeared in 1285 and was used to described ‘unintelligible’ and regional language varieties spoken in France.

(17) a. Jeo ne dis. (Old French)
1SG NEG say.1SG.PRS
b. Je ne dis pas (Standard French)
1SG NE say.1SG.PRS NEG
c. Je dis pas (Colloquial French)
1SG say.1SG.PRS NEG
d. Mo pa dir (Mauritian)
1SG NEG say.LF
'I don't say'

Like the inflectional *ne* in French, *pa* exhibit clitic properties in all the creoles. They exhibit phonological or prosodic dependence on a host and can never stand alone e.g. as an answer to a question (18-d).

(18) a. Mwen pap jamn bliye. pa + ape
1SG NEG.PROG never forget.LF
'I will never forget. (Haitian Kréyol)
b. An pé ké mangé. pa + ké
1SG NEG FUT eat.LF
'I won't eat.' (Guadeloupean Kréyol)
c. li pe e dormi. pa + e
3SG NEG PROG sleep.LF
'He's not sleeping.' (Louisiana Creole)
d. To konn Zan? *pa/non; pa ditou.
2SG know.SF John? *not/no; not at all
'Do you know John. *not/no (Mauritian)

In some creoles, the alternating position of the negative marker has an effect on the verb stem. As previously mentioned, postverbal negation selects a short verb form while preverbal negation select the long form and this irrespective of mode in the absence of TAM markers.

(19) Louisiana Creole (Henri & Klingler 2014)
a. Jan pa lave son figi.
John NEG wash.LF 3SG.POSS face
'John didn't wash his face.'
b. Jan lav pa son figi.
John wash.SF NEG 3SG.POSS face
'John doesn't wash his face.'
c. Jan pa té lave son figi.
John NEG PST wash.LF 3SG.POSS face
'John didn't wash his face.'
d. Lav pa sa. (informal)
wash.SF NEG this
'Don't wash this.'

e. Pa lave sa. (formal)
NEG wash.LF this
'Don't wash this.'

This is similar to Mauritian with negation scoping over so-called neg-raising verb e.g. *panse* 'think', *espere* 'hope', *krwar* 'believe', *ve* 'want' and modals like *bizin* 'need' (20-b), *kapav* 'can', *oredi* 'should' , *devet* 'maybe/perhaps' (Henri, 2018). In the presence of TAM marking (20-d), negation obligatorily appears in pre-TAM position.

(20) Mauritian

a. Mo pa panse li pou vini.
1SG.WK NEG think.LF 3SG IND.FUT come.LF
'I don't think he will come.'

b. Mo bizin pa vini.
1SG.WK need NEG come.LF
'I need to not come.'

c. Mo pans pa li pou vini.
1SG.WK think.SF NEG 3SG IND.FUT come.LF
'I don't think he will come.'

d. Mo pa ti panse li pou vini.
1SG.WK NEG PST think.LF 3SG IND.FUT come.LF
'I don't think he will come.'

With Reunionese Creole, stem selection is slightly more complex. The future is usually expressed periphrastically except in the presence of negation where the future is encoded synthetically.

(21) Reunionese Creole (Chaudenson, 2003)

a. Ma/mi sa manzé.
1SG.FUT/1SG FUT eat.LF
'I will eat'

b. Mi manzra pa.
1SG eat.FUT
'I will not eat'

The ambiclitic positioning of negation in combination with the strict ordering of TAM markers signal that all these markers exhibit affix properties with respect to the lexical head rather than purely syntactic properties.

(22) a. Mo pa tj'ava'nn donn li mo kas si mo
1SG NEG PST'IND.IRR'PRF give.SF 3SG 1SG.POSS money if 1SG
ti kone. (Mauritian)
PST know
'I wouldn't have given him my money if I knew.'

b. Mo te pe e fe aryen. (Louisiana Creole)
1SG PST NEG PROG do.LF nothing
'I wasn't doing anything.' (Klingler, 2003)

Although compared to affixes, negation can scope over conjuncts and is not selective of its hosts.

(23) Mauritian

a. Zan pa [kwi manze ni/ou bwar rom].
John NEG cook.SF food nor/or drink rhum
'John doesn't eat food or drink rhum.'

b. Zan pa [manze bwar].
John NEG eat.LF drink.LF
'John doesn't eat or drink.

In particular, it can be separated from the verb by a small class of adverbs e.g. *ankò* 'yet'. In Gualoupean Kréyol not only is there elision of a vowel but one can also observe the harmonization of the vowels [pa ɑ̃kɔ] → [pɔkɔ] → [pɔɔ]. A similar process is witnessed in Louisiana Creole.

(24) a. An pòò te mangé lè i rivé. (Guadeloupean Kréyol)
1SG.WF NEG.YET PST eat.LF when SG arrive
'I hadn't eaten when he arrived.'

b. Li pe e dormi. (Louisiana Creole)
3SG NEG PROG sleep.LF
'He's not sleeping'

## 5 A constraint-based account of negation

Given the properties described above, negation is analyzed on a par with TAM markers. There are different alternatives to modeling the peculiar morphotactics seen in French-related creoles. While we focus only on Mauritian in this section, a similar approach can be adopted for the other languages. A first option would be to adopt an information-based approach to realisational morphology à la Crysmann & Bonami (2016) to account for the variable position of negation. Since these clitics are less selective of their host, we allow for the stem to be either verbal or adverbial. Strict ordering is easily handled by position classes. In this implementation, we may impose that the verb form be short or long depending on the position class of negation: -4 in preverbal position and 1 in postverbal position.

For this paper, we follow Henri (2022) in assuming that negation and TAM markers are functors Van Eynde (1998) that modify a predicative head. This can be of different categories since like TAM, negation can select non-verbal predicates.

(25) a. Zan pa malin.
John NEG cunning
'John is not cunning.'

b. Zan pa profeser.
John NEG teacher
'John is not. teacher.'

The functor analysis has the advantage of providing a convenient account of the VP internal morphosyntactic constraints and linearization previously described.

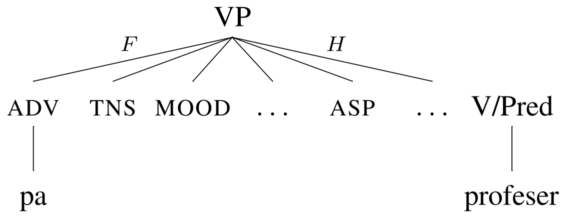



Figure 1: Flat VP structure

Amendments to the traditional *head-functor phrase* allow for more than one functor to select a single head. As already noted, we allow for the head to be predicative for all the markers but for some to allow for selection of adverbs (e.g. tense and irrealis markers).

(26)
$$\textit{hd-functor-phrase} \Rightarrow \begin{bmatrix} \text{MARKING } \boxed{0} \oplus \ldots \oplus \boxed{n} \\ \text{HEAD-DTR } | \text{SYNSEM } \boxed{1}\begin{bmatrix}\text{MARKING} & \textit{unmarked}\end{bmatrix} \\ \text{FUN-DTRS } \left\langle \begin{bmatrix} \text{HEAD} \begin{bmatrix}\text{SELECT} & \boxed{1}\end{bmatrix} \\ \text{MARKING } \boxed{0} \end{bmatrix} \ldots \begin{bmatrix} \text{HEAD} \begin{bmatrix}\text{SELECT} & \boxed{1}\end{bmatrix} \\ \text{MARKING } \boxed{n} \end{bmatrix} \right\rangle \end{bmatrix}$$

The SELECTOR PRINCIPLE, applicable to the locally-headed head-functor phrase, constrains the SELECT feature to have a value that is identical to the SYNSEM value head daughter to the effect of imposing restrictions on both syntactic and semantic properties of the head (Van Eynde 2006: 165). In addition, the MARKING PRINCIPLE requires the MARKING feature of the functor daughters to be transferred to the mother (Pollard & Sag, 1994; Van Eynde, 2006). In other words, the selection of a head by a functor or functors has the effect of marking the construction with its value. MARKING values are further associated with other features like for instance, TAM and POLARITY.

(27)
$$\begin{bmatrix} \textit{marking} & \\ \text{TAM} & \begin{bmatrix} \text{TNS} & \textit{tense} \\ \text{MOOD} & \textit{mood} \\ \text{ASP} & \textit{asp} \end{bmatrix} \\ \text{POL} & \textit{pol} \end{bmatrix}$$

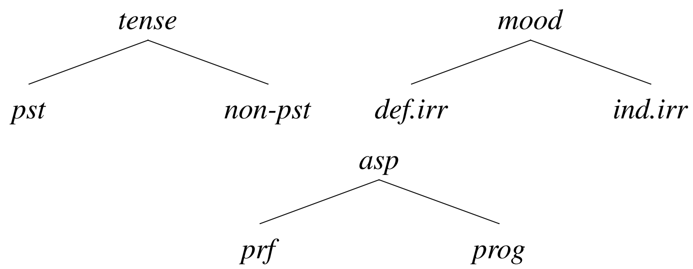


Figure 2: Type hierarchy fragments for TAM

We define a linear precedence rule (28) to account for the strict linear order of the markers[8] and define the entry for [pa] as follows:

(28) Linear precedence rule : POL $<$ TNS $<$ ASP $<$MOOD $<$ V

(29)

$$\left\langle \text{pa}, \begin{bmatrix} \text{CAT} \begin{bmatrix} \text{HEAD} \begin{bmatrix} \textit{pol} \\ \text{SELECT} \quad \boxed{2}\begin{bmatrix}\text{MARKING} \quad \textit{unmarked}\end{bmatrix}\end{bmatrix} \\ \text{MARKING} \begin{bmatrix}\text{POL} \quad +\end{bmatrix} \\ \text{LEX} \quad + \end{bmatrix} \\ \text{CONT} \quad \boxed{1} NO^{\emptyset}_{\emptyset} \\ \text{STORE} \quad \left\{\boxed{1}\right\} \end{bmatrix} \right\rangle$$

*Pa*[9] marks the head it selects as POL+ and because it participates in the formation of polyadic quantification, it is a propositional operator rather than a variable binding operator[10].

Finally note that the lexical entry for modifier pa specifies a feature LEX+ in preverbal position. Adverbs allowed to either precede or follow the verb are underspecified for the feature LEX (Hassamal, 2017). This means that when [pa] is in postverbal position, it is specified as LEX-. Thus postverbal negation is analyzed as a complement, as proposed for English and French (Abeillé & Godard, 1997; Kim & Sag, 2002). The argument is supported by the fact that postverbal [pa] is restricted to appear with a small class of verb and obligatorily triggers the short form, like phrasal complements usually do (33). For these verbs, [pa] marked as LEX- may appear as their first element on their COMPS list. For those epistemic verbs selecting an extraposed clausal complement, rules (30), (32) stipulate that they appear as SF if they have negation on their COMPS list.

[8]Another alternative is proposed in Henri (2010) where a type-hierarchy constrains the markers to their respective position.

[9]Or *nepli* 'no more'.

[10]See Henri (2022) for more details on Negative Concord in Mauritian.

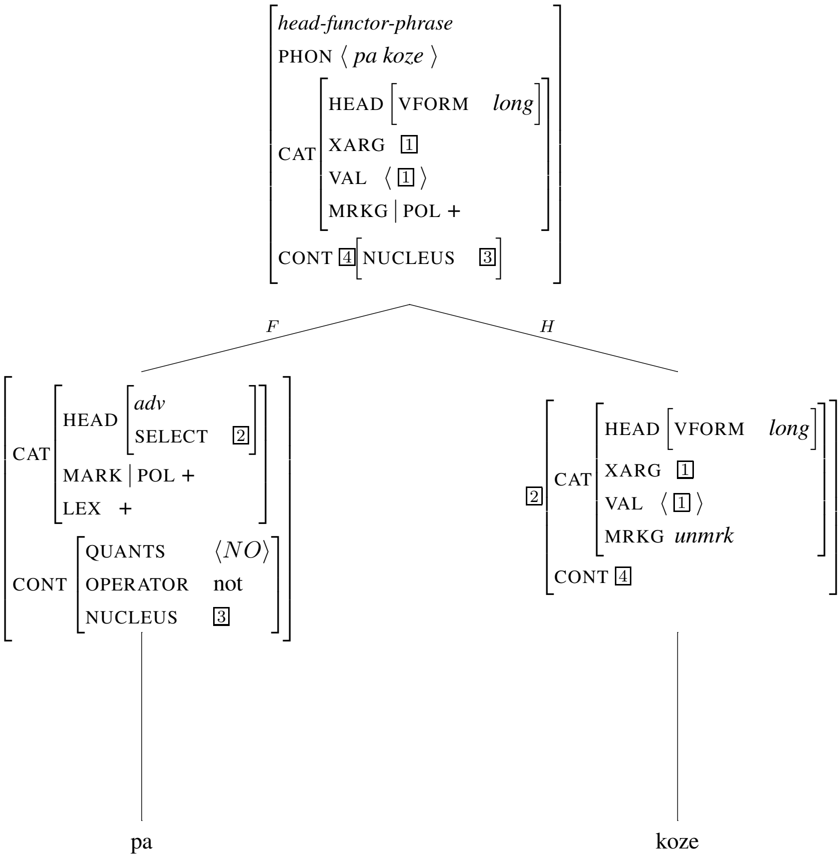



Figure 3: Tree for *pa kone* ‘don’t know’

(30) $\left[\text{HEAD} \quad \left[\text{VFORM} \quad \textit{short}\right]\right] \Rightarrow \left[\text{VAL} \quad \left[\text{COMPS} \quad \textit{nelist}\right]\right]$

(31) Li ve pa manze. (Mauritian)
3SG want.SF NEG eat.LF
‘He doesn’t want to eat.’

(32) $$\boxed{1}\begin{bmatrix}\text{HEAD} & \textit{verb}\\ \text{COMPS} & \boxed{2}\end{bmatrix} \mapsto \left[\text{COMPS} \quad \left\langle \begin{bmatrix}\textit{adv} & \\ \text{SEL} & \boxed{1}\\ \text{LEX} & -\end{bmatrix} \oplus \boxed{2} \right\rangle\right]$$

(33)
$$\boxed{1}\begin{bmatrix} \textit{epistemic-vb} & \\ \text{CAT} & \begin{bmatrix}\text{HEAD} & \boxed{2}\\ \text{VAL} & \begin{bmatrix}\text{COMPS} & \textit{elist}\\ \text{EXTRA} & \langle \text{S}\rangle\end{bmatrix}\end{bmatrix}\\ \text{CONT} & \boxed{3}\end{bmatrix} \mapsto \begin{bmatrix}\text{VAL} & \begin{bmatrix}\text{SUBJ} & \textit{non-nci}\\ \text{COMPS} & \left\langle \begin{bmatrix}\textit{neg} & \\ \text{LID} & \textit{pa}\\ \text{SEL} & \boxed{1}\\ \text{MARKING} & \begin{bmatrix}\text{POL} & +\end{bmatrix}\end{bmatrix}\right\rangle\end{bmatrix}\\ \text{EXTRA} & \langle \text{S}\rangle\end{bmatrix}$$

# 6 Conclusion: On creole genesis

The scenario presented in the previous sections casts serious doubts on the idea that creoles (and pidgins) do not inherit grammatical structure from their lexifier language(s). Notwithstanding other languages' grammatical contributions[11] or innovations, French-lexified contact languages do continue processes of language change originating in the lexifier language. French syntactic periphrases are in the creoles fully grammaticalized to the extent that markers don't retain their lexical content contrary to French, where auxiliaries are also used as main verbs (Henri & Kihm, 2015). These markers behave more like affixes rather than syntactically independent words in showing fusional properties. The same is true of negation, where one could argue that we've come full cycle according to Jespersen's development of negation with a preverbal *pa* in the creole offsprings. These observations contradict the claim that contact languages start anew and have historically no single parent (e.g. Thomason & Kaufman, 1988; Thomason, 2001; McWhorter, 2001; Bakker, 2015). In the case of French-related creoles, both vocabulary and morphosynstactic properties expressed on verbs[12] are definitely traceable to the lexifier based on identification of cognates in comparative historical linguistics.

On the other hand, this development submits nicely to the idea that creoles (and pidgins) are linguistically mixed[13], inheriting from the different languages that came into play during their emergence and beyond in contrast with intertwined languages, which are usually described as exhibiting a clear split between two language contributors. The overwhelmingly preverbal, even preTAM position of negation within the French-lexified creoles is nothing but an evolution of its distribution in colloquial French in conjunction with the verbal system, itself heavily analytic. While negation is postverbal in the present tense, it appears before non-finite verbs e.g. in the passé composé, a tense which with the present tense counts the two most frequent tenses. The past participle [ete] the form that gave rise to the anterior marker in these creoles participates in such constructions and could have served as template for the peculiar position of negation in many French-lexified creoles. This means that patterns of alternation, including TAM constructions and

[11]From so-called substrate or adstrate languages.

[12]Except for the long and short verb distinction in the Indian Ocean creoles which have exapted new functions due to Bantu and Malagasy influence.

[13]See also (Mufwene, 2001; Aboh, 2016; Baptista, 2020, among others) for comparable viewpoints.

negation, which are salient in terms of frequency and/or predictability will be more likely to persist/survive through language change. The variation within these constructions across French-lexified creoles correlates with their respective singular ecology. For instance, the marker of the progressive in Lesser Antilles and French Guyana creoles is *ka* from *qu'à*, probably from the restrictive *ne. . .qu(e)* expression (34-a) (Hazaël-Massieux, 2005, 2008) compared to Haitian or Mauritian progressive *ape*[14].

(34) a. Tu n'as qu'à manger. (French)
2SG.WF NE'avoir.2SG.PRS qu'INF eat.INF
'You just eat.'

b. Ou ka mangé (Guadeloupean Kréyol)
2SG PROG eat
'You eat/are eating.'

It would seem then that rather than having no single parent, contact languages have more than one single parent compared to other languages traditionally assumed to proceed from one proto-language. Such a hypothesis seem certainly less eccentric than the received idea that pidgins and creoles are genetically and structurally disconnected from their contributing languages by virtue of a simplification process (pidginization).

# References

Abeillé, Anne & Danièle Godard. 1997. The syntax of French negative adverbs. In Danielle Forget, Paul Hirschbühler, France Martineau & María Luisa Rivero (eds.), *Negation and polarity: Syntax and Semantics: Selected papers from the colloquium Negation: Syntax and Semantics. Ottawa, 11–13 May 1995* (Current Issues in Linguistic Theory 155), 1–28. Amsterdam: John Benjamins.

Abeillé, Anne & Danièle Godard. 2021. *Grande Grammaire du Français*. Arles, France: Actes Sud.

Aboh, Enoch O. 2016. Creole distinctiveness: A dead end. *Journal of Pidgins and Creole Languages* 31(2). 400–418.

Abouda, Lotfi & Marie Skrovec. 2017. Du rapport micro-diachronique futur simple/futur périphrastique en français moderne. Etude des variables temporelles et aspectuelles. *Corela [En ligne]* (HS-21).

Alleyne, Mervyn C. 1996. *Syntaxe historique créole* Hommes et sociétés. Paris: Éditions Karthala.

Ayres-Bennett, W. & Janice Carruthers. 1992. "une regrettable et fort disgracieuse faute de français"? The Description and Analysis of the French Surcomposés

[14] Other scholars have suggested a substrate inheritance.

from 1530 to the present day. *Transactions of the Philological Society* 90(2). 219–257.

Baker, Philip, Guillaume Fon-Sing & Vinesh Y. Hookoomsing. 2007. The corpus of Mauritian Creole texts. In Philip Baker & Guillaume Fon-Sing (eds.), *The making of Mauritian Creole*, 1–61. London: Battlebridge Publications.

Bakker, Peter. 2015. Creole languages have no ... — but they do have .... *Journal of Pidgin and Creole Languages* 30(1). 167–176.

Bakker, Peter, Aymeric Daval-Markussen, Mikael Parkvall & Ingo Plag. 2011. Creoles are typologically distinct from noncreoles. *Journal of Pidgin and Creole Languages* 26(1). 5–42.

Baptista, Marlyse. 2020. Competition, selection and the role of congruence in Creole genesis and development. *Language* 1(96). 160–199.

Bickerton, Derek. 1981. *Roots of Languages*. Ann Arbor: Karoma.

Borel, Marine. 2018. Formes surcomposées "standard" et formes surcomposées "régionales". *SHS Web Conf.* 46. 12007.

Chaudenson, Robert. 2003. *La créolisation. théorie, applications, implications*. Paris: L'Harmattan.

Crysmann, Berthold & Olivier Bonami. 2016. Variable morphotactics in Information-Based Morphology. *Journal of Linguistics* 52(2). 311–374.

DeGraff, Michel. 2005. Linguists most dangerous myth: The fallacy of creole exceptionalism. *Language in Society* 34(4). 533–591.

Diggelen, Miep Van. 1978. Negro-Dutch. *Amsterdam Creole Studies* 2. 69–100.

Dryer, Matthew S. 1988. Universals of negative position. In M. Hammond, E. Moravcsik & J. Wirth. Amsterdam (eds.), *Studies in Syntactic Typology*, 93–124. John Benjamins.

Hassamal, Shrita. 2017. *Grammar of mauritian adverbs*: Université Paris Diderot, Paris 7 dissertation. Thèse de doctorat dirigée par Abeillé, Anne Sciences du langage – linguistique Sorbonne Paris Cité 2017.

Hazaël-Massieux, Marie-Christine. 2005. Les français populaires contre la norme : Regards sur la genèse des créoles au xviie siècle. *Cahiers d'études germaniques* 73–85.

Hazaël-Massieux, Marie-Christine. 2008. *Textes anciens en créole français de la caraïbe: Histoire et analyse* Lettres et Langues – Linguistique. Paris: Editions Publibook.

Henri, Fabiola. 2010. *A constraint-based approach to verbal constructions in Mauritian*: University of Mauritius and Université Paris Diderot, Paris 7 dissertation.

Henri, Fabiola. 2018. A lexicalist account of negation and negative concord in Mauritian. In Viviane Déprez & Fabiola Henri (eds.), *Negation and negative concord: The view from creoles* (Creole Language Library 55), 69–101. John Benjamins.

Henri, Fabiola. 2022. Mauritian Verb Morphology at Linguistic Interfaces, ms. To appear in Language Science Press.

Henri, Fabiola & Alain Kihm. 2015. The morphology of tam marking in creole languages: a comparative study. *Word Structure* 8(2). 248–282.

Henri, Fabiola & Tom Klingler. 2014. If you look closely: Inflectional morphology in louisiana creole. Paper presented at the Workshop on Creole Complexity, University of Kentucky.

Henri, Fabiola, Gregory Stump & Delphine Tribout. 2020. Derivation and the morphological complexity of three french-based creoles. In Peter Arkadiev & Francesco Gardani (eds.), *The complexities of morphology*, 105–135. Oxford University Press.

Holm, John. 1988. *Pidgins and creoles*, vol. 2: Reference survey. Cambridge: Cambridge University Press.

Jespersen, Otto. 1922. *Language: Its nature, development and origin*. London: G. Allen and Unwin.

Kim, Jong-Bok & Ivan A. Sag. 2002. Negation without head movement. *Natural Language and Linguistic Theory* 2(20). 339–412.

Klingler, Thomas A. 2003. *'If I could turn my tongue like that': The Creole Language of Pointe Coupée Parish, Louisiana*. Baton Rouge/London: Louisiana State University Press.

Levesque, Aimée. 2010. *L'enseignement de la distinction entre le passé composé et l'imparfait et l'utilisation de ces temps verbaux en classe d'immersion française : observations et proposition didactique*: Université de Montréal dissertation.

McWhorter, John. 1998. Identifying the creole prototype: Vindicating a typological class. *Language* 74(4). 788–818.

McWhorter, John. 2001. The world's simplest grammars are creole grammars. *Linguistic Typology* 5(2-3). 125–166.

McWhorter, John. 2018. *The creole debate*. Cambridge: Cambridge University Press.

McWhorter, John & Mikael Parkvall. 2002. Pas tout à fait du français: Une étude créole. *Études Créoles* 25. 179–231.

Mufwene, Salikoko. 2001. *Ecology of Language Evolution*. Cambridge: Cambridge University Press.

Mufwene, Salikoko S., Christophe Coupé & François Pellegrino. 2017. Complexity in language: A multifaceted phenomenon. In Salikoko S. Mufwene, Christophe Coupé & François Pellegrino (eds.), *Complexity in language: Developmental and evolutionary perspectives* Cambridge Approaches to Language Contact, 1–29. Cambridge: Cambridge University Press.

Pollard, Carl & Ivan Sag. 1994. *Head-driven phrase structure grammar*. Stanford: CSLI Publications.

Rottet, Kevin J. 1992. Functional categories and verb movement in Louisiana Creole. *Probus* 4(3). 261–289.

Thomason, Sarah & Terrence Kaufman. 1988. *Language Contact, Creolization, and Genetic Linguistics.* Berkeley: University of California Press.

Thomason, Sarah G. 2001. *Language contact: An Introduction*. Edinburgh University Press.

Van Eynde, Frank. 1998. Tense, Aspect and Negation. In Frank Van Eynde & Paul Schmidt (eds.), *Studies in machine translation and natural language processing* 10, 209–280. Office for Official Publications of the European Communities.

Van Eynde, Frank. 2006. NP-internal Agreement and the Structure of the Noun Phrase. *Journal of Linguistics* 42(1). 139–186.

# Imperatives and negation in Romance languages: Verbalisation, de-verbalisation and marking

Emil Ionescu
University of Bucharest

Proceedings of the 28th International Conference on
Head-Driven Phrase Structure Grammar

Online (Frankfurt/Main)

Stefan Müller, Nurit Melnik (Editors)

2021

Frankfurt/Main: University Library

pages 319–339

Keywords: verb, interjection, D-words, Romance languages, verbalisation/de-verbalisation, marking

Ionescu, Emil. 2021. Imperatives and negation in Romance languages: Verbalisation, de-verbalisation and marking. In Stefan Müller & Nurit Melnik (eds.), *Proceedings of the 28th International Conference on Head-Driven Phrase Structure Grammar, Online (Frankfurt/Main)*, 319–339. Frankfurt/Main: University Library. DOI: 10.21248/hpsg.2021.17.

**Abstract**

The topic of this paper is the expression of negative directives in several Romance languages. The majority of Romance languages do not express negative directives by adding (pre-verbal) negation to the positive imperative form, but by using a different verb form (infinitive, subjunctive or something else), to which negation is attached. The present analysis shows that (some) directive verbal forms in Romance lost some hallmarks of their verbhood. The phenomenon is taken as witnessing different stages of de-verbalisation. De-verbalisation makes directive verb forms similar to interjections. The variation documented in the Romance imperatives with respect to the compatibility/incompatibility with negation may thus seen as tendencies of different degrees of the imperatives to come closer either to the verb, or to the interjection. In the context of these tendencies, the incompatibility between negation and imperatives may be explained through the concept of marking. Put briefly, imperatives require to be marked by negation but negation is or is not able to mark them.

# 1 Introduction

The relationship between imperatives[1] and negation in Romance languages (and in other languages, as well) may be of compatibility or incompatibility. This means that imperatives may or may not be negated. Compatibility and incompatibility manifest in multiple forms, and involve (in a rather unpredictable way) pre- or post-verbal position of negation and the person of the imperative. Here is an (almost) complete inventory (for Romance languages):

- Pre-verbal negation is incompatible with imperatives.
  Italian[2] (also Daco-Romanian[3] and Spanish), 2nd pers. sg:

  (1) *Non parla! 'Don`t speak!' (*parla*= true imperative)

- Pre-verbal negation is incompatible with plural imperatives but compatible with singular ones.
  The dialect from Cortina D`Ampezzo, Italy, 2nd pers. sg.:

  (2) No laőra! 'Don`t work!' (*laőra* =true imperative)

[1] By `imperatives` I mean throughout this paper what is sometimes called `true imperatives` (see, for instance, Rivero and Terzi 1995), as distinct from `surrogate (or suppletive) imperatives` - for example, infinitives used with directive force.
[2] For Italian and Italian dialects, the data used here are from Zanuttini (1997).
[3] Daco-Romanian is one of the dialects of the Romanian language and the national language of the Romanian state.

Cortina D`Ampezzo, 2nd pers. pl:

(3) *No lourà! ‘Don`t work!’ (*lourà*=true imperative)

- Pre-verbal negation is compatible with imperatives.
  Aromanian[4], 2nd pers. sg.:

  (4) Nu zi! ‘Don`t speak!’ (*zi*=true imperative)

- Post-verbal negation is compatible with imperatives.
  French (also Wallon, several dialects of Italian – Piedmontese, Valdotain, Milanese – and several varieties of Occitan – see Zanuttini 1997: 111–112), 2nd pers sg.:

  (5) Ne parle pas! ‘Don`t speak!’ (*parle*=true imperative)

- Post-verbal negation is incompatible with imperatives.
  Modern Central Occitan, 2nd pers. sg.:

  (6) *Canta pas! ‘Don`t sing!’ (*canta*=true imperative)

Despite the discouraging diversity, the above data deserve the effort to prospect the chances of a unified perspective, and the present paper attempts to do that[5]. The leading concepts in the following approach are verbalisation and de-verbalisation (as `background` concepts in the analysis) and marking (as a `foreground` concept).

## 2 Verbalisation and de-verbalisation in the field of the expression of directives

The aim of this part of the paper is to prove two facts: (i) that the main classes of words which express directives (that is, interjections and verb forms) share properties which makes them hybrid or impure verbs and interjections; and (ii) that in this class of hybrid words some interjection properties are instantiated by verbs whereas some verbs properties are illustrated by interjections. This increases the hybrid character of the words involved in expressing directives.

[4] Aromanian is a dialect of Romanian, which is still spoken in enclaves, mainly in the Balkan Peninsula.

[5] There is already a reach literature, especially of generative orientation, on this topic: Rivero and Terzi (1995), Zanuttini (1997), Tomic (1999), Han (2001), Bošković (2004), Zeijlstra (2006), Cavalcante (2011) etc.

In the light of these processes, the unavailability of some of the imperatives to negation is viewed as a form of de-verbalisation.

## 2.1 Expressing directives

A directive (Searle 1979) may be expressed in natural language through different forms. However, two parts of speech play a particularly important role in this respect: the interjection and the verb. Here are examples of interjections and verbs used with directive force in Spanish. Similar examples may be given not only from the area of Romance languages but also from languages of the world in general:

(7) ¡ Anda, Juan! 'Come on John!'

(8) ¡ Habla! 'Speak!'

Interjections and verbs are important in expressing directives but they are not limited to play this role. Apart from injunctions, interjections also serve to express emotions (*exclamative interjections* – for instance, *Wow* ! in English, which expresses admiration and/or surprise), or natural noises (*onomatopoeic interjections*). The situation of the verbs is more complex. The imperative mood or certain performatives show that verbs have dedicated forms for directives. Nevertheless, verbs may be also used to express assertions or to ask questions, which are speech acts distinct from directives.

A peculiar property of interjections and verbs deserves special attention. When they are involved in expressing directives they are no longer pure interjections or verbs. Moreover, when an interjection serves to express a directive (a *D-interjection*), it loses a feature of interjection and acquires a feature of verb. Likewise when a verb form expresses a directive (a *D-verb form*) it loses something from its verbhood and acquires a feature of interjection. So, one may say that D-interjections tend to become verbs (verbalisation), whereas D-verb forms tend to become interjections (de-verbalisation). In the area of Romance languages these tendencies are illustrated by two properties which are shared by all D-verb forms and D-interjections. These properties are the independent occurrence and the adverbial modification. We will take a look at either of them.

### 2.1.1 Independent occurrence

If considered as a criterion of comparison between interjections and verb forms which do not express directives, the independent occurrence appears to be a property of the interjections. Indeed, exclamative and onomatopoeic interjections never occur in subordination (one cannot have a clause such as *I said *that wow !*, but the clause *I said: Wow !* is allowed– the same goes for every Romance language). On the other hand, verb forms not expressing directives may (or even have to) be used in subordination. Just as in English, where one may have the same verb form *sing* used either as an independent or as a subordinate clause (*You sing* vs *I know that you sing*), one may have the same situation in all Romance languages.

This contrasts with D-verb forms and D-interjections. In their case the independent occurrence is a common property. So, no D-verb form or D-interjection is allowed to be subordinate. The following example in Romanian documents this situation (the first pair of examples contains a D-interjection while the second pair contains a D-verb form):

(9) Hai! / I-am spus *că hai! ‘Come on / I told him *that come on!’

(10) Vino! / I-am spus *că vino! ‘Come / I told him *that come!’

On may therefore conclude that the incapacity of the D-verb forms to occur in subordination is a (weak) symptom of their de-verbalisation, in the sense that due to this property D-verb forms tend to come closer to interjections.

### 2.1.2 Adverbial modification

Taken as another criterion of comparison between interjections and verb forms not expressing directives, adverbial modification appears to be a verb property. Adverbial modification characterizes verb forms with illocutionary forces distinct from directives. Adverbial modification, therefore, is not possible in the case of exclamative or onomatopoeic interjections. This may be seen in the following examples in Italian, where the adverb modifies a verb form with assertive force but cannot modify the exclamative interjection which expresses impatience:

(11) Gianni è venutto subito ‘John has come quickly’

(12) Uff, subito, Gianni, subito! ‘Ooh, quick, John, quick!’

The adverb *subito* in (12) cannot be understood as modifying the interjection *uff* !.

The situation changes again when one deals with D-interjections and D-verb forms. This time the adverb may be uniformly used to modify the interjection (13) or the verb form (14):

(13) Smettila adesso! ‘Stop it right now!’

(14) Vieni subito! ‘Come quickly!’

The availability of the D-interjections to adverbial modification may then be interpreted as a weak symptom of their verbalisation.

### 2.1.3. D-words

Since independent occurrence and adverbial modification are shared features of D-verb forms and D-interjections but are not shared properties of non-D-interjections and non-D-verb forms, it is justified to identify an intermediary category between verbs and interjections on the basis of the shared properties. I call it *D-words*. The identity of D-words with respect to `pure` interjections and verbs is represented in the table below.

| | Independent occurrence | Adverbial modification |
|---|---|---|
| D-words (interjections or verb forms) | + | + |
| Non-D-interjections | + | - |
| Non-D-verb forms | underspecified or - | + |

Table 1. Comparison between properties of verb forms, interjections and D-words.

The mixed identity of the D-words is strengthened in addition by other phenomena: properties which characterise interjections, are instantiated by verb forms, and also properties specific to verbs are illustrated by interjections. Thus, it is well known that non-D-interjections do not have arguments, nor do they host pronominal clitics. Both phenomena characterise the verb. However, in Daco-Romanian one may find a D-interjection (*Na*!, 'Take (that)') which host pronominal clitics as arguments: *Na-ți-l*! ('Take CLto you Clthat!'). Clitics may be replaced with full NP: *Na cartea*! ('Take the book!'). The same holds for the D-interjections *Iată!* and *Uite!* 'Look!'. Likewise, the D-interjection *Hai*! ('Come on!') may optionally have a subject argument *Hai și tu*! ('Come on you, too!').

As to the verbs, it is also well known that they do not have a special propensity for mono- or bi-syllabic phonetical structure. Mono- or bi-syllabic structure is a hallmark of the interjections. Nevertheless, many imperatives are either etymologically mono- or bi-syllabic, or they undergo processes of truncation (see the next paragraph)[6].

In line with these facts, in the following two paragraphs we will discuss two other relevant aspects of the hybridisation of the D-words: inflection and the unavailability to negation.

---

[6] For a systematic analysis of this aspect of the imperatives, see Floricic and Molinu (2012).

### 2.1.4 D-words and inflection

Inflection divides the class of D-words into two subclasses: inflected and non-inflected (= root) forms. Again, Daco-Romanian is particularly rich and instructive in this respect. The D-interjections *Hai*! (*Haide*!), 'Come on!', *Na!* 'Take it!', *Uite*!, *Iată*!, 'Look!', *Vă*! 'Go!' are uninflected forms, so they are closer to interjections, because interjections are not inflected. Nevertheless, the interjection *Haideţi*! ('Come on (pl.)') *is* inflected (*-ţi* is the 2nd pers. pl. ending for the verbs) and this means a step further in the process of the verbalisation.

In the field of the D-verb forms the majority of the lexical items in Daco-Romanian are inflected. However, a small group of old imperatives coming from Latin (*Du*! 'Bring it!', *Fă*! 'Do it!' and *Zi*! 'Speak!') are uninflected. The picture has to be completed by adding that some inflected D-verb forms have truncated counter-parts. Truncation results in morphological simplification and what is thus lost is just inflection. For example, the verbs *Păzeşte-te*! and *Fereşte-te*! 'Watch(sg.) out!' become in their truncated versions *Păzea*! and *Ferea*! with no ending. Truncated D-verb forms are amply documented in the subdialects of Daco-Romanian (Puşcariu 1959: 169–170).

From the point of view of the inflection, Italian is simpler than Daco-Romanian[7]. D-words coming from interjections are invariably uninflected, and in this respect no symptom of verbalisation may be noticed. D-verb forms, though, underwent modifications. Firstly, the verbs which turned into interjections lost inflection (*Basta*! 'Enough!', *Smetttila*! 'Stop it!'). Secondly, there are D-words that, due to their forms, indicate their verbal origin. These verb forms have no inflection, either: *Sii*! 'be.2nd sg.', *Abbi*! 'have.2nd sg.', *Vogli*! 'want.2nd sg.', *Sappi*! 'know.2nd sg.' (Romanello and Repetti 2014: 139–140). And thirdly, there are also inflected verbs with directive force, which have truncated counter-parts: *te'* (< *tieni*), *ve'* (< *vedi*), *gua'* (< *guarda*), *vete* (< *vedete*) (Hubert-Sauter1951: 65)

Finally, some relevant data also come from Spanish, where eight irregular imperatives of the 2nd pers. sg. (*haz* \`do\`, *ve* \`go\`, *di* \`speak\`, *pon* \`open\`, *sal* \`go\`, *se* \`be\`, *ten* \`have\`, and *ven* \`come\`) are uninflected and invariably mono-syllabic. Just like in Italian, Spanish D-interjections are uninflected (*anda, hale* \`come on\`, *basta* \`enough\`).

In all the cases described above, one may therefore identify clues of morphological de-verbalisation, because the lack of inflection does not characterize the verb. The tendency of these D-verb forms to come closer to interjections is clear and contrasts with the situation of the D-infinitives and D-indicatives, which preserve inflection.

[7] I owe details on D-interjections in Italian to Oana Sălișteanu.

### 2.1.5 D-words and negation in the context of the verbalisation and de-verbalisation

The relationship negation-imperatives may now be approached in the space of the D-words delimited above; at issue is the play between the complementary tendencies that manifest within this space, verbalisation of the interjections and de-verbalisation of the verb forms.

Noticing that exclamative and onomatopoeic interjections are incompatible with negation is irrelevant: one cannot imagine what the combination between negation and such interjections would amount to. Noticing instead that D-interjections cannot be negated *is* relevant, because just like imperatives, D-interjections are destinated to change a state of things in the world. Under these conditions, their incompatibility with negation goes with another interjection property – the independent occurrence – and both show that the verbalisation of D-interjections is really weak. And, indeed, to the best of my knowledge no D-interjection in the Romance area could be negated; it would not be surprising to discover that this is a property of D-interjections in general.

On the other hand, negation *does* characterize the verb in general, which means that non-D-verb forms may be negated. However, in the field of the D-words some imperatives may be negated, whereas some others may not. In the context of the two tendencies, compatibility and incompatibility between negation and imperatives receive simple and obvious interpretations: compatibility means more verbhood in the nature of imperatives, whereas incompatibility means more de-verbalisation. Imperatives that are incompatible with negation therefore show an additional symptom of de-verbalisation, because they are closer to (D-)interjections than imperatives which may be negated. An important piece of evidence in favour of this view is the fact that in Romance languages in which pre-verbal negation is incompatible with imperatives, both non-inflected and truncated verb forms (if any) are invariably incompatible with negation.

## 3 Toward an explanation

Describing D-words as lexical items subject to verbalisation and de-verbalisation supplies a new understanding of the compatibility / incompatibility between imperatives and negation.[8] While this understanding does not represent by itself an explanation, it actually inspires one. Such an

[8] This understanding, however, has been anticipated in Indo-European linguistics. Stati (1965: 185) mentions that the passage from imperatives to interjections is documented in Latin, too, and that one of the types of imperative forms reconstructed in Indo-European has no ending (it is a root form). Also, in recent works in contemporary linguistics the relationship between imperatives and interjections is more carefully explored (Floricic and Molinu 2012, Swearingen 2017).

explanation is described in the next section. The analysis will be focused on languages in which the de-verbalisation of the imperatives means unavailability to negation. In addition, it also takes into account the special case of Aromanian, where the verbalisation of the imperatives (inflected or uninflected) allows them to be negated.

### 3.1 Imperatives as marked constructions

The explanation starts from the observation that true imperatives that are de-verbalised with respect to negation, are, in the synchrony of Romance languages, expressions of a phenomenon which occurred (and was more visible) in Vulgar Latin (VL). The phenomenon in question is the isolation of the imperatives from the rest of verbal forms, as a consequence of the fact that VL, unlike Classical Latin (CL), did not use a negative marker specific to imperatives.

In CL, imperatives and counter-factual subjunctives were negated by means of the negative marker *nē*, whereas the other verb forms were negated with the non-specific marker *non* (see Ernout and Thomas 1964, Croft 1991, van der Auwera 2010). *Nē* progressively weakened as a dedicated negator in CL. Moreover, traces of *nē* as a negative marker do not seem to be documented in VL. Under these conditions, imperatives in VL became isolated, because, unlike the rest of the verb forms (which were negated by adding the negative maker *non* to the verb), imperatives were not available to this operation.

The majority of Romance languages repeat through inheritance the situation in VL. The synchronic incompatibility between true imperative and negation may thus be seen as the manifestation of the deficiency of the VL imperatives to express negation.

On may represent this deficiency as following from a certain (implicit) requirement which in fact is not satisfied: the requirement that imperatives be marked under negation. This amounts to say that imperatives are allowed to be negated, as long as an imperative-dedicated negator exists in the language. Such a negation would then be a *directive* negation

The situation of the true imperatives which cannot be negated by means of pre-verbal negation therefore seems to be determined in Romance languages by the following factors:

(i) the existence of true imperatives (which play themselves a marking role for positive directives).
(ii) the lack of a directive negator (or of a negator which is opaque to the marking property of imperative).
(iii) the requirement that imperatives be marked in the negative polarity, too.

In this context, there remains to approach the case of Aromanian. Aromanian dispose of true imperatives (root imperatives and inflected ones). The negator *nu* indiscriminately applies to true imperatives and other verb forms (with or without directive force). In terms of marking, this situation may be explained in three theoretically distinct ways:

- True imperatives lost marking both in positive and negative polarity. Negation freely applies to all of the verbal forms, the result being uniformly unmarked negative forms.
- True imperatives mark the directive force in positive polarity but do not require marking under negation. Again, applying negation to imperatives yields both unmarked negative (true) imperatives and unmarked negative verb forms.
- True imperatives mark directives in positive polarity and require marking under negation. Negation *nu*, which is not a directive negation, is underspecified (that is, neutral), with respect to the distinction marked / unmarked directive force, *just because it combines both with imperative and nonimperative directive forms*. This means that when negation applies to true imperatives it shares with them the directive marking carried by the imperative, whereas when negation applies to unmarked verb forms it shares with them the lack of marking.

The first hypothesis is immediately discarded. The idea that true imperatives could have lost marking in either of their polar forms is rejected by the obvious fact that true imperatives mark directives in positive polarity, due to the imperative mood as a dedicated verb form. There remains then to choose between the last two hypotheses. We will argue that the hypothesis of an underspecified negator best fits the facts.

Relevant in this respect is the comparison between pairs of polar – true and suppletive – imperatives, both types being available in Aromanian. Consider the pair of polar true imperatives *Dă!* 'Give (it)!' (sg.) / *Nu dă!* 'Don`t give (it) !' (sg.), and the pair of polar suppletive imperatives *Dați!* `Give (it)!` (pl.) / *Nu dați!* 'Don`t give (it)!' (pl.) In the suppletive pair *Dați!* / *Nu dați!*, no member is marked for the directive force, because neither the mood (the indicative) nor negation has this function. On the other hand, in the pair of true imperatives *Dă!* / *Nu dă!*, the directive in the positive polarity *Dă!* is obviously marked by the imperative mood itself.

The question now arises as to whether the prohibitive *Nu dă!* is also marked for the directive force. The present answer is yes, and is based on the syntactic relationship between negation and imperative. The relationship is complementation, the imperative being the complement of the negation[9]. To recall, negation *nu* in Aromanian is not specialised in marking the directive force. Nevertheless, it is not restricted to only select unmarked directive verb forms, either. Crosslinguistic evidence in support of its neutrality is relevant:

[9] The import of the fact that pre-verbal negation is the $Neg^0$ head in its relationship with imperatives is emphasized in Zanuttini (1997) or Zeijlstra (2006).

in Classical Latin *ne* selects imperatives (and certain subjunctives) but no other verb forms. In Daco-Romanian *nu* combines with all kinds of verb forms except imperatives. In Aromanian, though, the negator *nu* indiscriminately combines with verb forms expressing directives. The availability of the Aromanian *nu* therefore proves its underspecification with respect to the distinction marking/unmarking the directive force. Underspecification simply means that the head *nu* of a construction expressing a directive is able to host the marking properties of its verbal complement. That is, if the verbal complement carries the feature *unmarked*, negation will be able to also express this feature. And if the complement is an imperative, negation will receive from it the directive marking. Thus, in both cases, the features transmitted by the verbal complement to the negation head will also be the features of the negative construction itself. Aromanian, then, observes the requirement of marking imperative under negation without resorting to a directive negation. Due to the transparency of the negation, the marking property of the imperative also becomes a property of the whole negative clause.

## 3.2 Formal expression

The analysis presented above can receive a formal expression. In what follows, we will describe the main steps of this enterprise within the HPSG theory.

In HPSG, directive clauses[10] are characterized as independent phrases whose content is an *outcome* (Ginzburg and Sag 2000: 42). Independent occurrence is encoded by means of the feature I(ndependent)C(lause) which has the Boolean value +: [IC: +]. The specific message – an outcome – is encoded by means of the feature CONT(ent) which has the value *outcome*: [CONT: *outcome*]. The whole looks as follows (*dir-cl* denotes the phrasal type directive clause and the sign → is the implication sign):

C1 (*dir-cl*) $\textit{dir-cl} \rightarrow \begin{bmatrix} \text{HEAD:}\, verb[IC:\ +] \\ \text{CONT:}\, outcome \end{bmatrix}$

This formula is a constraint on the type *dir-cl* and says that if something is a directive clause then it expresses an outcome and is an independent clause whose head is a verb. The representation on the right of the implication sign is called an *attribute-value matrix* (AVM) and denotes a feature structure (FS).

In most languages – the majority of Romance languages included – a directive clause is marked for its directive illocutionary force. Marking comes from the imperative mood as a directive-dedicated verb form. In order to capture this peculiarity, an additional specification has to be made, by means of the attribute MARKING.

[10] I rename Ginzburg and Sag`s *imperative clause* as *directive clause*, in order to refine the hierarchy of clauses.

In HPSG, marking is used to encode different specific features displayed by linguistic items (Pollard and Sag 1994, Tseng 2000). In the present case, MARKING may be used to express the idea that the linguistic item to which MARKING applies – the directive clause – marks the directive force. We call such a clause a marked directive clause (*marked-dir-cl*).

A marked directive clause inherits from its supertype (directive clause, *dir-cl*) the specification that its content is an outcome. In addition, it specifies that it has a MARKING attribute whose value is the directive force. This may be expressed in the following representation, where *directive* represents the value of the MARKING attribute:

C2 (*marked-dir-cl*) *marked-dir-cl* → $\left[\text{HEAD:}\, imp[\text{MARKING:}\, directive]\right]$

There are also *unmarked directive clauses,* that is, directive clauses whose head verb forms are not characteristic to directives and do not mark them. In this case, a new subtype of directive clause is needed. It will be the type *unmarked-dir-cl,* with the following constraint:

C3 (*unmarked-dir-cl*) *unmarked-dir-cl* → $\left[\text{HEAD:}\, \neg imp[\text{MARKING:}\, unmarked]\right]$

The symbols $\neg imp$ express the fact that the verb form has to be distinct from imperative.

One therefore obtains three types of directive clauses for languages which, like Daco-Romanian, Italian or Spanish ban the combination (pre-)verbal negation-imperative. The most general type is the type *dir-cl*, with two subtypes, *marked-dir-cl*, and *unmarked-dir-cl*, which inherit the properties of their supertypes (clause and directive clause).

We need now representations for lexical items involved in the construction of different types of directive clauses. These are mainly negation and the imperative verb.

As a part of speech, negation may be considered an item akin to verbs and complementizers. For this reason, negation may be placed in the hierarchy of the lexical types as a subtype of the type *verbal* (Ginzburg and Sag 2000: 23–24).

P(*verbal*) *verbal*: *verb*, *comp*(lementizer), *neg*(ation)

This characterization needs more. We follow Kim (2000: 173) who presents reasons to assume that in Italian and Spanish negation shares with the verb it negates the same part of speech properties (which in HPSG are encoded as HEAD features). The identity of the part of speech properties between negation and verb is expressed in HPSG by means of identical tags (which are symbolized as boxed numbers or numbers in module). Identical tags are equivalent to coindexing in other theoretical frameworks. As MARKING and its value are HEAD properties the MARKING value of the negation will be necessarily identical to the MARKING value of the verb with which negation co-occurs.[11]

The relationship between negation and its verb is complementation: the verb is the complement of the negator. Complementation is encoded by means of the feature COMP(lement)S. With these specifications, the representation of the negator in Romance languages in which negation and true imperatives are incompatible is the following:[12]

C4 (*neg*) $neg \rightarrow \begin{bmatrix} \text{HEAD}: |1| \\ \text{COMPS}: \langle VP\left[\text{HEAD}: |1| verb[\text{MARKING}: unmarked]\right]\rangle \end{bmatrix}$

In words, C4 says that negation takes the part of speech properties of its complement. This means that it shares with its verbal complement the value *unmarked* for the attribute MARKING. In this way, negation selects verbs with the *unmarked* value for this attribute.

Turning now to imperative, its relevant property for the present analysis lies in the following representation:

C5 (*imp*) $imp \rightarrow \left[\text{HEAD}: imp[\text{MARKING}: directive]\right]$

C5 says that the HEAD feature MARKING of an imperative has as value the directive force. If this verb form projects its complements (if any), the result is a phrase which illustrates a marked directive clause (see C2, above).

C1–C5 suffice to account for the relationship between imperatives and negation in Romance languages such as Daco-Romanian, Italian or Spanish (but not only in them). As the complement of the negation has to be unmarked, the imperative cannot be the complement of the negation just because the imperative is marked for directives. On the other hand, as negation itself is unmarked for the illocutionary force, what it projects has to be an unmarked phrase and hence an unmarked clause. Nevertheless, the present architecture of constraints allows for both marked clauses (which are exactly the projections of the imperative verb and are constrained by C2 above) and unmarked clauses (which are the projections of the other verb forms able to be used with directive force - these verb forms have not been given here; they are

[11] I follow in this respect Tseng`s (2002) proposal. The proposal is distinct from the classical theory of marking in Pollard and Sag (1994).
[12] In proposing C4 I ignore the fact that the complementation of the negation in Daco-Romanian is more complicate than in standard Italian or Spanish.

constrained by C3[13]). Both results are welcome, because they cover the empirical data in languages for which these constraints are in force.

As to Aromanian, the structure of the explanation is the following. Since Aromanian also makes the distinction between true and suppletive imperatives, the clausal projections of these types of lexical items illustrate the constraints on marked and unmarked directive clauses C2-C3. Of course, C5, which characterizes true imperatives, is also in force. The only difference between Aromanian and the other Romance languages studied here lies in the representation of the negator *nu*. Unlike negation in Daco-Romanian, Spanish or standard Italian, negation in Aromanian takes as complement a verb form which is underspecified with respect to the directive marking. That is, the complement of the negation in Aromanian may be a verb with [MARKING: *directive*] or [MARKING: *unmarked*] specification. Now, since negation shares the HEAD attributes with its complement, and since MARKING is exactly a HEAD attribute, its value on the complement will be shared with the value of the MARKING attribute on negation. This is expressed in the following lexical representation:

$$\text{C6}\ \ (neg_{\text{Arom}})\ \ neg \rightarrow \begin{bmatrix} \text{HEAD: } |1| \\ \text{COMPS: } \langle \text{VP}\big[\text{HEAD: } |1| verb[\text{MARKING: } |2|]\big]\rangle \end{bmatrix}$$

In C6, the tag |2| is also the tag of the MARKING attribute of the negation (which for reasons of simplicity has not been written any more). The tag does not specify whether it means *directive* or *unmarked*, so the tag is allowed to denote any value. Consequently, if the tag means *directive*, negation projects a marked directive clause, because, due to sharing, the HEAD attribute MARKING of the negation also acquires this value from its complement. If, on the contrary, the tag means *unmarked* (illocutionary force), then, in virtue of the same device of sharing, the clause projected by negation is an unmarked directive clause.

Thus, on the present analysis, the difference between languages in which imperatives are compatible with negation and languages in which imperatives and negation are incompatible amounts (at least in the Romance field) to the distinct selectional properties of the negators, with respect to their complements.

### 3.3 Two further cases

The short analyses below are destinated to put to test the explanation proposed above in terms of marking.

---

[13] Such an unmarked directive clause in Italian is for instance Cantate! \`sing\` 2[nd] pl. indicative.

### 3.3.1 Brazilian Portuguese

Brazilian Portuguese (BP) resembles Aromanian in that, although preverbal negation (*naõ*) does not mark directives, it takes as complement the imperative. The important difference from Aromanian is that this situation is the consequence of the fact that BP does not recognise the requirement that imperative be marked under negation. The present framework is able to make this difference visible.

BP inherited from European Portuguese (EP) the imperative of 2nd pers. sg. as a form that marks the directive: BP = EP = *Canta (tu)!* (`Sing (sg)`). In EP the imperative is distinct from the corresponding indicative form: *Tu cantas* (` You (sg.) sing`) – (Cavalcante 2011: 208). It therefore counts as a true imperative. In addition, EP uses subjunctives of 2nd pers. sg. with directive force, which means that it also disposes of suppletive forms ( for instance *Cantes (tu)!* `Sing (subjunct. Sg)`). Thus, in EP the imperative participates in a double opposition which gives it identity: *canta* (imp.)/*cantas* (ind.)/*cantes* (subjunct.).

In BP, though, this double opposition does not exist, because the 2nd pers. sg indicative lost its distinctive ending *-s* and became identical to the corresponding form of the imperative: *Tu canta=Canta (tu)* (`You (sg) sing`=`Sing (sg)`). The imperative thus lost its status of form specialised in expressing directives and became similar in use to the suppletive subjunctives. This situation is reflected in the present formalism as follows.

The negator *naõ* receives the representation that has been given for negators in Daco-Romanian, Italian or Spanish, that is, C4, repeated below:

$$\text{C4 } (\textit{neg}) \;\; \textit{neg} \rightarrow \begin{bmatrix} \text{HEAD: } \boxed{1} \\ \text{COMPS: } \langle VP\left[\text{HEAD: } \boxed{1}\, verb[\text{MARKING: } unmarked]\right]\rangle \end{bmatrix}$$

C4 shows that *naõ* can only negate unmarked verbal forms.

The imperative needs a distinct representation, required to express its status of non-dedicated form with respect to directives. This means that the value of the feature MARKING has to be the value *unmarked*:

$$\text{C5` } (\textit{imp}_{\text{BP}}) \;\; \textit{imp} \rightarrow \left[\text{HEAD: } imp[\text{MARKING: } unmarked]\right]$$

C4–C5` are now all we need to account for the situation in BP, because representations constrained by C4–C5` project clauses validated by C3 above (which, in turn defines unmarked directive clauses). This is indeed a correct characterization of the BP imperative clauses, be they in positive or negative polarity.

On the other hand, as no projection in BP satisfies C2 (recall that C2 defines marked directive clauses), the distinction between marked and unmarked directive clauses, encoded in C2–C3, becomes in fact useless and may be abandoned in favour of the most general constraint C1, on directive clauses themselves. The redundancy of C2 proves that the requirement of marking directives under negation does not apply in BP. This situation is in a salient contrast with Aromanian, where due to the transparency of negation (see C6), with respect to the directive marking, both C2 and C3 are relevant.

### 3.3.2 French

The case of French negated imperatives is interesting because it also illustrates the compatibility between negation and true imperatives. At the same time, French is representative for a whole class of Romance languages and dialects in which negation is post-verbal. Post-verbal negation, at least in Romance languages, constantly associates with compatibility with true imperatives, and we will see that the theory of marking proposed here explains this association. French has true imperatives (*Mange la soupe !* `Eat (sg) the soup`), which mark the directive force. Their representation is virtually identical to C5, used so far. A special accent has to be put on the complement list, because no specification is given regarding the marking of its members:

C5`` (*imp*$_{\mathrm{Fr}}$) *imp* $\rightarrow \begin{bmatrix} \text{HEAD: } imp[\text{MARKING: } directive] \\ \text{COMPS: } L(ist) \end{bmatrix}$

C5`` characterizes French imperatives in positive polarity. The clausal projection of a positive true imperative is constrained by C2, and characterizes marked directive clauses.

Unlike negators discussed so far, the French negator (*pas*) is not considered a verbal item, but an adverb. This is the option taken by Abeillé and Godard (1997) (see also Kim 2000 and, for approaches of a different theoretical orientation, Zeijlstra 2006 or Bošković 2011). The option is justified by the identical behaviour of *pas* with other adverbs of negation. The representation of *pas* is given below; the attribute MOD encodes the fact that the adverb modifies a verb with the content denoted by the tag $|1|$. The content of the adverb itself is the predicate of negation which takes as argument the content$|1|$ of the verb. The negator *pas* does not mark directives:

C4` (*neg*$_{\mathrm{Fr}}$) *neg* $\rightarrow \begin{bmatrix} \text{HEAD: } adv \begin{bmatrix} \text{MOD: } verb[\text{CONT: } |1|] \\ \text{MARKING: } unmarked \end{bmatrix} \\ \text{CONT: } \begin{bmatrix} \text{REL: } negation \\ \text{ARG: } |1| \end{bmatrix} \end{bmatrix}$

Taking the negator *pas* as an adverb has a significant impact on the projection of the imperatives in negative polarity. In principle, the combination imperative-negation may be a construction with the imperative as the head and the negator as its complement or adjunct. This means that the syntactic relationship between imperative and negator which is recognised in the case of languages with preverbal negation is now reversed. Indeed, this time the imperative is the head and the negator is the non-head daughter. This explains the linear order imperative-negator.

In Abeillé and Godard`s account it is argued that *pas* has to be treated as a complement added to the list (possibly empty) of the complements of the positive imperative. The supplementation of the list is done through an operation called *list concatenation* (symbol,⨁). The list concatenation introduces a sequential order among the members of the concatenation. One thus accounts for the fact that the negator *pas* precedes any complement in the original list of the imperative (for instance, *Mange la soupe ! / Ne mange pas la soupe !,* with *pas* preceding *la soupe*). A distinct representation is therefore needed for negated imperatives (in the representation below the presence of the clitic *ne* on the verb is omitted):

C7 (*neg-imp*$_{\mathrm{Fr}}$) *neg-imp* →

$$\begin{bmatrix} \text{HEAD: } imp[\text{MARKING: } directive] \\ \text{COMPS: } \left\langle \begin{bmatrix} \text{HEAD: } adv \begin{bmatrix} \text{MOD: } verb[\text{CONT: } |1|] \\ \text{MARKING: } unmarked \end{bmatrix} \\ \text{CONT: } |2| \begin{bmatrix} \text{REL: } negation \\ \text{ARG: } |1| \end{bmatrix} \end{bmatrix} \right\rangle \oplus\ L(ist) \\ \text{CONT: } |2| \end{bmatrix}$$

Just like C5`` (which deals with positive imperatives), C7 also project the type of clause defined by C2. The projection is a marked directive clause, headed by imperative, with the negator *pas* as the first member in the concatenated lists of complements.

Now, the explanation of the fact that French true imperatives are compatible with a non-directive negator is already contained in the concatenated lists of complements of the negative imperative: even if it marks directives, the imperative does not constraint its complements to have the same marking value. In C7, while the head marks the directive, the negator complement *pas* is unmarked, and as already emphasized the other complements in the original list L need not be specified in this respect. This, indeed, is hardly surprising; a look at true imperatives negated by pre-verbal negators (in French or other Romance languages) shows that these imperatives have the same behaviour with respect to their complements; that is, they do not constraint their complements to share with them the same marking value for directives. The same holds if the negator is not a complement but an adjunct of the imperative. One may therefore say that if attached to the analysis of the negation proposed by Abeillé and Godard, the present analysis explains the descriptive generalization that post-verbal negation in Romance is compatible with true imperatives.

## 4 Conclusions

The conclusions below envisage two aspects of the present analysis: the nature of the explanation adopted in this paper and the relationship between explanation and the pair verbalisation/de-verbalisation.

### 4.1 The explanation

The account proposed in this paper is close to Zanuttini`s explanation for Italian. Recall that Zanuttini`s hypothesis is that negation selects the verb. In order to be the complement of the negation, the verb has to have enough morphological or functional structure. Imperatives in standard Italian do not comply with this requirement, so they are excluded as complements of the negation.

The present account also relies on complementation in the relationship between negation and imperative. Morphological peculiarities of the imperatives play a role in our explanation, too. Nevertheless, the data are differently exploited. The morphological/functional structure of the imperatives has been here considered in the perspective of its capacity of marking the directive force. It is on this empirical basis that the availability of the imperative to be the complement of the negator is evaluated.

The explanation proposed here may cover the incompatibility between pre-verbal negation and imperatives in Daco-Romanian, Italian, Spanish, Catalan and European Portuguese. It also covers the special cases of Aromanian and Brazilian Portuguese, where true imperatives are allowed to be the complements of non-directive negators. Finally, it is explained why post-verbal negation combines with true imperatives in French or the majority of Italian dialects, where negation is post-verbal. However, there are limitations, too. It is not clear what explanation could be proposed for the incompatibility between post-verbal negation *pas* and true imperatives in Modern Central Occitan, (see example (6) above, repeated here as (15a)):

(15) a. *Canta pas! ‘Don`t sing!’ (*canta* = true imperative)
b. Cantes pas! ‘Don`t sing!’ (*cantes* = subjunctive with directive force)

In the absence of supplementary details, it seems that ruling out (15a) and allowing (15b) presuppose the requirement that the negator of the true imperatives be a directive negator and nothing else. This would be the strictest version of the requirement that imperatives be marked under negation (which is not ignored by the present analysis). Indeed, Modern Central Occitan has true imperatives which could mark negated imperative constructions just because, as we saw in the case of French, the imperative is the head of the construction. However, it seems that this option is ignored.

Things are even more complicate in the case of the Italian dialect from Cortina D`Ampezzo, where the 2nd sg. imperative may be negated (16a) but the 2nd pl. one may not (16b):

(16) a. No laőra! ‘Don`t work!’ (*laőra* =true imperative)
b. *No lourà! ‘Don`t work!’ (*lourà*=true imperative)

Additional information is again needed. For both examples Zanuttini quotes parallel suppletive imperatives which use a form of *have* followed by the preposition *da* and the main verb in the infinitive: *No t`as da lourà*! (for 16a) and *No aé da lourà*! (for 16b). The suppletive version of (16a) seems to be in free variation with (16a), but in the case of (16b) the suppletive version is certainly meant to replace (16b). Our conjecture is that the Cortina D`Ampezzo dialect might have the same type of negator as Aromanian, that is, a negator underspecified with respect to the directive force. This would explain the combination (16a). As to the banned combination in (16b), the explanation could depend on whether infinitives in this dialect accept to be negated (because *lourà* is an infinitive used either as a positive imperative or as a main verb in suppletive imperative constructions).

## 4.2 Directive marking and the pair verbalisation/de-verbalisation

The relationship between explanation through directive marking and the verbalisation/de-verbalisation of the imperatives is visible in the fact that the solutions to the problem of marking can be naturally described as cases of verbalisation or de-verbalisation. The following four possible situations can be found.

(i) There are languages in which no marked verb form or negation for directives exist. The requirement that directives be marked under negation does not exist, either, and, as a consequence, negation freely combines with all the types of verb forms expressing directives. In this case, one may say that the expression of the directive manifests a high degree of verbalisation, because the absence of the dedicated verb forms for directives means that the expression of the directives has been almost completely integrated into the system of the verb forms. This is the case of the Brazilian Portuguese.

(ii) Some languages have marked verbal forms for directives (that is, true imperatives) but no marked negation. In these languages, positive directives are marked. Negation indiscriminately combines with expressions of the directives (true imperatives included). As shown above, we take this phenomenon as indicating a special property of negation – underspecification with respect to marking (like in Aromanian). Again, this is a symptom of verbalisation but the verbalisation in this case is less strong than in the preceding case.

(iii) Some languages have marked forms both for verbs and negation (in the field of Romance languages, this is the case of the Classical Latin). They observe the requirement that dedicated verb forms be marked under negation, by using marked negation in combination with imperatives. This solution also means a certain degree of verbalisation, as far as imperatives are concerned. Nevertheless, verbalisation in this case is considerably weaker, because the system of negation resorts to special items in order to integrate imperatives into the class of the verb.

(iv) Finally, there are languages with marked verb forms for directives but no corresponding marked negation. In the Romance field, these languages represent the majority. The marking requirement under negation is observed at the cost of the banned combination between negation and imperatives. This places imperatives at the periphery of the verb system, because the ban for negation means less verbhood and brings imperatives closer to interjections.

The four situations describe a scale of the de-verbalisation/verbalisation which has in its first position the almost complete verbalisation of the imperative and in the fourth position the weakest form of verbalisation documented in Romance languages. It seems therefore that the various cases of marking or unmarking can be naturally interpreted as a form of verbalisation or de-verbalisation.

## References


Abeillé, A. and D. Godard (1997), The Syntax of French Negative Adverbs, in A. Abeillé, D. Godard and Ph. Miller (eds.) *The Major Syntactic Structures of French*, ESSLLI Reader, Aix en Provence.

Bošković, Ž. (2004), On the Clitic Switch in Greek Imperatives, in O. Mišeska Tomić (ed.) *Balkan Syntax and Semantics*, John Benjamins, Amsterdam, 269–291.

Bošković, Z. (2011), When are negative imperatives banned?, *Proceedings of of SinFonIJA3*.

Cavalcante, R. (2011), Negative Imperatives in Portuguese and Other Romance Languages, in J. Herschensohn (ed.) *Romance Linguistics 2010: Selected papers from the 40th Linguistic Symposium on Romance Linguistics (LSRL), Seattle, Washington, March 2010*, John Benjamins, Amsterdam, 205–219.

Croft, W. (1991), The Evolution of Negation, *Journal of Linguistics* 27: 1, 1–27.

Ernout, A. and F. Thomas (1964), *Syntaxe latine*, Kliencksick, Paris.

Floricic, F. and L. Molinu (2012), Romance Monosyllabic Imperatives and Markedness, in Th. Stolz, N. Nau, C. Stroh (eds.) *Monosyllables: from phonology to typology*, Akademie Verlag, STUF, Studia Typologica, 149–172.

Ginzburg, J. and I. Sag (2000), *Interrogative Investigations*, CSLI Publications, Stanford.

Han, Ch-H. (2001), *Force, Negation and Imperatives*, The Linguistic Review, Walter De Gruyter, Berlin, 289–325.

Hubert-Sauter, M. (1951), *Zur Syntax des Imperativs im Italienischen*, Francke, Bern.

Ionescu, E. (2019), Negative imperatives in Eastern Romance languages: Latin heritage and Romance innovation, *Zeitschrift fur Romanische Philologie* 135: 3, 845–865.

Kim, J-B. (2000), *The Grammar of Negation*, CSLI Publications, Stanford.

Pollard, C. and I. Sag (1987), *Information-based Syntax and Semantics*, CSLI Publications, Stanford.

Pollard, C. and I. Sag (1994), *Head-driven Phrase Structure Grammar*, University of Chicago Press and CSLI Publications, Chicago and Stanford.

Puşcariu, S. (1959), *Limba română. Rostirea*, Editura Academiei Republicii Populare Române, București.

Romanello, E. and L. Repetti (2014), Imperative Characteristics in Romance Varieties Spoken, *Rivista di Linguistica* 26: 1, 135–163.

Searle, J. (1979), *Expression and Meaning*, Cambridge University Press, Cambridge.

Stati, S. (1965), Verbul, in Al. Rosetti (red. resp.), *Istoria limbii române, vol I. Limba latină*, Editura Academiei Republicii Populare Române, București, 166–196.

Swearingen, A. (2017), Crossing the categorial divide: imperative and interjection conversions in Romance, in D. van Olmen and S. Heinold (eds.) *Imperatives and Directive Strategies*, John Benjamins Publishing Company, Amsterdam, 297–324.

Tseng, J. (2002), Remarks on Marking, in F. van Eynde, , L. Hellan and D. Beermann (eds.) *Proceedings of the 8th International HPSG Conference*, CSLI Publications, http://csli-publications.stanford.edu/.

van der Auwera, J. (2010), Prohibition: Constructions and Markers, in S. Dingfang and K. Turner (eds.) *Contrasting Meaning in Languages of the East and West*, Tübingen, Narr, 443–475.

Zanuttini, R. (1997), *Negation and Clausal Structure*, Oxford University Press, Oxford.

Zeijlstra, H. (2004), *Sentential Negation and Negative concord*, Ph Dissertation, University of Amsterdam.

Zeijlstra, H. (2006), The Ban on True Negative Imperatives, in O. Bonami and P. Cabredo Hofherr (eds.) *Empirical Issues in Syntax and Semantics*, 405–424, http://www. ssp. nrs.fr/eiss6.

Zhang, S. (1990), *The status of imperatives in the theory of grammar*. PhD dissertation, University of Arizona.

# The gradual erosion of NPI-hood with need verbs in Germanic

Jakob Maché

Universidade de Lisboa

Proceedings of the 28th International Conference on
Head-Driven Phrase Structure Grammar

Online (Frankfurt/Main)

Stefan Müller, Nurit Melnik (Editors)

2021

Frankfurt/Main: University Library

pages 340–347

Keywords: HPSG, epistemic modality, negative polarity, 'need'-verb, modality, grammaticalisation, historical linguistics, Norwegian, Gothic, German, Dutch, English, Swedish, Icelandic, Danish

Maché, Jakob. 2021. The gradual erosion of NPI-hood with need verbs in Germanic. In Stefan Müller & Nurit Melnik (eds.), *Proceedings of the 28th International Conference on Head-Driven Phrase Structure Grammar, Online (Frankfurt/Main)*, 340–347. Frankfurt/Main: University Library. DOI: 10.21248/hpsg.2021.18.

# 1 Germanic 'need'-verbs: lexical polysemy meets negative polarity

Germanic 'need' verbs exhibit a great deal of variation across time and languages with respect to three aspects: (i) the environments in which they are licensed (strength), (ii) the array of different syntactic patterns in which they can be used, such as transitive or raising verbs, (iii) and which of these patterns are restricted to negative polarity licensing contexts.

One important property of 'need' verbs in Germanic is that they come with various syntactic argument structures such as transitive verb with $\langle \mathrm{NP}_{\mathrm{nom}}{:}\mathrm{EXP},\ \mathrm{NP}_{\mathrm{acc/gen}}{:}\mathrm{THEME}\rangle$, impersonal verb $\langle \mathrm{NP}_{\mathrm{acc/gen}}{:}\mathrm{THEME}\rangle$, directional phrases $\langle \mathrm{NP}_{\mathrm{nom}}{:}\mathrm{EXP},\ \mathrm{NP}_{\mathrm{acc/gen}}{:}\mathrm{THEME}\rangle$, with non-finite control or raising complements $\langle \mathrm{NP}_{\mathrm{nom}}{:}\mathrm{EXP},\ \mathrm{VP}_{\mathrm{bse/inf}}{:}\mathrm{THEME}\rangle$ or finite clausal arguments $\langle \mathrm{NP}_{\mathrm{nom}}{:}\mathrm{EXP},\ \mathrm{S}_{that}\rangle$. As demonstrated by Lightfoot (1979), Sweetser (1990), Diewald (1999) and Roberts & Roussou (2003), the different uses of verbs with modal meaning develop at different stages in grammaticalisation. It is well known, that circumstantial uses with infinitives developed from transitive uses and that epistemic uses with infinitives developed from circumstantial uses:

(1) $\mathrm{V}_{\mathrm{trans}} > \mathrm{V}_{\mathrm{circumstantial}} + \mathrm{INF} > \mathrm{V}_{\mathrm{epistemic}} + \mathrm{INF}$

Table 1 gives an overview over the NPI-hood of the different 'need'-verbs in the major germanic languages based on data from corpora (*Deutsches Textarchiv*, *Referenzkorpus Altdeutsch*, *Referenzkorpus Mittelhochdeutsch*, *Nordic Dialect Corpus and Syntax Database*, *Wulfila Project*), previous corpus studies such as Loureiro-Porto (2009) and historic dictionaries such as De Vries & Te Winkel (1882), Verwijs & Verdam (1947), *Svenska Akademiens Ordbok* and *Ordbog over det danske Sprog*.

As Table 1 indicates, there is an interesting correlation between the degree of grammaticalisation and the question whether a single use is distributionally unrestricted or restricted to negative polarity environments. At the one end of the scale, there is Dutch *hoeven*, which is always an NPI irrespective of the degree of grammaticalisation of the relevant uses, at the other end of the scale there is Swedish *behöva*, which is only used as an NPI in is most grammaticalised use, which is the epistemic one. All the transitive and circumstantial uses with infinitive of *behöva* are distributionally unrestricted.

[†]First, I would like to express my gratitude to three anonymous reviewers for their comments and suggestions. Furthermore, I am indebted to Elisabet Engdahl for helping me with data from Swedish, Bjarne Œrsnes for Danish, Ferdinand von Mengden for Old English, Mathias Hüning for Middle Dutch, Janne Bondi Johannessen for Norwegian and Heimir F. Viðarsson for Icelandic. Finally, I want to thank Łukasz Jędrejowski, Gerald Penn, Marga Reis, Frank Richter, Manfred Sailer, Gert Webelhuth and Hedde Zeilstra for comments before, during and after the presentation.

In the middle of the scale there are 'need' verbs like German *brauchen*, which is distributionally unrestricted whenever used as a transitive verb or impersonal verb, but which turns into an NPI whenever occurring with clausal complement. In case, some use of a 'need' verb is not attested it the relevant field of Table 1 shows a dash.

In a more global perspective it appears that the more grammaticalised the use of a verb is the more likely it is to retain its negative polar status. This assumption is further corroborated by the fact that of all the uses of English *can* it is only its most grammaticalised one which is restricted to negative polar environments, as shown by Hofmann (1976: 94), Brennan (1993: 14), Israel (1996: 630–631, 2011: 131–132), Drubig (2001: 43), Portner (2009: 30).

| | **intrans** | **trans** | **impers.** | **fin. clause** | **dir. PP** | **inf. circ.** | **inf. epist** |
|---|---|---|---|---|---|---|---|
| Goth. *þaurban* + bare Inf. | – | NPI | – | NPI | NPI | NPI | – |
| O. Sax. *thurban* + bare Inf. | – | – | – | – | NPI | NPI | – |
| O. Eng. *þurfan* + bare Inf. | – | ?NPI | – | – | – | NPI | – |
| O. H. Ger. *thurfan* + bare Inf. | NPI | NPI | – | – | NPI | NPI | – |
| M. H. Ger. *thurfan* + bare Inf. | NPI | NPI | – | – | NPI | NPI | – |
| Mod. Dt. *hoeven* + *te*-Inf. | – | NPI | NPI | – | NPI | NPI | NPI |
| Mod. Ger. *brauchen* + (*zu*)-Inf. | – | unrestr. | unrestr. | NPI | NPI | NPI | NPI |
| Mod. Dan. *behøve* + (*at*)-Inf. | – | unrestr. | – | – | – | NPI | NPI |
| Mod. Eng. *need* + bare Inf. | – | unrestr. | – | – | – | NPI | NPI |
| Mod. Nor. *trenge* + bare Inf. | – | unrestr. | – | – | – | NPI | NPI |
| Mod. Den. *behøve* + bare Inf. | – | unrestr. | – | – | – | NPI | NPI |
| Mod. Swe. *behöva* + bare Inf. | – | unrestr. | – | – | – | unrestr. | NPI |
| Mod. Isl. *þurfa* + *að*-Inf. | – | unrestr. | – | – | (unrestr.) | unrestr. | NPI |
| Mod. Nor. *behøve* + *å*-Inf. | – | unrestr. | – | – | – | unrestr. | – |
| Mod. Nor. *trenge* + *å*-Inf. | – | unrestr. | – | – | – | unrestr. | – |
| Mod. Engl. *need* + *to*-Inf. | – | unrestr. | – | – | – | unrestr. | – |

Table 1: Distribution of NPI uses of 'need' verbs in Germanic languages

# 2 Analysis

These data raise two questions: First of all, how do the different uses of 'need' verbs relate to each other in the lexicon? Is there a single entry or are there separate and independent entries? And secondly, why are more more grammaticalised 'need' verbs more likely to be NPIs?

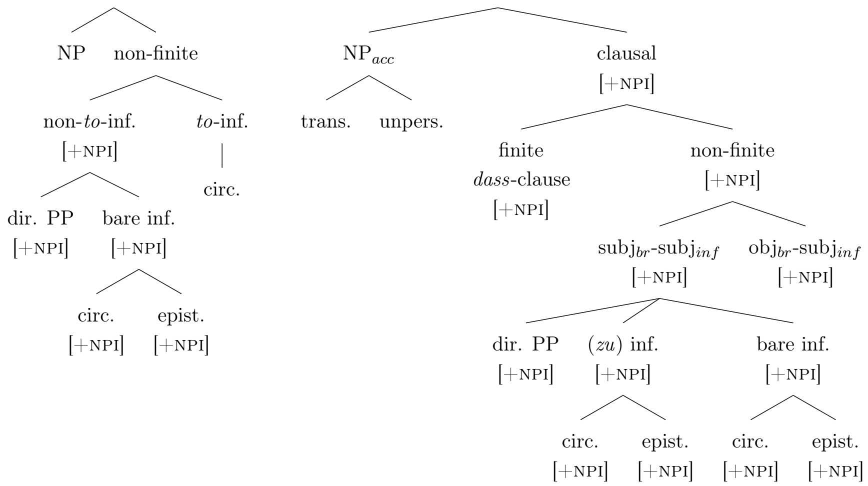
## 2.1 Modelling lexical polysemy in the lexicon

As regards the first question, it is assumed here that lexicon entries of modal verbs in general are organised in type hierarchies which relate all of the different uses to each other. On the top branch, there is the least grammaticalised use, and the more deeper in the tree, the more grammaticalised uses tend to be (cf. 2–3)

$$\left[\textsc{arg-st}\left\langle \mathrm{NP}_i, \left[\textsc{head}\left[\begin{array}{l}\textsc{agr}|\textsc{case}\ \mathit{str}\\ \mathit{noun}\end{array}\right]\right]\right\rangle\right]$$

Figure 1: Lexicon entry at stage 1 of language acquisition

(2) Engl. *need* (3) German *brauchen*




This internal structure of lexical polysemous verbs is motivated by evidence from language acquisition, which is the main force behind grammaticalisation (cf. Paul 1920: 34 §18, Lightfoot 1979: 375, Lightfoot 1998: 18). Following Green's (2011) concept of *Type Differentiation*, acquisition of new forms can be understood as branching the old underspecificed form into two more specified forms that are contrasted by conflicting feature values. Thus, grammaticalisation of new forms can be sketched as follows: at some points of their development a $form_1$ with the feature $F$ specified as $a_1$ will be reanalysed. Which means it will lose its specification. In the learner's lexicon this is going to be expressed as the assumption of a super type $form_0$ with a underspecified feature $F$. At the same time, the L1-learner has space to assume a more grammaticalised $form_2$ with a feature value $a_2$ which reflects a higher degree of grammaticalisation. To illustrate this mechanism, assume the first stage of acquisition in which the transitive use of the 'need' verb is acquired as illustrated in Figure 1.

Once the L1-learner is exposed to data which suggest that the THEME-argument might also be realised as infinitive, a reanalysis takes place (i) which causes the category of the second argument to become underspecified and (ii) which introduces two daughters one bearing the old value *noun* and a second daughter bearing the new value *verb*, yielding a control infinitive structure, cf. Figure 2. This models exactly the data for L1 acquisition of modality and 'need' verbs gathered by Cournane (2014; 2015); Hacquard &

$$\left[\textsc{arg-st}\left\langle \mathrm{NP}_i, \left[\textsc{head}\ noun \vee verb\right]\right\rangle\right]$$

$$\left[\textsc{arg-st}\left\langle \mathrm{NP}_i, \left[\textsc{head}\begin{bmatrix}\textsc{agr}|\textsc{case}\ str\\ noun\end{bmatrix}\right]\right\rangle\right] \quad \left[\textsc{arg-st}\left\langle \mathrm{NP}_i, \left[\textsc{head}\begin{bmatrix}\textsc{subj} & \left\langle \mathrm{NP}_i\right\rangle\\ \textsc{vform} & bse\\ verb & \end{bmatrix}\right]\right\rangle\right]$$

Figure 2: Lexicon entry at stage 2 of language acquisition

Cournane (2016), Lin (2016); Lin et al. (2015), Lin et al. (2017).

## 2.2 Modelling the diverging distributions of negative polarity across Germanic languages

Turning to the second question, there seems to be a principle at work: if any use of a 'need' verb bears the NPI feature all the remaining uses which subsequently grammaticalised out of it bear that feature too. This exactly accounts for the vast variation on NPI uses among 'need' verbs in Germanic as illustrated in Table 1. In the case of Dutch, the NPI feature takes is in the top node and inherited to all possible uses; in English the NPI feature only applies to non-finite uses without *to* (cf. 2) and in German, the NPI feature extends to all the uses which involve a clausal complement (cf. 3).

Tackling to the question why the distribution of NPI uses is so heterogenous in Modern Germanic languages, it is recommended to take a look at earlier stages (cf. Table 1), the earliest documented stages Gothic, Old Saxon, OHG and OE involve a 'need' verb *thurfan* and its cognates which is (almost) exlusivly found in NPI licensing environments, mostly in the scope of a negation and in interrogatives, in Gothic and in Modern Swedish it appears that relative clauses can license NPIs, too. At least it is remarkable that many of the instances which do not occur in well known NPI-licensing contexts are found in relative clauses.

(4) sumai mundedun, ei unte arka habaida
some-M.NOM.P mean-PRET-3P that until box-ACC.S have-PRET-3S
Iudas, þatei qeþi imma Iesus: bugei [$_{\text{REL-CL}}$
Iudas that say-OPT.PRET.3P him-M.DAT.S Iesus: buy-IMP
þizei þaurbeima du dulþai], aiþþau þaim
REL.GEN.S need-OPT.PRS.1P to feast-DAT or DEM.M.DAT.P
unledam ei hva gibau.[1]
poor-DAT.P for.that something-ACC give-OPT.PRS.1S
'For some of them thought, because Judas had the bag, that Jesus had said unto him, Buy those things that we have need of against the feast; or, that he should give something to the poor.'

[1] *Wulfila Bible* Codex Argenteus, John 13:29

(5) det var ju mycket som skulle – alla lysrör
there was PRT a.lot that FUT.AUX <break> all neon.lamps
[REL-CL som behövde skiftas] och andra __UNDEF__
REL needed replace-PST.PASS and other ???
ljuspunkter[2]
light.spots
'. . . neon lamps which needed to be replaced . . . .'

The behaviour of 'need' verbs in known studied stages of Germanic languages suggests thus that the common Protogermanic ancestor **þurƀan* must have been negative polar covering all its uses from transitive to clause embedding uses (cf. Birkmann 1987: 371–373 on the phonological reconstruction).

It will be shown that almost all the 'need' verbs in Germanic have undergone an erosion of their negative polarity to some extent, in some languages such as Danish the transitive uses are no longer NPIs, in others such as Icelandic transitive and circumstantial uses lost their NPI status and the English NPI *need* + bare infinitive is increasingly replaced by a non NPI *need* + *to*-infinitive (cf. Müller 2008).

The development in the various languages indicates that both scenarios for the loss of negative polarity can be found, replacement by a new distributionally unrestricted form (cf. Hoeksema 1998) and the loss of negative polarity (cf. Jäger 2010).

Comparing the various Modern Germanic languages, van der Wouden (2001) and Richter & Soehn (2006) observed that 'need' verbs are licensed by a different types of licensing contexts in different languages. It is argued here that the more there are NPI licensing contexts in a language, the more difficult it is for L1 to recognise a given use as NPI in the input data, hence the more likely it is this use is going to lose its NPI-hood. In a similar manner, Goldberg (2019: 101–104) observes that L1-learner tend to simplify their grammars if the input becomes too opaque. All this is in line with the well known assumption that L1-acquisition is the main locus of language change (cf. Paul 1920: 34 §18, Lightfoot 1979: 375, Lightfoot 1998: 18). Moreover this is corroborated by the findings on L1-acquisition of negative polar 'need' verbs in Lin et al. (2015) and Lin et al. (2017), who show that L1-learner gradually acquire the various licensing contexts in which Dutch *hoeven* 'need' with clausal negation *niet* (2;) or negative quantifier *geen* 'no' (4;) before allowing more licensers from 7;00 onward. In other words, it takes much time until weak NPIs are acquired. Apart from that it will be demonstrated that individual speakers already reanalysed weak NPIs such as *brauchen* as distributionally unrestricted forms.

Finally, it will be shown here that there are 'need' verbs which are no longer strict NPIs but which still overwhelmingly occur in non-veridical environments

[2] NDC: bara_om3

such as the circumstantial uses in Norwegian *trenger* with infinitive (75/2) and *behøve* with infinitive (25/2) und to lesser extent Swedish *behöva* with infinitive (66/20). These facts suggest that NPI-hood is not even a binary feature but a gradual or probabilistic one.

Alternatively, it could be assumed that NPI-hood is not expressed by a lexical feature but a long the lines of Israel (1996: 630–631, 2011: 127–142) who suggest that sensitivity polarity can be explained in a pragmatic way in terms of scalar implicature. As Israel points out, 'need'-verbs encode endpoints of a scale thereby behaving like prototypical polarity sensitive items. The account outlined here remains agnostic to the question whether NPI-hood is expressed as a lexical feature or derived by pragmatic principles. But there has to be some information in the lexical entries which designates transitive uses of need verbs to be NPIs such as in Modern Dutch, but designates them to be distributionally unrestricted in languages like Modern Scandinavian or German.

## References


Birkmann, Thomas. 1987. *Präteritopräsentia: morphologische Entwicklung einer Sonderklasse in den altgermanischen Sprachen*. Vol. 188 (Linguistische Arbeiten). Tübingen: Niemeyer.

Brennan, Virginia. 1993. *Root and Epistemic Modal Auxiliary Verbs in English*. Amherst: University of Massachusetts. (Doctoral dissertation).

Cournane, Ailíis. 2014. In search of l1 evidence for diachronic reanalysis. *Language Acquisition* 21(1). 103–117. DOI: 10.1080/10489223.2013.855218.

Cournane, Ailíis. 2015. *Modal development: input-divergen l1 acquistion in the direction of diachronic reanalysis*. Toronto: University of Toronto. (Doctoral dissertation).

De Vries, Matthias & Labert Allard Te Winkel. 1882. *Woordenboek der nederlansche taal*. 's-Gravenhage: Nijhoff.

Diewald, Gabriele. 1999. *Die Modalverben im Deutschen: Grammatikalisierung und Polyfunktionalität* (Reihe Germanistische Linguistik 208). Tübingen: Niemeyer.

Drubig, Hans Bernhard. 2001. On the syntactic form of epistemic modality. Ms. Universität Tübingen.

Goldberg, Adele E. 2019. *Explain me this. creativity, competition, and the partial productivity of constructions*. Princeton: Princeton University Press.

Green, Georgia. 2011. Modelling grammar growth: Universal grammar without innate principles or parameters. In Kersti Borjars & Robert Borsley (eds.), *Non-transformational syntax: a guide to current models*, 378–403. Oxford: Wiley-Blackwell.

Hacquard, Valentine & Ailíis Cournane. 2016. Themes and variations in the expression of modality. In *Proceedings of NELS 46*, 21–42.

Hoeksema, Jack. 1998. On the (non)loss of polarity sensitivity: duch *ooit*. In Richard M. Hogg & Linda van Bergen (eds.), *Historical linguistics 1995: selected papers from the 12th international conference on historical linguistics, manchester, august 1995*, 101–114. Amsterdam: John Benjamins.

Hofmann, Thomas Ronald. 1976. Past Tense Replacement and the Modal System. In James McCawley (ed.), *Notes from the Linguistic Underground* (Syntax and semantics 7), 86–99. New York: Academic Press.

Israel, Michael. 1996. Polarity sensitivity as lexical semantics. *Linguistics and Philosophy* 19(6). 619–666. DOI: 10.1007/bf00632710. https://doi.org/10.1007%2Fbf00632710.

Israel, Michael. 2011. *The grammar of polarity. pragmatics, sensitivity, and the logic of scales*. Cambridge: Cambridge University Press.

Jäger, Agnes. 2010. *Anything* is *nothing* is *something. Natural Language & Linguistic Theory* 28. 787–822. DOI: DOI10.1007/s11049-010-9113-1.

Lightfoot, David. 1979. *Principles of diachronic syntax*. Vol. 23 (Cambridge studies in linguistics). Cambridge: Cambridge University Press.

Lightfoot, David. 1998. *Development of Language: Acquisition, Change and Evolution* (Maryland lectures in language and cognition 1). Malden: Blackwell.

Lin, Jing. 2016. On the distribution and acquisition of the west germanic 'need' verbs: german between dutch and english. *Journal of Germanic Linguistics* 28(4). 349–369. DOI: https://doi.org/10.1017/S1470542716000179.

Lin, Jing, Fred Weerman & Hedde Zeijlstra. 2015. Emerging npis: the acquisition of dutch *hoeven* 'need'. *The Linguistic Review* 32(2). 333–374.

Lin, Jing, Fred Weerman & Hedde Zeijlstra. 2017. Acquisition of the dutch npi hoeven 'need': from lexical frames to abstract knowledge. *Language Acquisition*. DOI: 10.1080/10489223.2017.1348097.

Loureiro-Porto, Lucía. 2009. *The semantic predecessors of 'need' in the history of english (c750–1710)*. Vol. 43. Malden, MA: Wiley-Blackwell.

Müller, Friederike. 2008. From degrammaticalisation to regrammaticalisation? current changes in the use of 'need'. *Arbeiten aus Anglistik und Amerikanistik* 33(1). 71–94.

Paul, Hermann. 1920. *Deutsche Grammatik*. Vol. 4 Syntax II. Niemeyer.

Portner, Paul. 2009. *Modality*. Oxford: Oxford University Press.

Richter, Frank & Jan-Philipp Soehn. 2006. *Braucht niemanden zu scheren*: a survey of npi licensing in German. In Stefan Müller (ed.), *Proceedings of the 13th international conference on Head-Driven Phrase Structure Grammar, Varna*, 421–440. http://cslipublications.stanford.edu/HPSG/2006/richter-soehn.pdf.

Roberts, Ian G. & Anna Roussou. 2003. *Synactic change: a minimalist approach to grammaticalization*. Vol. 100 (Cambridge studies in linguistics). Cambridge: University Press.

Sweetser, Eve. 1990. *From etymology to pragmatics. Metaphorical and cultural aspects of semantic structure*. Vol. 54 (Cambridge studies in linguistics). Cambridge: University Press.

van der Wouden, Ton. 2001. Three modal verbs. In Sheila Watts, Jonathan West & Hans-Joachim Solms (eds.), *Zur verbmorphologie germanischer sprachen*, vol. 446 (Linguistische Arbeiten), 189–210. Niemeyer.

Verwijs, Eelco & Jan Verdam (eds.). 1947. *Middelnederlandsch woordenboek*. Nijhoff.

# Minimizer negative polarity items in non-negative contexts

Manfred Sailer

Goethe-University Frankfurt a.M.

Proceedings of the 28th International Conference on
Head-Driven Phrase Structure Grammar

Online (Frankfurt/Main)

Stefan Müller, Nurit Melnik (Editors)

2021

Frankfurt/Main: University Library

pages 348–368

Keywords: conventional implicature, enriched semantic representation, generalized conversational implicature, negative polarity item, semantics-pragmatics interface

Sailer, Manfred. 2021. Minimizer negative polarity items in non-negative contexts. In Stefan Müller & Nurit Melnik (eds.), *Proceedings of the 28th International Conference on Head-Driven Phrase Structure Grammar, Online (Frankfurt/Main)*, 348–368. Frankfurt/Main: University Library. DOI: 10.21248/hpsg.2021.19.

**Abstract**

Minimizer strong NPIs such as *lift a finger* are known to be more restricted in their occurrence than weak NPIs like *ever*. Sedivy 1990 ('Against a unified analysis of negative polaritylicensing'. *Cahiers Lingistiques D'Ottawa* 18. 95–105) points to contexts with a "negative side message" in which *lift a finger* can occur but *ever* cannot. The paper provides a short overview over the relevant contexts and proposes an extension of a representational theory of NPI licensing with the following components: First, an *utterance content* is introduced that enriches the primary truth-conditional content by conventional implicatures and generalized conversational implicatures. Second, *ever*-type NPIs can be licensed by weak NPI licensors, but only in the primary truth-conditional meaning of an utterance. *Lift-finger*-type NPIs can only be licensed in the scope of negation, but the licensing can be checked at the representation of the enriched meaning of an utterance.

# 1 Introduction

In this paper, I will constrast the distributions of two types of negative polarity items (NPIs): NPIs such as *lift a finger* and *drink a drop*, which are often characterized as *strong NPIs*, *strict* NPIs, *minimizer NPIs* – or *lexical* NPIs in Sedivy (1990). To avoid any commitment to a characterization of this class, I will simply refer to such NPIs as *lift-finger*-type NPIs and I will mark them in bold small caps in my examples, see (1). The second type of NPIs are expressions such as *ever* and the NPI-uses of *any*, *anything*, .... These are often called *weak NPIs*. Sedivy (1990) chooses the term *regular NPIs* for them. I will refer to them as *ever*-type NPIs and mark them in small caps in my examples, see (2).

As shown in (1) and (2), NPIs of both types can occur if they are in the scope of sentential negation, as expressed with a negated auxiliary in the (a)-examples or a so-called neg-word like *noone* in the (b)-examples. These licensing expressions are called *strong licensors* and will be underlined with a solid line in this paper. They create an anti-additive context for the NPIs (van der Wouden, 1997). Similarly, both types of NPIs are excluded in affirmative sentences that lack a licensor, see the (d)-examples. While the two types of NPIs behave in the same way in these contexts, only *ever*-type NPIs can be used in the scope of simply downward-entailing expressions such as *few*, see the (c)-examples. I will mark such weak licensors with a wavy line.

(1) a. Alex didn't **LIFT A FINGER** to help.
b. Noone **LIFTED A FINGER** to help.
c. * Few students **LIFTED A FINGER** to help.

[†]I would like to thank the reviewers and the audience for their comments, in particular Jack Hoeksema, Jacob Maché, Frank Richter, Monica-Mihaela Rizea Casa, and Hedde Zeijlstra. All errors are mine.

d. * Alex LIFTED A FINGER to help.

(2) a. Alex didn't do ANYTHING to help.
b. Noone did ANYTHING to help.
c. Few students did ANYTHING to help.
d. * Alex did ANYTHING to help.

In general, the literature on NPIs gives the impression that *lift-finger*-type NPIs occur in a subset of the contexts in which *ever*-type NPIs can be found. However, Sedivy (1990) lists contexts such as (3), in which the occurrence pattern is reversed. With the stressed auxiliary, the *lift-finger*-type NPI is licensed even if there is no overt negative element or NPI-licensor in the clause. An *ever*-type NPI is, however, excluded in this context.

(3) a. But I DO GIVE A DAMN.
b. * But Bert DID EVER kiss Marilyn Monroe. (Sedivy, 1990, 98)

In this paper, I will maintain the traditional idea that *lift-finger*-type NPIs can only be licensed in the scope of negation, whereas *ever*-type NPIs are licensed in the scope of any NPI-licensing operator – in whichever way they are defined. To account for the contrast in (3), I will propose that the licensing of *ever*-type NPIs is checked in the primary, truth-conditional content of a clause. *Lift-finger*-type NPIs, on the other hand, can be licensed by conventionalized negative "side messages" as well. Such side messages can be conventional implicatures or even generalized conversational implicatures.

To develop this idea, I will look at a number of constructions that are challenging for established theories of NPI licensing (Section 2). I will present my understanding of the central ideas of Levinson (2000), who proposes *enriched semantic representations* that comprise the above mentioned types of side messages in Section 3. I show how the critical contexts are represented in this architection (Section 4). In Section 5, I show how the traditional NPI-licensing data in (1)–(2) as well as the challenging contrast in (3) can be captured in a theory of NPI licensing that assumes (i) that NPI-licensing conditions are expressed as constraints on semantic representations, and (ii) such representations may include conventional implicatures and generalized conversational implicatures. The main results will be summarized in a conclusion, Section 6.

## 2 Challenging contrasts

In this section, I will look at three constructions that are potentially problematic for a "classical," entailment-based view of NPI licensing: the restrictor of a universal quantifier, denial-uses of auxiliaries, and irrealis uses of modals. While the data have been discussed in the literature – including Linebarger (1980), Sedivy (1990), and Heim (1984) – they have not been integrated systematically into a theory of NPI licensing yet.

What I call the "classical," entailment-based view of NPI licensing is the theory of Ladusaw (1980) and its refinement in Zwarts (1981, 1986) and van der Wouden (1997).[1] According to this theory, NPIs can only occur in downward-entailing contexts, i.e. in contexts that allow inferences from supersets to subsets. For example, *Few guests smoked at the party* entails *Few guests smoked and drank at the party*. Strong NPIs are further restricted to so-called *anti-additive* contexts. The scope of *no N* is anti-additive, because *No guest* [*smoked or drank alcohol*] is equivalent to *No guest smoked and no guest drank alcohol*.

The scope of clausal negation and of neg-words (such as *nobody*, *never*), but also the restrictor of a universal quantifier constitute anti-additive contexts. The anti-additivity of the restrictor of a universal quantifier can be illustrated with the equivalence of *Everyone who smokes or drinks may have an addiction problem* and *Everyone who smokes may have an addiction problem and everyone who drinks may have an addiction problem*.

As this classical theory of NPI licensing is based on entailment, pragmatics should not have an influence on the basic conditions under which NPIs are licensed. However, there could be additional pragmatic restricting as to whether an NPI can occur or not. This seems to be the case for the restrictor of universal quantifiers. Linebarger (1980) and Heim (1984) note that *lift-finger*-type NPIs are possible there in principle, see (4a), though not generally, see (4b).

(4) [Every restaurant that charges SO MUCH AS a dime for iceberg lettuce]
   a. . . . ought to be closed down.
   b. ?? . . . actually has four stars in the handbook.

(Linebarger, 1980, 107)

According to Heim (1984, 104–105), *lift-finger*-type NPIs require that there be a causal or necessary relation between the restrictor and the scope, rather than a mere coincidence. For *ever*-type NPIs, no such additional, pragmatic constraint is needed, see (5).

(5) a. [Every restaurant that has EVER charged a dime for iceberg lettuce], ought to be closed down.
   b. [Every restaurant that I have EVER gone to], happens to have four stars in the handbook. (Heim, 1984, 105)

This suggests that the data on the restrictor of a universal quantifier are compatible with the classical theory: it is an anti-additive context and *lift-finger*-type NPIs occur in a subset of contexts of *ever*-type NPIs.

[1] I deliberately ignore other refinements, such as the inclusion of presuppositions (von Fintel, 1999), or the relaxation to non-veridicality (Zwarts, 1995; Giannakidou, 1999), as these do not relate directly to the data discussed in this paper.

Matters are different once we look at next two contexts, which have been pointed out by Sedivy (1990). They do not contain an overt NPI-licenser but still license *lift-finger*-type NPIs, though not *ever*-type NPIs.

Sedivy (1990, 98) provides the data in (3) above. She characterizes them as *contrastive* use of *do*, or as *denial*. In (6), I construct a suitable context sentence for example (3a) and provide Sedivy's negative side message.

(6) A: I am disappointed that you <u>don't</u> **GIVE A DAMN** about my problems.
B: But I DO **GIVE A DAMN**.
Side message: It is not true that [I <u>don't</u> **GIVE A DAMN**].

In (7), the same is done for an *ever*-type NPI. As shown, a denial context, even if it triggers a negative side message, cannot license the NPI *ever*.

(7) A: I <u>don't</u> think Bert EVER kissed Marilyn Monroe.
B: * Bert DID EVER kiss Marilyn Monroe.
Side message: It is not true that [Bert <u>didn't</u> EVER kiss Marilyn Monroe].

The denial context is problematic for the classical theory of NPI licensing. First, it does not satisfy the precondition of what is an NPI-licensing context, as it is not downward entailing. Second, it is surprising to find *lift-finger*-type NPIs in a context that does not license *ever*-type NPIs.

We can now look at the last context to be discussed in this paper. Sedivy (1990, 98-99) lists examples with irrealis uses of modals. Two of her examples are given in (8). They all have a negative side message, which is given below the example. However, only *lift-finger*-type NPIs are licensed in this environment.

(8) a. John should have **LIFTED A FINGER** to help Mary.
Side message: John <u>didn't</u> **LIFT A FINGER** to help Mary.
b. * John should have eaten ANY healthy tofu.
Side message: John <u>didn't</u> eat ANY healthy tofu.

Irrealis modals do not constitute a downward-entailing context and, consequently, should not license NPIs, let alone *lift-finger*-type NPIs.

So far, I have presented the challenging contexts in the light of what I called the classical theory of NPI licensing. Sedivy (1990) shows that they are equally problematic for the Binding Theoretical account of Progovac (1988, 1992), and for the approach in Linebarger (1980, 1987).

The scalar approach of Krifka (1994), Eckardt (2005) and others is more recent than Sedivy's paper. In scalar approaches, an NPI usually has a minimal lexical semantics and triggers larger, scalar alternatives. At the same time, the NPI is required to occur in a sentence that makes a stronger statement than had any of the alternatives been used. The combination of these conditions means that NPIs are licensed in scale-reversal contexts, which means downward-entailing contexts relative to contextually given alternatives. Eckardt & Csipak (2013) try to capture the more restricted occurrence pattern of *lift-finger*-type NPIs by an additional *non-veridicality condition*: The statement containing a minimizer may not be true in the actual world. Eckardt & Csipak show how this accounts for the contrast in (4). However, the other two contexts remain problematic, as they should not license NPIs at all, and, furthermore, in the denial contexts the speaker commits to the truth of the statement.

Finally, there is the representational, collocational approach formulated for instance in Sailer & Richter (2002) and Richter & Soehn (2006). In this approach, NPIs are collocationally restricted to occur in a semantic representation in which they are in the scope of an NPI-licensing operator. As in the other approaches, *lift-finger*-type NPIs are assumed to be licensed in a subset of the licensing contexts of *ever*-type NPIs. Only Richter & Soehn (2006, 438–439) discuss the option of licensing some NPIs not just in the representation of the at-issue content of sentence, but also in the the representation of the non-at-issue content.

The core insight of Sedivy (1990) is that there is not a uniform mechanism of NPI licensing, but that *ever*-type NPIs require a direct licensing through the grammatical structure, whereas *lift-finger*-type NPIs can be licensed by pragmatically triggered side messages. In the next sections, I will show how such side messages can be integrated into the semantic representation of an utterance to make them accessible for NPI licensing.

## 3 Enriched semantic representations

In this section, I will propose to enrich the semantic representation of an utterance with conventional implicatures and generalized conversational implicatures (Grice, 1975). My proposal can be seen as synthesis of insights and techniques from the formal semantic and pragmatic literature.

*Discourse Representation Theory* (Kamp & Reyle, 1993; Kamp et al., 2011) distinguishes a *preliminary representation* that is expanded through anaphora resolution and presupposition accommodation – where the latter is treated as a case of anaphora resolution (van der Sandt, 1992). AnderBois et al. (2015) show that the non-at-issue content can interact with anaphora resolution and, therefore, should be part of the expanded representation as well.

Research on *conventional implicatures*, such as Potts (2005) and Gutzmann (2015), has shown that conventional implicatures need to be computed alongside the at-issue content of an utterance, but have to be kept apart as they have an independent truth value (Potts, 2005) which determines the felicity conditions of an utterance (Gutzmann, 2015).

I assume that the semantic representation of a sign consists of a truth-conditional part and a part for conventional implicatures or use-conditional semantics. I will use the notation in (9), where I separate the truth-conditional semantics from a list of conventional implicatures by the symbol " ‡ ".

(9) Alex, who is a linguist, read the book.
$\exists x(\mathbf{book}(x) \wedge \mathbf{read}(\mathbf{alex,x}))$
$$‡ \left\langle \begin{array}{l} \exists ! x(\mathbf{book}(x)), \\ \exists ! y(y = \mathbf{alex} \wedge \forall y(y = \mathbf{alex} \rightarrow \mathbf{linguist}(y)) \end{array} \right\rangle$$

According to the analysis of definites in Sailer & Am-David (2016), the main clause, *Alex read the book*, has a preliminary content of the form $\mathbf{read}(\mathbf{alex}, x)$. The definite NP *the book* introduces an existence and a uniqueness condition. Sailer & Am-David (2016) follow Horn & Abbot (2013) and Coppock & Beaver (2015) in separating these two: The existence requirement is a presupposition, $\exists x(\mathbf{book}(x) \wedge \ldots)$, which is accommodated into the truth-conditional content of the clause. The uniqueness condition, $\exists ! x(\mathbf{book}(x))$, is treated as a conventional implicature, and added after the " ‡ " symbol. The appositive relative clause is contributed as a conventional implicature. In its representation, the anaphoric relation between the relative pronoun and its antecedent is resolved.

I will refer to the strictly truth-conditional part of a semantic representation as the one in (9) as the *primary truth-conditional content*. The overall representation will be called the *conventional content*.

The next step is to include *generalized conversational implicatures*. Just like particularized conversational implicatures, Grice (1975) describes them as defeasible, non-detachable, calculable, and non-conventional. Levinson (2000, 15) adds to this list that they are reinforceable. Finally, they are not projective in the sense of Karttunen & Peters (1979) or Tonhauser et al. (2013). This means that they do not project over the scope of negation or in yes/no questions, nor do they project in belief contexts. Even though generalized conversational implicatures are non-conventional, they arise by default, whereas particularized conversational implicatures only arise when contextually required, see Grice (1975, 56–57) and Levinson (2000, 16–21).

Levinson (2000, Section 1.4) distinguishes three types of generalized conversational implicatures. First, the **Q(uantity)-heuristics** ("What isn't said, isn't") is based on the maxim of Quantity. It licenses scalar inferences. Second, the **I(nformativeness)-heuristics** ("What is expressed simply, is stereotypically exemplified") is the basis for strengthing a disjunction into an exclusive disjunction or a conditional into a bi-implication, for example. Third, the **M(anner)-heuristics** ("What is said in an abnormal way, isn't normal") captures effects of the maxim of Manner. There is a hierarchy among these heuristics, with the Q-heuristics as the strongest, and the I-heuristics as the weakest.

Evidence for the importance of generalized conversational implicatures for semantics comes from data such as (10), quoted here after Levinson (2000, 199). I indicate the material added by a generalized conversational implicature by a dotted underlining. As Levinson points out, the use of the comparative in this example would be contradictory without the added inference on the temporal ordering of the drinking and the driving.

(10) Driving home and drinking three beers is better than drinking three beers and driving home.
I-heuristics: Driving home and then drinking three beers is better than drinking three beers and then driving home.

In the following, I will show how I will implement Levinson's ideas. I assume that generalized conversational implicatures are added *after* the computation of the conventional content. I will call the resulting semantic representation the *utterance content* – which is what Levinson (2000, 188) calls the *Semantic Interpretation*. The utterance content has the same form as the conventional content, i.e., it consists of a truth-conditional part and list of conventional implicatures.

I conceive of generalized conversational implicatures as *rewriting rules* on semantic representations of the following form:

(11) Given two formulæ $\alpha, \beta$, a rewriting rule for a generalized conversational implicature has the form $\alpha \mapsto_{GCI} \beta$.
Such a rule means: If $\alpha$ occurs in the conventional content, it can optionally be replaced with $(\alpha \wedge \beta)$ in the utterance content.

The relevant rewriting rule for (10) is given in (12), where "$\phi < \psi$" is true iff $\phi$ is temporally ordered before $\psi$. I illustrate the application of this rule with a simplified example in (13).

(12) $(\phi \wedge \psi) \mapsto_{GCI} (\phi < \psi)$

(13) Alex drove (home) and drank (three beer).
Conventional content: $\mathbf{drive}(\mathbf{alex}) \wedge \mathbf{drink}(\mathbf{alex}) \ddagger \langle\rangle$
Utterance content:
$\mathbf{drive}(\mathbf{alex}) \wedge \mathbf{drink}(\mathbf{alex}) \wedge (\mathbf{drive}(\mathbf{alex}) < \mathbf{drink}(\mathbf{alex})) \ddagger \langle\rangle$

The rule in (12) adds the temporal ordering. Note that the modification triggered by the generalized conversational implicature is included inside the truth-conditional part of the utterance content.

If the semantic representation that triggers the generalized conversational implicature is part of a conventional implicatures, the material added by the rewriting rule will also be part of that conventional implicature. Grice (1975, 56) argues that in sentence *I went to a house yesterday and found a tortoise inside the front door*, the indefinite description *a house* triggers the conversational implicature that it is not the speaker's house. In (14), this sentence occurs inside a non-restrictive relative clause, i.e., a semantic contribution that is considered a conventional implicature (Potts, 2005). The inference that it is not Kim's house is still valid.

(14) Kim, who went to a house yesterday and found a tortoise inside the front door, usually doesn't like reptiles.
Inference: it is not Kim's house

The presented encoding of generalized conversational implicatures captures the defining properties of this type of inference from Grice (1975). *Defeasibility:* The application of rules like the ones in (12) is optional. This means that in cases in which the inference does not arise or is cancelled, the rule has not been applied. *Non-detachablity:* The rules depend on semantic representations, not on a particular choice of words. *Calculability:* All proposed rules should be based on the Gricean maxims and/or Levinson's Q-, I-, or M-heuristics. *Non-conventionality:* The inference is not part of the conventional content.

We can also look at the two additional properties that I mentioned. *Reinforceability:* As the application of rewriting rules for generalized conversational implicatures is optional, they need not be included in the utterance content and the same conventional content could be mapped to distinct utterance contents. Consequently, reiterating explicitly a particular generalized conversational implicature is never really redundant as it excludes other potential utterance contents. *Non-projectivity:* The additional semantic contribution is added directly to the content triggering the inference. Consequently, it will be in the scope of all operators that have scope over the trigger.

The resulting semantics-pragmatics interface is sketched in Figure 1. The boxes represent levels of semantic representation. The non-boxed parts describe the semantic and pragmatic processes that lead to these representations. The model is heavily influenced by the representation in Levinson (2000, 188), but deviates from it in various respects. First, as I will work with various semantic representations (which can be seen as values of appropriate features in a potential HPSG rendering of this theory), I put the representations in boxes, rather than the processes. Second, I included conventional implicatures and use-conditional content, which are not considered in detail in Levinson (2000). Third, Levinson argues that generalized conversational implicatures play an important role in the process of fixing and narrowing reference. As I am not directly concerned with this aspect here, I preferred to stick to the architecture in Kamp et al. (2011) and previous work of my own, where anaphora resolution and presupposition accommodation are treated as part of the conventional content. Fourth, I am not using exactly Levinson's terminology. For example, he refers to the application of generalized conversational implicatures as *Gricean pragmatics 1* and to that of particularized conversational implicatures as *Gricean pragmatics 2*. Instead, I simply name the types of inferences at work.

The model presented in Figure 1 has been formulated with an integration into a constraint-based framework such as Head-driven Phrase Structure in mind. However, I will refrain from making a concrete proposal for reasons of space, but see Sailer & Am-David (2016) for an encoding of the parts needed for the conventional content. The utterance content will only be defined on

(linking, scope) (anaphora and presuppositions)
compositional semantics indexical pragmatics
$\Downarrow$ $\Downarrow$

| Primary (truth-conditional) content |
|---|

$\Downarrow$

conventional implicatures, use-conditional content

$\Downarrow$

| Conventional content |
|---|

$\Downarrow$

generalized conversational implicatures

$\Downarrow$

| Utterance content |
|---|

$\Downarrow$

particularized conversational implicatures

Figure 1: Model of the semantics-pragmatics interaction

independent utterances and will be the result of applying rules for generalized conversational implicatures as the one in (12) to the conventional content.[2]

## 4 Utterance content of the relevant contexts

In this section, I will present the semantic representation required for the three critical NPI-licensing contexts discussed in Section 2. I will start with denial, then turn to irrealis modals and, finally, to the restrictor of universal quantifiers.

In a recent paper, Gutzmann et al. (2020) present an analysis of so-called *Verum focus* (Höhle, 2019b). The authors argue, that there is a propositional operator, **VERUM**, that only has a use-conditional meaning, i.e., whose meaning contribution only has an effect on the felicity condition of the sentence.

Let me illustrate this with the example in (15) from Gutzmann et al. (2020, 3). The truth-conditional meaning of B's utterance is just that 'Peter kicked the dog'. There is, however, a use-conditional component: The sentence is only felicitous if B wants to prevent the current question under discussion (here: "Who kicked the dog?") to be settled to "Peter didn't kick the dog."

(15) A: I cannot imagine that Peter kicked the dog.
B: Peter DID kick the dog. (Gutzmann et al., 2020, 3)

To achieve this, Gutzmann et al. (2020, 39) define the meaning of the operator **VERUM** as in (16). As indicated with $[\![\ldots]\!]^{u,c}$, it is a definition of the

[2]See Höhle (2019a) for an analogous treatment of so called postlexical morphophonology.

use-conditional meaning in a context $c$. Instead of being true of false in the "use-conditional dimension," the expression is checked for felicity. The value "✓" indicates felicity.

(16) $[\![\textbf{VERUM}]\!]^{u,c}(p) = \checkmark$ iff speaker $c_s$ wants to prevent that QUD($c$) [MS: the question under discussion in context $c$] is downdated with $\neg p$.

For the purpose of this paper, I propose to decompose the representation of **VERUM** into a predicate **prevent-down-dating** (short: **pdd**) and a negation. The predicate **pdd** seems to be more general and can be of use also in an analysis of other operations on the background, such as some uses of rising declaratives (Gunlogson, 2003).

The fact that Verum is analyzed as a use-conditional operator indicates that it is part of the conventional content as defined in Section 3. In (17), I provide the conventional content of B's utterance in (15). I simplify the semantic representation of the NP *the dog* as **the-dog**.

(17) $\textbf{kick}(\textbf{peter}, \textbf{the-dog}) \ddagger \langle \textbf{pdd}(\neg\textbf{kick}(\textbf{peter}, \textbf{the-dog}))\rangle$

For the remaining two context, we will need to invoke generalized conversational implicatures. I will first look at irrealis modals as used in (8) above. The idea I will pursue here is that the use of the expression *should have VP* triggers the inference *didn't VP*. I will show with an example that this inference has the properties of a generalized conversational implicature, using the following criteria: defeasibility (to separate the inference from entailment), and reinforceability (to separate it from explicitly encoded content and presuppositions). Finally, I will show that it is calculable on the basis of Gricean maxims and/or any of the Q-, M-, or I-hypothesis. Consider the example in (18).

(18) Alex should have helped Kim.
Inference: Alex didn't help Kim.
   a. Alex should have helped Kim, and helped, indeed.
   b. Alex should have helped Kim, but didn't.

In (18a), the continuation cancels the default inference. In (18b) the continuation reinforces it. The inference can be seen as a scalar implicature, assuming a scale of factuality of the form "in some world" > "in the actual world". Using the modal expression, then triggers the negation of the stronger alternative (Q-hypothesis).

This leads me to postulating the generalized conversational implicature rule in (19). This rule gives rise to the conventional and utterance content of the sentence *Alex should have helped Kim* given in (20).

(19) $\textbf{SHOULD}(\phi) \mapsto_{GCI} \underset{\dots}{\neg\phi}$

(20) a. Conventional content: $\mathbf{SHOULD}(\mathbf{PAST}(\mathbf{help}(\mathbf{alex}, \mathbf{kim}))) \ddagger \langle\rangle$

b. Utterance content:
$\mathbf{SHOULD}(\mathbf{PAST}(\mathbf{help}(\mathbf{alex}, \mathbf{kim}))) \wedge \neg \mathbf{PAST}(\mathbf{help}(\mathbf{alex}, \mathbf{kim})) \ddagger \langle\rangle$

The last critical context to look at is the restrictor of a universal quantifier. According to Heim (1984), we find a difference in NPI-licensing depending on whether there is some causal or necessary relation between the restrictor and the scope. Following Horn (1997, 161), Sailer (2009, 464–465) and Eckardt & Csipak (2013, 289) assume that what constitutes a law-like statement is that a law holds even if it is not applied. In other words, a law-like universal statement does not allow for an inference that its restrictor set is non-empty. An episodic statement, however, has exactly this inference. I write down these observations in the format of rules for generalized conversational implicatures in (21).

(21) a. $\forall x(\phi \rightarrow \psi) \mapsto_{GCI} \exists x \phi$ (for episodic universals)

b. $\forall x(\phi \rightarrow \psi) \mapsto_{GCI} \mathbf{ModOp} \neg \exists x \phi$ (for lawlike universals)

I write **ModOp** in the rule for lawlike universals in (21b). This is intended as a placeholder for a modal operator. The operator could be just possibility, $\Diamond$, but it could also be some epistemic or deontic obligation. In the classical example in (4a), the understanding is that there should be no restaurant charging a dime for iceberg lettuce.

I will use the example in (22) to show that the inference for lawlike universal statements in (21b) is, indeed, a generalized conversational implicature. The inference is cancelled in (22a) and reinforced in (22b).

(22) Everyone who is caught driving drunk will loose their driver's license.
Inference: Possibly, no-one will be caught driving drunk.

a. ... and, with all the controls over the weekend, it is certain that the police will get someone. $(\ldots \wedge \Box \exists x \phi)$

b. ..., but possibly, the police will not find any drunken driver. $(\ldots \wedge \mathbf{ModOp} \neg \exists x \phi)$

To complete the argument, I have to show that the inferences are calculable. The fact that Horn (1997, 161) describes episodic universal statements as "general sentences of common speech" suggests that the inference in (21a) is based on the I-hypothesis ("What is expressed simply, is stereotypically exemplified"), capturing the ordinary case. The inference for lawlike statements in (21b), on the other hand, follows from the Q-hypothesis ("what isn't said, isn't"). As the universal quantifier in logic does not require a non-empty restrictor set, we can infer that option of an empty one.

Note that there is no problem in assuming two apparently contradictory ways of enriching the conventional content of an utterance. Instead, this is exactly what we expect for conversational implicatures. Nonetheless, the two options for enrichment given in (21) are both general and not dependent on a particular situation.

The conventional content and the utterance content of the lawlike interpretation of example (22) is given in (23).

(23) a. Conventional content: $\forall x(\mathbf{get\text{-}caught}(x) \rightarrow \mathbf{loose\text{-}license}(x)) \ddagger \langle\rangle$

b. Utterance content:
$\forall x(\mathbf{get\text{-}caught}(x) \rightarrow \mathbf{loose\text{-}license}(x))$
$\wedge \underset{\cdots\cdots\cdots\cdots\cdots\cdots\cdots}{\mathbf{ModOp}\neg\exists x(\mathbf{get\text{-}caught}(x))} \ddagger \langle\rangle$

We can now take a look at the analyses of the three contexts discussed in this paper as posing a challenge to existing theories of NPI licensing. We observe that in all of them, there is no negation in the primary truth-conditional content, but there is a negation in the utterance content. .

## 5 A revised representational theory of NPI licensing

The result of the previous section can be used as the basis for a revised representational theory of NPI licensing. The basic idea of a representational theory of NPI licensing is that an NPI can lexically impose constraints on the semantic representations in which it can be used (see Sailer & Richter (2002), Richter & Soehn (2006) and other work by these authors). This makes it necessary to have a structural notion of an *NPI-licensing semantic environment*. For example, Richter & Soehn (2006) basically list all operators and their scope depending on the type of entailment they allow. Other publications propose some generalization, though this is not really important for the present purpose.

I will start with the characterization of the licensing condition of *ever*-type NPIs. As these are the weakest type of NPIs in English, I assume that they are licensed in any NPI-licensing semantic structure. These include the scope of negation, the restrictor of a universal quantifier, the scope of *few* etc. As we have introduced not only the primary truth-conditional content, but also the conventional content and the utterance content, we now need to determine at which level of semantic representation the NPI needs to be licensed. I assume that the primary truth-conditional content is the right level for *ever*-type NPIs. This is summarized in (24).

(24) Licensing condition for *ever*-type NPIs:
The semantic contribution of an *ever*-type NPI must occur in an NPI-licensing environment within the primary truth-conditional content of a clause containing the NPI.

Let me go through the examples from this paper to see that this licensing condition makes the right predictions. To do this, I will look at relevant example sentences and indicate their (simpified) primary truth-conditional content. The sentences from (2) are presented in such way in (25). The licensing condition is met in the examples (25a)–(25c). However, there is no licensing environment in the simple affirmative clause in (25d). Consequently, the NPI is not licensed in this sentence.

(25) a. Alex didn't do ANYTHING to help.
Primary content: $\neg\exists x(\mathbf{do}(\mathbf{alex}, x))$

b. Noone did ANYTHING to help.
Primary content: $\neg\exists y \exists x(\mathbf{do}(y, x))$

c. Few students did ANYTHING to help.
$[\mathbf{Few}\, y : \mathbf{student}(y)](\exists x(\mathbf{do}(y, x)))$

d. * Alex did ANYTHING to help.
$\exists x(\mathbf{do}(\mathbf{alex}, x))$

We can now look at the three environment discussed in more detail from Section 2 on. An *ever*-type NPI can occur in the restrictor of a universal quantifier, independently of whether it is intpreted as episodical or as lawlike. This follows from the classification of this environment as NPI-licensing. I sketch the primary content of the sentences from (5) in (26).

(26) [Every restaurant that ... EVER ... ], ...
Primary content: $\forall x((\mathbf{restaurant}(x) \wedge \ldots \mathbf{npi} \ldots) \rightarrow \ldots)$

Matters are different in the other two environments discussed in Section 2. I provide the primary content and the utterance content of sentence (3b) in (27). For simplicity, I add a time argument to predicates for examples with *ever*.

(27) * But Bert DID EVER kiss Marilyn Monroe.
Primary content: $\exists t(\mathbf{time}(t) \wedge \mathbf{kiss}(t, \mathbf{bert}, \mathbf{mm}))$
Utterance content: $\exists t(\mathbf{time}(t) \wedge \mathbf{kiss}(t, \mathbf{bert}, \mathbf{mm}))$
$\ddagger \langle \mathbf{pdd}(\neg\exists t(\mathbf{time}(t) \wedge \mathbf{kiss}(t, \mathbf{bert}, \mathbf{mm}))) \rangle$

The semantics of the NPI does not occur in an NPI-licensing environment in the primary content of the sentence. Consequently, the NPI is not licensed. It is immaterial for the *ever*-type NPI that its semantics occurs in the scope of negation in the use-conditional content.

The same explanation can be given for irrealis modals, as in example (8b) above, which I repeat in (28) together with its primary content and its utterance content. As the primary content does not contain an NPI-licensing environment, the *ever*-type NPI cannot be used. The negation that the generalized conversational implicature introduces into the truth-conditional content at the utterance level cannot license the NPI.

(28) * John should have eaten ANY healthy tofu.

Primary content: $\mathbf{SHOULD}(\mathbf{PAST}(\exists x(\mathbf{tofu}(x) \wedge \mathbf{eat}(\mathbf{john}, x))))$
Utterance content:
$$\mathbf{SHOULD}(\mathbf{PAST}(\exists x(\mathbf{tofu}(x) \wedge \mathbf{eat}(\mathbf{john}, x)))) \\ \wedge \neg \mathbf{PAST}(\exists x(\mathbf{tofu}(x) \wedge \mathbf{eat}(\mathbf{john}, x))) \ddagger \langle\rangle$$

This completes the discussion of the licensing pattern of *ever*-type NPIs. I adopt an representational theory of NPI licensing and explicitly restrict the licensing of this type of NPI to the primary content.

The licensing condition of *lift-finger*-type NPIs differs from that of *ever*-type NPIs. To capture the more restricted occurrence pattern in standard contexts as the ones in (1), I assume that *lift-finger*-type NPIs can only be licensed by negation itself. However, this licensing is not restricted to the primary content, but can be checked throughout the entire utterance content. This is expressed in (29).

(29) Licensing condition for *lift-finger*-type NPIs:
The semantic contribution of a *lift-finger*-type NPI must occur in the (immediate) scope of negation within the utterance content of the utterance containg the NPI.

This condition directly captures the data in (1). I repeat the examples in (30) together with their utterance content.

(30) a. Alex didn't LIFT A FINGER to help.
$\neg\mathbf{lift\text{-}finger}(\mathbf{alex}) \ddagger \langle\rangle$
b. Noone LIFTED A FINGER to help.
$\neg\exists x\,\mathbf{lift\text{-}finger}(x) \ddagger \langle\rangle$
c. * Few students LIFTED A FINGER to help.
$[\mathbf{Few}x : \mathbf{student}(x)](\mathbf{lift\text{-}finger}(x)) \ddagger \langle\rangle$
d. * Alex LIFTED A FINGER to help.
$\mathbf{lift\text{-}finger}(\mathbf{alex}) \ddagger \langle\rangle$

In the first two examples, the NPI is in the scope of negation in the truth-conditional part of the utterance content. This is not the case in (30c) and (30d). As the NPI is not in the scope of negation in the conventional implicatures either, it is not licensed. This shows that the licensing condition in (29) allows us to capture the core data on *lift-finger*-type NPIs, i.e., their restriction to occurrence with negation only and not with weaker licensors such as *few*.

We can now turn to the examples from Sedivy (1990). I repeat example (3a) in (31) together with its utterance content.

(31) But I DO GIVE A DAMN.
$\mathbf{give\text{-}damn}(\mathbf{speaker}) \ddagger \langle \mathbf{pdd}(\neg\mathbf{give\text{-}damn}(\mathbf{speaker}))\rangle$

The NPI does not occur in the scope of negation in the primary truth-conditional content. However, the semantics of the NPI occurs in the scope of negation in the use-conditional content, inside the argument of the predicate **pdd**, which takes care of the management of the question under discussion. As the licensing condition on *lift-finger*-type NPIs takes this level of semantics into consideration as well, the NPI is licensed.

In the remaining two contexts, we observe licensing through a generalized conversational implicature. The use of an irrealis modal in (8a), repeated in (32), triggers the inference that John did not lift a finger to help Mary. As shown in the utterance content of this sentence, this inference is included inside the overall truth-conditional semantics. As the licensing condition of *lift-finger*-type NPIs are only checked at that level, the NPI is licensed.

(32) John should have lifted a finger to help Mary.
$\mathbf{SHOULD}(\mathbf{PAST}(\mathbf{lift\text{-}finger}(\mathbf{john})))\wedge\neg\mathbf{PAST}(\mathbf{lift\text{-}finger}(\mathbf{john}) \ddagger \langle\rangle$

We can now look at *lift-finger*-type NPIs in the restrictor of a universal quantifier. I indicate the conventional content directly below the example in (33). The content of the NPI, schematically indciated by **npi**, is not in the scope of negation. In a lawlike reading, we can add the generalized conversational implicature from (21b) to the truth-conditional meaning of the utterance content. This results in a semantic representation in which the NPI's semantics occurs in the scope of negation, thus satisfying the licensing condition of the NPI.

(33) [Every restaurant that charges SO MUCH AS a dime for iceberg lettuce]
Conventional content: $\forall x((\mathbf{restaurant}(x) \wedge \ldots \mathbf{npi} \ldots) \rightarrow \ldots) \ddagger \langle\rangle$

a. . . . ought to be closed down.
$\forall x(((\mathbf{rest}(x) \wedge \ldots \mathbf{npi} \ldots)$
$\wedge \mathbf{ModOp}\neg\exists x(\mathbf{rest}(x) \wedge \ldots \mathbf{npi} \ldots)) \rightarrow \ldots) \ddagger \langle\rangle$

b. ?? . . . actually has four stars in the handbook.
$\forall x(((\mathbf{rest}(x) \wedge \ldots \mathbf{npi} \ldots)\wedge\exists x(\mathbf{rest}(x) \wedge \ldots \mathbf{npi} \ldots)) \rightarrow \ldots) \ddagger \langle\rangle$

In the case of an episodic reading, the generalized conversational implicature from (21a) can be added, see (33b). This inference does not introduce a negation. Consequently, the *lift-finger*-type NPI cannot be used in this reading.

Before closing this section, I would like to address a potential concern. Any scalar implicature introduces a negation (of stronger scalar alternatives). One might wonder if this means that *lift-finger*-type NPIs should be licensed whenever there is a scalar inference. The answer to this is clearly no. Consider the rule for a scalar implication for the scale $\exists < \forall$ in (34).

(34) $\exists x(\phi \wedge \psi) \mapsto_{GCI} \neg\forall x(\phi \rightarrow \psi)$

Sentence (35) can give rise to this inference. I indicate the utterance content for this example. The material from the scope of the existential quantifier, here: $\mathbf{read}(x)$, does not occur in the immediate scope of a negation anywhere in the utterance content. Consequently, *lift-finger*-type NPIs cannot be licensed.

(35) Some students read the book.
Scalar implicature: Not all students read the book.
$\exists x(\mathbf{student}(x) \wedge \mathbf{read}(x)) \wedge \neg\forall x(\mathbf{student}(x) \rightarrow \mathbf{read}(x)) \ddagger \langle\rangle$

In this section, I went through the examples discussed in the first two sections of this paper. I showed that they can be captured in a theory of NPI licensing which takes into account two parameters: first, the type of licensing operator, and second, the level of semantic representation within which the NPI needs to be licensed.

# 6 Conclusion

In this paper, I have proposed an extension of a representational theory of NPI licensing that includes use-conditional content as well as generalized conversational implicatures. The theory presented here is conservative in that the licensors of *ever*-type NPIs are a superset of the licensors of *lift-finger*-type NPIs. However, the licensing condition for *ever*-type NPIs can only be checked in the primary content, whereas *lift-finger*-type NPIs can be licensed anywhere within the utterance content. This new theory provides a systematic account of the previously unexplained data from Sedivy (1990), in which *lift-finger*-type NPIs are possible in contexts in which *ever*-type NPIs are not licensed.

There is an important difference in the categorization of the data in contrast to most approaches to NPI-licensing. Even though the restrictor of a universal quantifier is an anti-additive environment, I do not consider it a licensing context for *lift-finger*-type NPIs *per se*. My motivation for this move is that licensing of *lift-finger*-type NPIs is only possible in this context under a certain reading.

It might be argued that the contexts discussed in Section 2 are marginal and that they need not be taken into consideration. However, Fritzinger et al. (2010) show that natural occurrences of NPIs in contexts with negative inferences can be found in corpora. This makes me optimistic that systematic empirical work on the critical contexts will provide us with a more solid database in the future.

The paper proposes an extension of the architecture of semantics within a constraint-based view of grammar. This, admittedly programmatic, part of the paper is an attempt to further enlarge the connection between formal semantics and formal pragmatics by providing an integrated architecture. My proposal combines work on conventional implicatures and use-conditional semantics with the theory of generalized conversational implicatures of Levinson (2000). The licensing behaviour of NPIs shows that these pragmatic inferences have a grammatical effect and should, consequently, be part of the semantic representation of an utterance. At the same time, the differences between *ever*-type NPIs and *lift-finger*-type NPIs also show that we need to be able to keep the various levels of semantic representation apart.

When I introduced the rules for generalized conversational implicatures in Section 3, I emphasized that these rules apply optionally. However, if a *lift-finger*-type NPI is used in an utterance in which it is not licensed in the conventional content, it can only be rescued by applying a rule that introduces a licensing negation. In this sense, the application of a generalized conversational implicature – i.e. the restriction to a particular reading – can be enforced by the NPI. This is, of course, not special to NPIs. Examples like (10) and others that prove the truth-conditional relevance of generalized conversational implicatures illustrate the same point: The examples are not sensibly interpretable unless the implicature is being evoked.

At present, I do not see that *particularized conversational implicatures* should be part of the utterance content. There are two reasons for this: First, they do not seem to have a grammatical or truth conditional effect. Second, they seem to depend purely on the extra-linguistic context – rather than on the words or structures (like conventional implicatures) or the semantic representation (like generalized conversational implicatures).

I refrained from proposing an explicit integration of the proposed semantic-pragmatic interface into HPSG. I hope that this non-technical way of presentation makes it possible to evaluate my proposal independently of a particular framework of grammar. Nonetheless, I hope that the characterization given in this paper is precise enough to show that such an integration is possible.

# References

AnderBois, Scott, Adrian Brasoveanu & Robert Henderson. 2015. At-issue proposals and appositive impositions in discourse. *Journal of Semantics* 32(1). 93–138. doi:10.1093/jos/fft014.

Coppock, Elizabeth & David Beaver. 2015. Definiteness and determinacy. *Linguistics and Philosophy* 38. 377–435.

Eckardt, Regine. 2005. Too poor to mention: Subminimal events and negative polarity items. In Claudia Maienborn & Angelika Wöllstein (eds.), *Event arguments: Foundations and applications*, 301–330. Tübingen: Niemeyer.

Eckardt, Regine & Eva Csipak. 2013. Minimizers: Towards pragmatic licensing. In Eva Csipak, Mingya Liu, Regine Eckardt & Manfred Sailer (eds.), *Beyond "any" and "ever". New explorations in negative polarity sensitivity*, 267–298. Berlin: De Gruyter.

von Fintel, Kai. 1999. NPI-licensing, Strawson-entailment, and context-dependency. *Journal of Semantics* 16. 97–148.

Fritzinger, Fabienne, Frank Richter & Marion Weller. 2010. Pattern-based extraction of negative polarity items from dependency-parsed text. In Nicoletta Calzolari, Khalid Choukri, Bente Maegaard, Joseph Mariani, Jan Odjik, Stelios Piperidis, Mike Rosner & Daniel Tapias (eds.), *Proceedings of the seventh conference on international language resources and evaluation (lrec'10)*, European Language Resources Association (ELRA).

Giannakidou, Anastasia. 1999. Affective dependencies. *Linguistics and Philosophy* 22. 367–421.

Grice, Paul. 1975. Logic and conversation. In Peter Cole & Jerry L. Morgan (eds.), *Syntax and semantics*, vol. 3, 41–58. New York: Academic Press.

Gunlogson, Christine. 2003. *True to form: Rising and falling declaratives as questions in English*. New York: Routledge.

Gutzmann, Daniel. 2015. *Use-conditional meaning* (Oxford Studies in Semantics and Pragmatics 6). Oxford University Press.

Gutzmann, Daniel, Katharina Hartmann & Lisa Matthewson. 2020. Verum focus is verum, not focus: Cross-linguistic evidence. *Glossa* 5(1). 51. 1–48. doi: https://doi.org/10.5334/gjgl.347.

Heim, Irene. 1984. A note on negative polarity and downward entailingness. In *NELS 14*, 98–107. https://scholarworks.umass.edu/nels/vol14/iss1/8.

Höhle, Tilman N. 2019a. An architecture for phonology. In Stefan Müller, Marga Reis & Frank Richter (eds.), *Beiträge zur deutschen Grammatik. Gesammelte Schriften von Tilman N. Höhle*, 571–607. Berlin: Language Science Press 2nd edn. doi:10.5281/zenodo.2588381. Originally published 1998.

Höhle, Tilman N. 2019b. Über Verum-Fokus im Deutschen. In Stefan Müller, Marga Reis & Frank Richter (eds.), *Beiträge zur deutschen Grammatik. Gesammelte Schriften von Tilman N. Höhle*, 381–416. Berlin: Language Science Press 2nd edn. doi:10.5281/zenodo.2588379. Originally published 1992.

Horn, Laurence R. 1997. All John's children are as bald as the king of France: Existential import and the geometry of opposition. In Kora Singer, Randall Eggert & Gregory Anderson (eds.), *Chicago linguistics society 33*, 155–179. Chicago: Chicago Linguistics Society.

Horn, Laurence R. & Barbara Abbot. 2013. <the, a>: (in)definiteness and implicature. In William P. Kabasenche & Matthew H. Michael O'Rourke, Slater (eds.), *Reference and referring*, vol. 10 Topics in Contemporary Philosophy, 325–355. Cambridge, Mass.: MIT Press.

Kamp, Hans, Josef von Genabith & Uwe Reyle. 2011. Discourse representation theory. In Dov Gabbay & Franz Günthner (eds.), *Handbook of philosophical logic*, vol. 15, 125–394. Dordrecht: Reidel 2nd edn.

Kamp, Hans & Uwe Reyle. 1993. *From discourse to logic*. Dordrecht: Kluwer Academic Publishers.

Karttunen, Lauri & Stanley Peters. 1979. Conventional implicature. In Choon-Kyo Oh & David A. Dinneen (eds.), *Presupposition* (Syntax and Semantics 11), 1–56. New York: Academic Press.

Krifka, Manfred. 1994. The semantics and pragmatics of weak and strong polarity items in assertions. In *Proceedings of salt iv*, 195–219.

Ladusaw, William. 1980. On the notion 'affective' in the analysis of negative polarity items. *Journal of Linguistic Research* 1. 1–16.

Levinson, Stephen C. 2000. *Presumptive meanings: The theory of generalized conversational implicature*. Cambridge, Massachusetts; London, England: MIT Press.

Linebarger, Marcia. 1987. Negative polarity and grammatical representation. *Linguistics and Philosophy* 10. 325–387.

Linebarger, Marcia Christine. 1980. *The grammar of negative polarity*: MIT dissertation. Cited after the reproduction by the Indiana University Linguistics Club, Indiana, 1981.

Potts, Christopher. 2005. *The logic of conventional implicatures* (Oxford Studies in Theoretical Linguistics 7). Oxford: Oxford University Press.

Progovac, Ljiljana. 1988. *A binding approach to polarity sensitivity*: University of Southern California dissertation.

Progovac, Ljiljana. 1992. Negative polarity: A semantico-syntactic approach. *Lingua* 86(4). 271–299.

Richter, Frank & Jan-Philipp Soehn. 2006. *Braucht niemanden zu scheren*: A survey of npi licensing in german. In Stefan Müller (ed.), *Proceedings of the 13th international conference on head-driven phrase structure grammar, varna 2006*, 421–440. http://cslipublications.stanford.edu/HPSG/2006/richter-soehn.pdf.

Sailer, Manfred. 2009. On reading-dependent licensing of strong NPIs. In Arndt Riester & Torgrim Solstad (eds.), *Proceedings of Sinn und Bedeutung 13*, vol. 5 SinSpeC. Working Papers of the SFB 732, 455–468. Stuttgart: University of Stuttgart. https://ojs.ub.uni-konstanz.de/sub/index.php/sub/article/view/565/511.

Sailer, Manfred & Assif Am-David. 2016. Definite meaning and definite marking. In Doug Arnold, Miriam Butt, Berthold Crysmann, Tracy Holloway King & Stefan Müller (eds.), *Proceedings of the Joint 2016 Conference on*

*Head-driven Phrase Structure Grammar and Lexical Functional Grammar, Polish Academy of Sciences, Warsaw, Poland*, 641–661. Stanford, CA: CSLI Publications. http://cslipublications.stanford.edu/HPSG/2016/headlex2016-sailer-am-david.pdf.

Sailer, Manfred & Frank Richter. 2002. Not for love or money: Collocations! In Gerhard Jäger, Paola Monachesi, Gerald Penn & Shuly Wintner (eds.), *Proceedings of Formal Grammar 2002*, 149–160. www.sfs.uni-tuebingen.de/hpsg/archive/bibliography/papers/sailer-richter-fg02.ps.

van der Sandt, Rob A. 1992. Presupposition projection as anaphora resolution. *Journal of Semantics* 9. 333–377.

Sedivy, Julie. 1990. Against a unified analysis of negative polarity licensing. *Cahiers Lingistiques D'Ottawa* 18. 95–105.

Tonhauser, Judith, David Beaver, Craige Roberts & Mandy Simons. 2013. Toward a taxonomy of projective content. *Language* 89(1). 66–109.

van der Wouden, Ton. 1997. *Negative contexts: Collocation, polarity and multiple negation*. London: Routledge.

Zwarts, Frans. 1981. Negatief polaire uitdrukkingen. *GLOT* 4(1). 35–132.

Zwarts, Frans. 1986. *Categoriale grammatica en algebraïsche semantiek. een onderzoek naar negatie en polariteit in het Nederlands*: Rijksuniversiteit Groningen dissertation.

Zwarts, Frans. 1995. Nonveridical contexts. *Linguistic Analysis* 25. 286–312.