TAG + metagrammar, LFG, HPSG and lexicalism

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Abstract

This paper deals with lexicalism and recent proposals that suggest that argument structure constructions can be or should be handled on a phrasal level. I first provide some general background, then discuss a particular proposal made in Tree Adjoining Grammar and provide a lexical alternative within the framework of HPSG. The paper ends with a comparison of Distributional Morphology and recent DM-based LFG approaches and lexical rule-based HPSG proposals.

1 Introduction

This paper deals with lexicalism and recent proposals that suggest that argument structure constructions can be or should be handled on a phrasal level.[†] I first provide some general background, then discuss a particular proposal made in Tree Adjoining Grammar and provide a lexical alternative within the framework of HPSG. The paper ends with a comparison of Distributional Morphology and recent DM-based LFG approaches and lexical rule-based HPSG proposals.

Phrasal approaches to argument structure constructions became popular with the work of Goldberg (1995). Goldberg works in the framework of Construction Grammar (CxG; Lakoff 1987, Fillmore, Kay & O'Connor 1988). (1a) shows a key example from Goldberg (1995: 29, 55):

(1) a. Sam sneezed the napkin off the table.
b. * Sam sneezed the napkin.
c. Sam sneezed.

The verb *sneeze* is an intransitive, mono-valenced verb, as the examples (1b,c) show. (1a) has a causative meaning. Goldberg argues that this meaning component is not contributed by any of the lexical items but by the complete configuration. By inserting *sneeze* into a certain configuration, we get an argument extension (additional object *the napkin* and the oblique *off the table*) and additional meaning components (the causation).

Goldberg's approach was and is very successful, since it is so "obviously right". There is a direct connection between form and meaning and this is compatible with pattern-based approaches to language acquisition.

The alternatives are lexical frameworks like Lexical Functional Grammar (LFG; Dalrymple 2023), Head-Driven Phrase Structure Grammar (HPSG; Müller, Abeillé, Borsley & Koenig 2024), and Categorial Grammar (CG; Steedman & Baldridge 2006). These frameworks assume that valence information is associated with lexical heads and in the case of HPSG and CG there are very general syntactic rules that combine heads with arguments. So, what about these proposals? Should they be given up? Well, if one reads up on the history of syntactic theory, one will notice that there were phrasal

[†]I thank Alex Alsina for inviting me to the LFG 2025 conference and all participants for discussion. I also thank three anonymous reviewers of CSSP 2025 for comments on a six page abstract on TAG and Construction Grammar and the LFG reviewers for the post-conference reviewing. Special thanks go to Ash Asudeh for discussion during the conference and for reviewing the post-conference submission. All mistakes in the final paper were newly introduced by me.

approaches in the seventies and eighties. The framework of Generalized Phrase Structure Grammar (GPSG; Gazdar, Klein, Pullum & Sag 1985) is rather similar to phrasal Construction Grammar. Heads are not associated with valence information but have numbers instead, which are used to assign lexical elements to slots in phrase structure rules. Within such a setting, *sneezed* can be inserted into a rule for Caused Motion Constructions as in (1a) or into the rule for intransitives like (1c).

In her review of the GPSG book by Gazdar et al. (1985), Jacobson (1987) pointed out many problems of this phrasal approach and showed that they have simple lexical solutions within Categorial Grammar. Nerbonne (1986) and Johnson (1986) found out that German partial fronting poses an inherent problem for GPSG, since the fronted verbs can be fronted together with all subsets of the arguments they would usually take. The solution they came up with is basically a Categorial Grammar solution remodeled in GPSG. As I pointed out in Müller (2016: Section 5.5.1), there is an additional problem: morphology needs to have access to valence information. Consider the following examples of *-bar* '-able' derivation:

(2) a. Ich unterstütze den Mann.
I support the.ACC man

b. Der Mann ist unterstützbar.
the.NOM man is supportable

c. Ich helfe dem Mann.
I help the.DAT man

d. * Der Mann ist helfbar.
the.NOM man is helpable

There is no obvious difference in semantics between the verbs *helfen* 'to help' and *unterstützen* 'to support' from which a difference in case could be derived.[1] *-bar* '-able' derivation productively applies only to verbs taking both a nominative and an accusative (Riehemann 1998: 55). If morphology cannot see this information, since it is hidden in numbers, as in GPSG, or since valence information is added on the phrasal level only, there is a problem.[2,3]

[1]Thanks to Ash Asudeh, who pointed out to me that *help* and *support* can be coordinated. This is also possible for *helfen* 'to help' und *unterstützen* 'to support':

(i) Wir helfen und unterstützen.
we help and support
(https://www.hilfelotse-berlin.de/detail/wir-helfen-und-unterstuetzen, 2025-12-04)

Such a coordination would be pointless, if the meaning were identical.

[2]A reviewer remarks that the numbers are visible to the morphology component. This is true, but the information about valence is hidden in the numbers. For example, in Uszkoreit's (1987: 165–166) GPSG grammar of German the rule numbers 6 and 8 are the numbers for rules into which strictly transitive and ditransitive verbs can be inserted. There is nothing in the symbols 6 and 8 that gives the information away that these verbs govern an accusative. The *-bar* would have to specify that it only combines with verbs of class 6 and 8. This would not capture the fact that the *-bar* '-able' derivation is something like passivization – something that has to do with accusative objects. So GPSG is better off than phrasal approaches which add information about valence at the phrasal level, but still I do not consider the number selection approach satisfying.

[3]Morphology also interacts with resultative constructions. Due to space limitations, I could not include

The insights from this discussion have been ignored and phrasal approaches were suggested in the framework of CxG and later also in other frameworks. Since Mainstream Generative Grammar and Construction Grammar seem to be the two big currents in theoretical linguistics nowadays, many researchers from smaller alternative non-mainstream generative theories teamed up with Construction Grammar. Most variants of CxG are not or insufficiently formalized and proponents of other frameworks try to show that their framework can be seen as a formalization of CxG ideas. The following list cites some of the attempts or comparisons:

- Constructional HPSG (Sag 1997, Müller et al. 2024, Müller 2024)
- Simpler Syntax (Culicover & Jackendoff 2005, Culicover & Varaschin 2025)
- Sign-Based Construction Grammar (SBCG, an HPSG variant; Sag 2012, 2010: 486)
- Lexical Functional Grammar (Asudeh, Dalrymple & Toivonen 2013, Findlay 2023)
- Dependency Grammar (DG; Osborne & Groß 2012)
- Tree Adjoining Grammar (TAG; Lichte & Kallmeyer 2017, Kallmeyer & Osswald 2013, Seyffarth 2019, 2023)

Of course the question is what defines a Construction Grammar (Müller 2024). If the idea of form-meaning pairs is considered crucial, then all frameworks listed above in all variants can be considered Construction Grammars. This includes lexicalized models of HPSG, LFG, DG, and TAG (Joshi, Levy & Takahashi 1975, Joshi & Schabes 1997, Abeillé & Rambow 2000) and Sag, Boas & Kay (2012: Section 2.3) explicitly follow my arguments for lexical approaches in their introductory chapter on Sign-Based Construction Grammar. But some authors working in the frameworks mentioned try to provide formalizations of Goldbergian ideas and as I showed in several publications they fail. I believe that the reasons for failure are inherent in the nature of language. For a selection of papers discussing the issues see Müller (2006, 2010, 2013b, 2018a) and Müller & Wechsler (2014). The conclusion of this work is: all phenomena having to do with valence should be treated lexically.

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the discussion of morphology in this paper. The interested reader is referred to Müller (2025). For example, the resultative construction *leer fischen* 'to fish something empty' can be used in *-bar* '-able' derivation and in *Ge- -e*-nominalization: *leerfischbar* 'possible to be fished empty', *Leergefische* 'repeated annoying fishing empty of something'. Note that the nominalization is discontinuous. The word internal structure is completely different from what was suggested for phrasal TAG approaches on the sentential level and a complex raising mechanism for the linking of semantic arguments to syntactic arguments of the nominalized resultative construction would be needed. The parts of the construction in Figure 4 cannot be found in the structures of adjectives or nouns derived from the resultative construction. So these morphological derivations pose a problem for metagrammar TAGs and also for all other versions of TAG unless they assume lexical rules/metarules mapping trees to other trees or lexical items to other lexical items. For a description of the morphology of particle verbs and resultative constructions see Müller (2003b).

2 Tree Adjoining Grammar $\stackrel{?}{=}$ the perfect phrasal CxG

A body of recent work in Tree Adjoining Grammar suggests that phrasal ideas can be implemented in TAG rather directly (Lichte & Kallmeyer 2017, Kallmeyer & Osswald 2013, Seyffarth 2019, 2023) by relying on inheritance in a metagrammar-based approach. I want to look at these approaches and check whether some new technique was found that falsifies my earlier claims.

2.1 TAG and constructions

A first look at TAG suggests that this framework is ideal for capturing the phenomena that are important to CxG researchers. TAG works with so called elementary trees that are combined into larger trees. A tree usually contains all arguments of a head. This is also true for long distance dependencies: TAG has an extended domain of locality (Joshi & Schabes 1997: 95–96, 99–100, Lichte & Kallmeyer 2017: 208). TAG has two modes of combination: substitution and adjunction. They are demonstrated in Figure 1 and Figure 2.

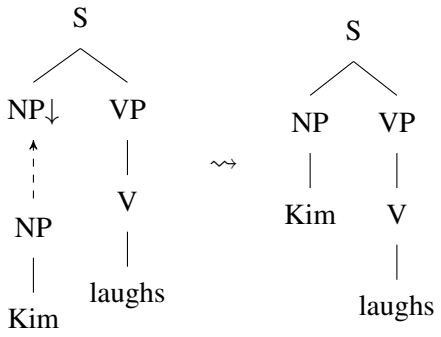

Figure 1: Substitution in TAG

TAG trees come with open slots into which other trees can be inserted. The elementary tree for *laughs* has such a slot for a subject NP. The NP tree of *Kim* is inserted there and a complete tree for *Kim laughs* results.

Trees can be taken apart again by the adjunction operation. This is shown in Figure 2. The tree for the adjunct *always* has two nodes with the same label (VP) and one of them is the top-most node and the other is marked with a '*'. The adjunction tree can be inserted at the appropriate place into another tree. The original tree is split up at a node that matches the one with the '*'.

TAG also has a convincing analysis of idioms with fixed material in discontinuous parts of idioms (Abeillé & Schabes 1989). Figure 3 shows the elementary tree for the analysis of the idiom *take sth into account*. TAG allows trees to have arbitrary amounts of fixed material, so *take* and *into account* are specified. In addition, there are open slots for NP arguments at appropriate places. The noun *account* is used without a determiner. Adjectives are impossible. Therefore the nodes in the tree of *into account* are marked as non-adjunction nodes (NA). This blocks adjunction of further material.

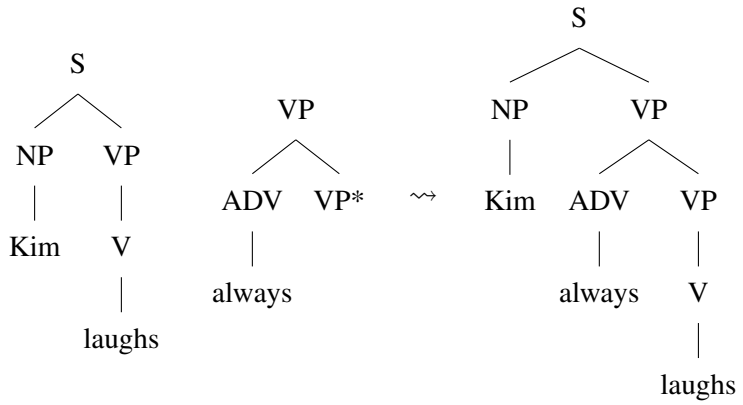

Figure 2: Adjunction in TAG

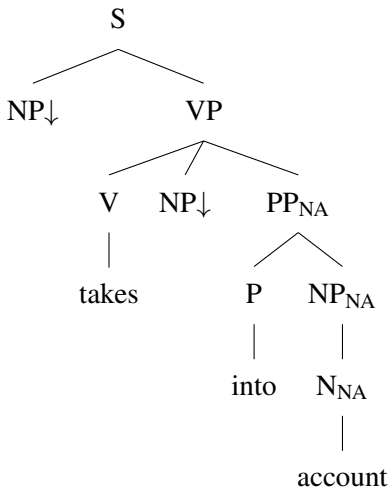

Figure 3: TAG elementary tree of the idiom *take into account*

Standard Lexicalized TAG (LTAG; Schabes, Abeillé & Joshi 1988) assumes that all trees are anchored; that is, there is at least one lexical element in a tree. Lexical items can be used with several trees, so-called tree families (Crabbé, Duchier, Gardent, Roux & Parmentier 2013: 594–595). For example, there can be active and passive trees for a certain verb. The trees in a tree family were assumed to be related to each other by lexical rules or metarules (Vijay-Shanker & Schabes 1992, Becker 1994). For example, a tree for a verb in the passive was assumed to be derived from a tree of the verb as it appears in active sentences (Vijay-Shanker & Schabes 1992: 210). Starting with the work of Candito (1998), metagrammars were used to describe trees and inheritance systems were used to capture generalizations. In some systems, trees are automatically computed from partial trees (Kallmeyer & Osswald 2013: 316, Lichte & Petitjean 2015: 199, Seyffarth 2023: 137).

I showed in earlier work that inheritance has mathematical limits and cannot be used to handle argument structure constructions and their alternations (Müller 2010, 2013a: Section 7.5.2, 2017). The question is now: Do metagrammars help? Are they different

from inheritance-based systems? I will have a look at some of the phrasal approaches in the following subsection. For a more detailed discussion see Müller (2025).

2.2 Metagrammars and Frame Semantics

Lichte & Kallmeyer (2017) argued that the Caused-Motion Construction is a phrasal construction and provide the tree with a linked Frame Semantics AVM in Figure 4 that can be used in an analysis of (1a) repeated here as (3) for convenience.[4]

(3) Sam sneezed the napkin off the table.

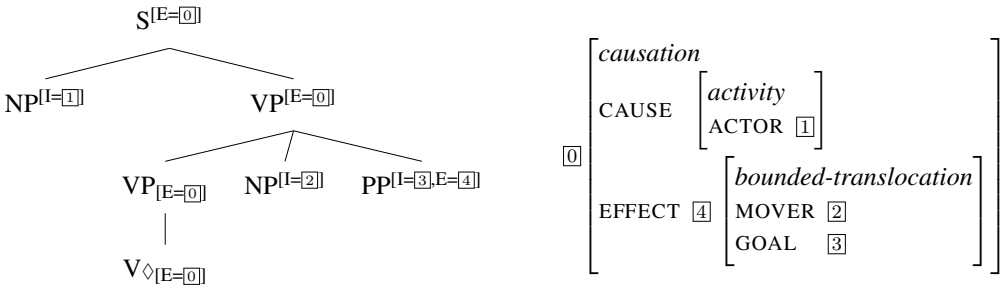

Figure 4: The Caused Motion Construction as phrasal construction according to Lichte & Kallmeyer (2017: 208)

'I' stands for internal content and 'E' for external content. The 'I' values are linked to contributions of NP arguments in the frame semantics and the 'E' values to values that are relevant for further composition. For example 4 is the complete contribution of the PP.

The figure shows a tree that is not lexically anchored. Instead there is a node marked with ◊. This node is the node into which a lexical anchor has to be inserted. This is basically the Goldbergian idea that a verb enters a certain construction and the construction takes care of the realization of the appropriate arguments. In the case at hand the object and the PP of the Caused Motion Construction are realized together with the usual subject of the intransitive verb.

The figure corresponds to the general assumption in phrasal approaches that the linking to the arguments comes about only when all parts of the construction are realized together.

Lichte & Kallmeyer assume a metagrammar approach. All trees in a grammar are split into parts and parts can then be used to assemble various trees (p. 209). Figure 5 shows the metagrammar fragment that is relevant for the Caused Motion Construction.

There is a general tree for verbs taking an object and forming a VP with it (DirObj). There is a tree for verbs combining with a subject (Subj). The verb is dominated by a VP (dashed line). Arbitrary material may intervene. There is a tree for verbs forming a VP (the VSpine) and a VP tree including a directional PP (DirPrepObj). These

[4]Contrary to what Lichte & Kallmeyer (2017: 208) state, the E of the lexical anchor V◊ should contribute the value of CAUSE and be different from 0.

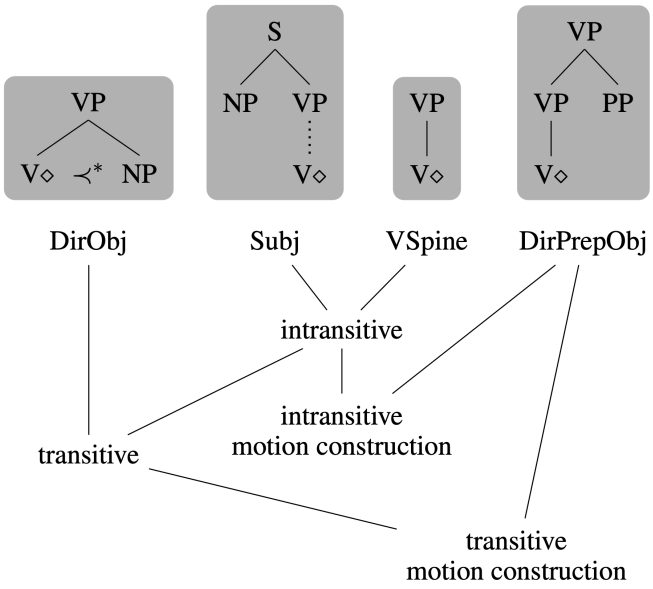

Figure 5: Metagrammar approach to Caused Motion Construction by Lichte & Kallmeyer (2017: 209)

tree fragments are combined in an inheritance hierarchy. The hierarchy is linguistically somewhat unintuitive with *transitive* being a subnode of *intransitive*.

In this view of the world active and passive are just alternative combinations of tree fragments. For example, Crabbé et al. (2013: 597) argue against lexical rules and suggest the following statements for active and passive trees instead:

(4) a. ActiveTransitiveVerb → Subject ∧ ActiveVerb ∧ CanonicalObject
b. PassiveTransitiveVerb → Subject ∧ PassiveVerb ∧ CanonicalByObject
c. TransitiveVerb → ActiveTransitiveVerb ∨ PassiveTransitiveVerb

Burkhardt, Lichte & Kallmeyer (2020) assume active and passive variants for resultative constructions (the Caused Motion Construction is a special case of resultatives, Goldberg & Jackendoff 2004: 540):

(5) Subject ∧ Resultative ∧
((ActiveVerb ∧ Direct-object) ∨ (active)
(PassiveVerb ∧ By-object) ∨ (passive, by-PP)
PassiveVerb) (passive, no by-PP)

The Resultative class is defined as shown in Figure 6. Note that this is basically a VP without a subject and an object. So this part of a tree is not what Goldberg sees as a resultative construction. It is a VP tree that basically looks like an adjunction structure rather than a VP including the result predicate and an object. This structure with the unary branching from V to VP is necessary to get the embedding of the semantics of the lexical anchor verb 00 under the *causation* frame. (This is another instance of a class of examples that show that semantics needs embedding; see Müller 2006: 871, 2010: Section 4.2, 2017.)

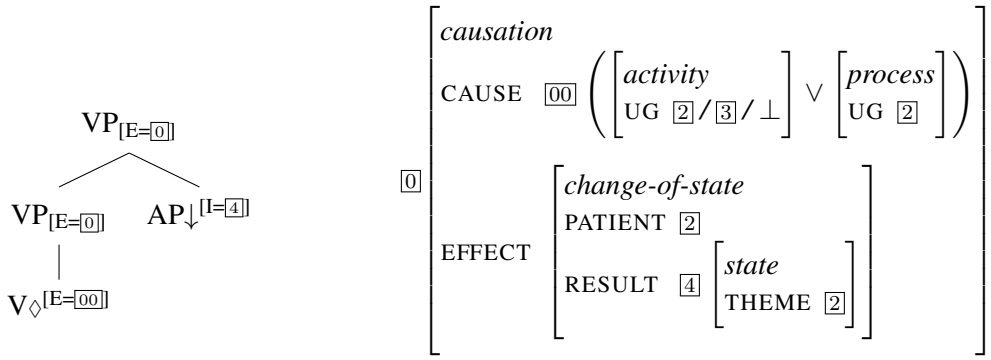

Figure 6: Resultative class in the metagrammar according to Burkhardt, Lichte & Kallmeyer (2020: 14)

In order to get the linking to subjects and objects, the following assumptions are made:

(6) a. Being a subject requires being an actor of an activity or an undergoer of a process.
b. Being an object requires being an undergoer of an activity.
c. The causation frame has actor and undergoer roles.
d. There is a propagation mechanism of actor and undergoer roles.

Based on these assumptions, the tree parts for sentences with subject and object are formulated as in Figure 7.[5] They link subjects and objects to actor and undergoer roles (see Van Valin & LaPolla 1997 on these macroroles).

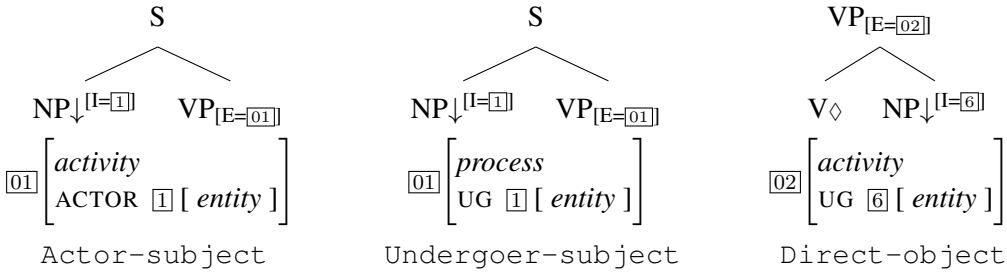

Figure 7: Subject and object classes according to Burkhardt, Lichte & Kallmeyer (2020: 15)

Without the assumptions in (6) and the subject and object construction parts in Figure 7, there would not be a link between the verb and the subject and object in phrasal constructions.

Figure 8 shows the result of the combination of Actor-subject, Direct-object, and Resultative class. The different classes are color-coded. The external semantics of the Resultative class (0) is identified with ($\widehat{=}$) the external semantics of the Subject class VP (01). This way the *causation* frame is the frame of the complete utterance. The

[5] This is refined later. Undergoers of activities can be subjects as well, if the VP is a passive VP. So the authors suggest two classes for activities, one for active sentences and one for passive sentences.

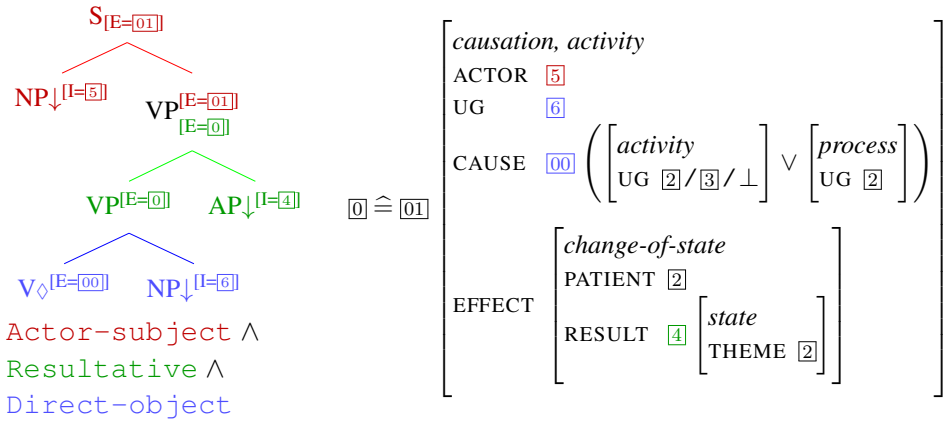

Figure 8: Combination of Actor-subject, Direct-object, and Resultative class

activity of the anchor verb (00) is identified with the CAUSE and hence embedded under the *causation* frame.

The assumptions in (6) have to be talked about, since subjects may be expletives as in (7a,b) and direct objects may be raised from the result predicate as in (7b):

(7) a. It rained.
b. Kim fishes the pond empty.

The NP in (7b) is not an undergoer of *fish*. It is fish that is fished not the pond. The undergoer of the verb *fish* is not expressed.

In addition, German has examples like (8):[6]

(8) Es regnet die Stühle nass.
it rained the chairs wet
'The chairs got wet because of the rain.'

This example and the example in (7b) suggests that the representation of the causative semantics should be as given in Figure 6; that is: there is a cause and an effect but no further semantic roles in the causation frame. See also Dowty (1979: 93) and Müller (2002: 226–227, 241) for such representations. Jackendoff (1990: 232) and Pustejovsky (1991: 65) suggest different representations but all without an actor and undergoer of the cause relation.

However, Kallmeyer, Lichte, Osswald & Petitjean (2016: 54) assume the following rules for the assignment and percolation of macroroles:

(9) a. if an effector exists, then it is the actor
b. a patient is always an undergoer

[6](8) is taken from Wunderlich (1995: 455). See also Wunderlich (1997: 118) for a similar example. Felfe (2020: 256) discusses the attested German example in (i):

(i) [...] und am Ende hagelt es die Ernte kaputt.
and at.the end hails it the crop to.pieces
'and in the end it hails and destroys the crop'

The linking problems would have to be solved for German as well.

c. a mover is always an effector

d. an emoter is always an experiencer

e. if the cause of a causation has an effector, then this is also the effector of the entire causation

f. if the effect of a causation has a patient, this is also the patient of the causation event

g. the patient of a change-of-state is the patient of the embedded result state

Figure 9 shows the analysis of (7b) without added macroroles. The internal con-

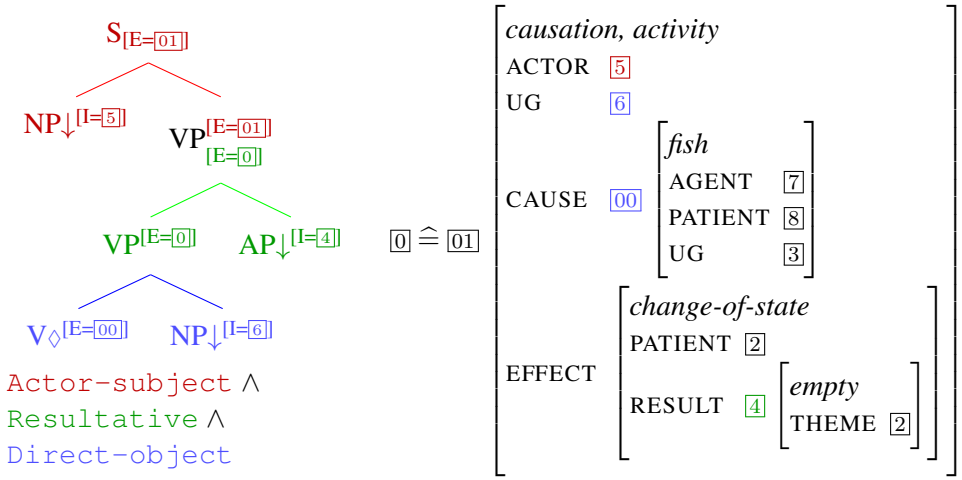

Figure 9: Combination of Actor-subject, Direct-object and Resultative class for *Kim fishes the pond empty* without inferred macroroles

tent of the subject (5) and the object (6) are linked to the actor and undergoer of the outermost frame, the *causation* frame. They are not linked to anything else in the complete frame representation. But the metagrammar decomposition analysis requires such a linking. In the concrete case of (7b), the theme of the *empty* relation has to be linked to the object in the clause. This is done by linking the undergoer role of the *causation* relation to the undergoer of *empty* via some intermediate undergoers in the chain of embedded relations (*causation*(*change-of-state*(*empty*))).

Figure 10 shows the added actor and undergoer macroroles. The rules in (9) add macroroles to the predicates that are provided by the involved words in the analysis and by the metagrammar classes. Because of this system of percolating macroroles (e.g., (9f) and (9g)), the undergoer macrorole of the *causation* is identified with the undergoer macrorole of *empty*, via the undergoer role of *change-of-state*.[7] A rule of the kind in (9e) identifies the actor of the whole *causation* with the actor of the *cause*. It is only because of this percolation that the assumption can be upheld that actor and undergoer are available at the outer-most level of sentential predication.

Based on the existence of expletive predicates as the cause and raised objects or fake reflexives, I would not assume an actor or an undergoer role for the *causation* frame. But

[7]Burkhardt et al. (2020) do not provide their system for the identification of macroroles. (9) is an approximation of what is needed for the current examples.

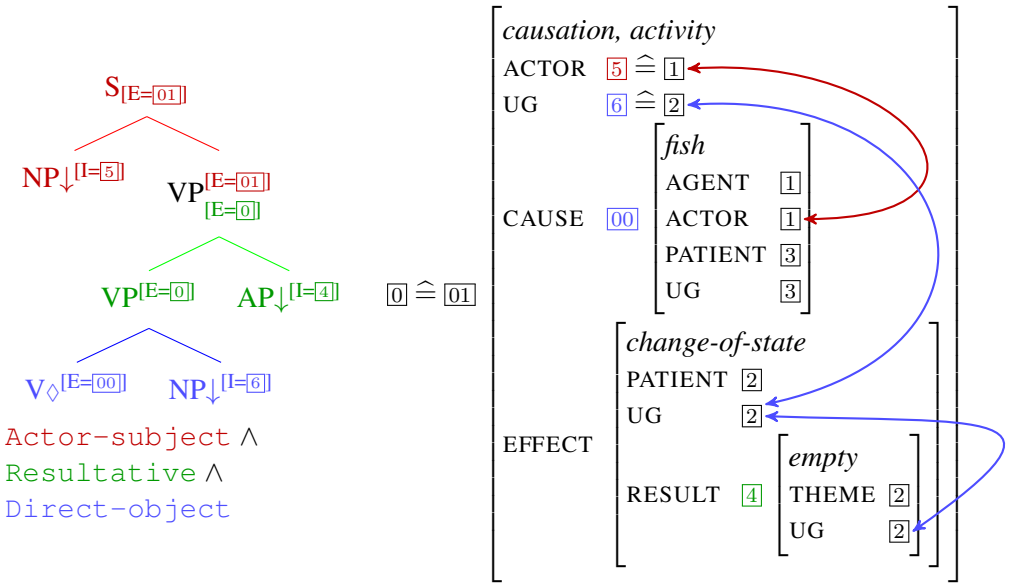

Figure 10: Object raising using propagation of undergoer information in frame semantic structures for *Kim fishes the pond empty*

this is required for the metagrammar decomposition analysis to work. If one looks at Figure 10 it becomes clear what is going on. The frame semantic structures are misused to establish a raising analysis within TAG: *causation* should be a two-place predicate rather than a relation between four arguments (actor, undergoer, cause, and effect).[8]

Compare the analysis in Figure 10 with the analysis of raising (functional control) in LFG (Bresnan 1982) in Figure 11. The similarities are obvious. The difference is that the LFG analysis uses the functional structure for an account of raising, while the frame-based TAG analysis uses semantic frames for this – a *semantic* structure that should not be used to encode *syntactic* relations.

The conclusion is that there are only two alternatives for the linking in the TAG analysis of the resultative construction under discussion: one option is to do it at the fully specified phrasal configuration as in Figure 4, which means that it could only be done at the lowest type *transitive motion construction* in Figure 5. This would mean that all the problems pointed out for phrasal approaches with fixed configurations would apply to this approach as well. The alternative is that semantic information that is deeply embedded and ultimately belongs to other predicates is made available in structures of embedding predicates as in Figure 10. This seems to be a hack.

[8]This also applies to the analysis of *leerfischbar* 'empty fishable' in (i).

(i) *modal-op*(*cause*(*fish*(x),*become*(*empty*(y))))

The modal operator does not have an undergoer, but an undergoer can be realized as an argument of the adjective.

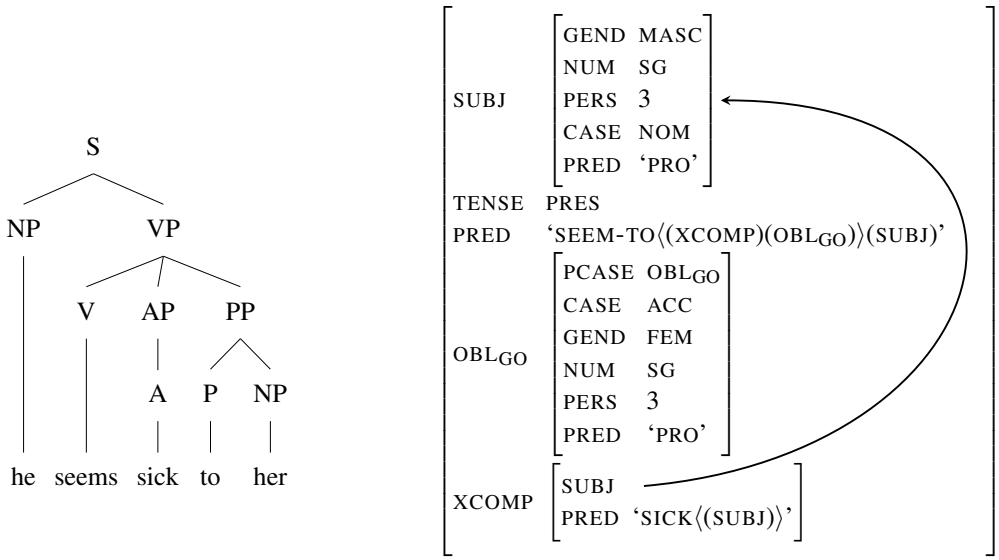

Figure 11: Raising in LFG at f-structure according to Bresnan (1982: 362)

2.3 Interation of valence changing processes

This section deals with valence changing processes. There are several "processes" that feed each other. This means that one rule creates the conditions for another rule to apply. Inheritance-based approaches cannot model such situations. Of course it will always be possible to come up with some tree for a certain syntactic configuration. The tree can be split into parts as it is in metagrammar approaches and the parts can be reassembled. But this basically amounts to writing down the language without any deeper insights about possible structures.

For example, benefactive and resultative constructions add arguments and the various variants of the passive suppress arguments. Languages like Lithuanian (Timberlake 1982), Irish (Noonan 1994), and Turkish (Özkaragöz 1986) show that several kinds of suppression can apply to one verb. The following Turkish examples are from Özkaragöz (1986: 77):[9]

(10) a. Bu ato-da bo-ul-un-ur. (Turkish)
this château-LOC strangle-PASS-PASS-AOR
'One is strangled (by one) in this château.'

b. Bu oda-da döv-ül-ün-ür.
this room-LOC hit-PASS-PASS-AOR
'One is beaten (by one) in this room.'

c. Harp-te vur-ul-un-ur.
war-LOC shoot-PASS-PASS-AOR
'One is shot (by one) in war.'

[9]The glosses are taken over from the original, but as will be discussed below these examples are not instances of double passivization but of a combination of passivization and the impersonal construction (Blevins 2003).

They are instances of the passive and the impersonal construction and are in a feeding relation (Blevins 2003) and I will argue that such phenomena are difficult to capture.

In metagrammar approaches, which often reject lexical rules (Crabbé et al. 2013: 597), possible configurations are just stated as conjunctions and disjunctions. For example, Crabbé et al. (2013: 597) assume the following conjunctions for active and passive transitive verbs:

(11) a. ActiveTransitiveVerb → Subject ∧ ActiveVerb ∧ CanonicalObject
b. PassiveTransitiveVerb → Subject ∧ PassiveVerb ∧ CanonicalByObject

ActiveVerb and PassiveVerb are just inflected verbs. In order to analyze the Turkish examples above, one would need ImpersonalPassiveVerb for verbs with correct inflection (passive suffix and impersonal suffix, glossed as PASS above). But in addition one would also need ImpersonalVerb and one would need further types for just impersonal constructions and impersonal constructions of passives. One could argue that these conjunctive types are somehow derived by computing an automatic closure of types in a metagrammar (Kallmeyer & Osswald 2013: 316, Lichte & Petitjean 2015: 199, Seyffarth 2023: 137). In such a system, one would have to specify which of the types are incompatible (in cases in which this does not follow from feature specifications). For example, Subject and ImpersonalPassiveVerb and CannonicalObject are incompatible. So one would not be better off.

Blevins (2003) suggested handling passivization and the impersonal construction via lexical rules. Both the passive and the impersonal construction suppress the subject. The object is promoted to subject in the passive, but nothing is promoted in the impersonal construction. It is important to note that the impersonal construction is not to be confused with the impersonal passive. The impersonal construction suppresses the subject and potential accusative objects can remain in the accusative (Blevins 2003: 495–496). By using a system of lexical rules to account for valence changing phenomena, one can have a passive rule mapping the object in the active to the subject in a passive and a further rule for impersonals that suppresses the new passive subject, which would have been the object in the active (Blevins 2003: 515). The interaction cannot be covered in an inheritance hierarchy containing descriptions of linguistic objects in terms of feature and value pairs, since if we inherit from the passive construction, we commit to a certain structure (Müller 2013b: 926–927).[10] If we would inherit from the impersonal construction as well, we would get conflicting information since we need embedding: the impersonal construction has to apply to the element that has been passivized before. So the passivized structure has to be the input for the impersonal construction. Note that the order of rule application is important. Passive creates the condition for the impersonal to apply. If one applies the impersonal first, a subjectless construction results, which cannot be the input to passivization, which is the suppression of the subject. This means that inheritance (without conditional constraints) cannot be used to model

[10]Timm Lichte (p. c. 2025) pointed out to me that it is possible to have conditional statements. These could be used to "check" whether the impersonal construction is combined with the passive and if it is not, a certain structure is enforced. The result is again that one creates a set of tree fragments that can be put together to give exactly the trees that are observable without capturing a connection between different realizations like active, passive and impersonal.

Ash Asudeh (p. c. 2025) suggested that Glue semantics as used in Asudeh et al. (2013) is another way of dealing with these phenomena, since the respective statements also involve implications.

the interaction of the two phenomena, since inheritance is just cumulation of constraints and it does not matter in which order one adds constraints conjunctively: A + B = B + A; independent of the order, we get the same constraints. This is different with embedding constructions (lexical rules or metarules). If we have two rules A and B, they can be constructed such that B can apply to the output of A but not vice versa. This results in a natural rule ordering, something that was argued against by proponents of metagrammar approaches (Crabbé et al. 2013: 597) and by some Construction Grammarians (Goldberg 1995: 107).

To get some idea about possible interactions between argument structure constructions, consider the data in (12):

(12) a. dass er fischt
that he.NOM fishes

b. dass gefischt wird
that fished is

c. * dass er den Teich fischt
that he.NOM the.ACC pond fishes

d. * dass der Teich gefischt wird
that the.NOM pond fished is

e. dass er den Teich leer fischt (resultative construction)
that he.NOM the.ACC pond empty fishes

f. dass der Teich leer gefischt wird (resultative construction + passive)
that the.NOM pond empty fished is

g. * dass er ihr fischt
that he.NOM her.DAT fishes

h. * dass er ihr den Teich fischt
that he.NOM her.DAT the.ACC pond fishes

i. dass er ihr den Teich leer fischt (rc + benefactive)
that he.NOM her.DAT the.ACC pond empty fishes
'that he fishes the pond empty for her'

j. * dass ihr der Teich gefischt wird
that her the.NOM pond fished is

k. dass ihr der Teich leer gefischt wird (rc + benefactive + passive)
that her.DAT the.NOM pond empty fished is
'that somebody fishes the pond empty for her'

l. dass sie den Teich leer gefischt bekommt (rc + benefactive + dative passive)
that she.NOM the.ACC pond empty fished becomes
'that somebody fishes the pond empty for her'

Some constructions extend the valence (benefactive adds a dative argument, resultative adds an accusative object and a result predicate), others reduce it (passive and dative passive). Some require the presence/absence of material. For example, the resultative construction requires a strictly intransitive verb as input. The object is licensed only if there is a result predicate. The benefactive dative is possible only if there is an accusative

object as well. It seems to be impossible to compute all variants automatically by adding up partial trees without overgeneration.[11] For example, (12g) is ungrammatical, but the parts *er* 'he' *ihr* 'her' and *fischt* 'fishes' must be compatible, since these components appear together in (12i). That certain constituents have to appear together is usually taken care of in TAG by stating that they are part of a tree, but metagrammars deal with partial trees. So additional constraints are needed to avoid missing parts or additional parts that result in ill-formed trees.

During the past years there have been different suggestions concerning the nature of the Caused Motion Construction/Resultative Construction within phrasal TAG approaches. Lichte & Kallmeyer (2017) and Kallmeyer & Osswald (2013) suggested that there is a construction spanning the complete sentence. Seyffarth (2019, 2023) suggested a VP construction that is adjoined to another VP. Some authors suggested that the construction is built from small pieces with reference to f-structure-like semantics (Burkhardt et al. 2020). As argued above, the feeding relations between phenomena cannot be covered in inheritance-based approaches. Furthermore it is unclear how cases of argument adjuncts like the dative NPs of benefactives would be covered. They cannot simply be treated as adjuncts since they interact with the dative passive. Like arguments the benefactive datives can be promoted to subject and then turn into nominatives while keeping their benefactive semantics. I just mention this problem here and point the interested reader to Müller (2025) for a more detailed discussion. Integrating the benefactive NPs into elementary trees without lexical rules would amount to further "just writing things down".

2.4 Subjects without a macrorole

Figure 7 showed two classes for sentences with a subject: Actor-subject and Undergoer-subject. The actor is linked to activities, the undergoer to processes. As was stated by Burkhardt et al. (2020: 19) themselves, this is not enough since subjects in the passive can be undergoers. So the authors added another class for passive subjects. As I pointed out, a further class is needed for expletives. Expletives neither get a semantic role nor a macrorole (Van Valin & LaPolla 1997: 149–150) and they can be embedded under other predicates so that it is not straightforward to refer to the type of the relation to which the expletive belongs:

(13) a. It will start to rain soon.
b. It seems to be raining over there.

Datives do not get a macrorole either (Van Valin & LaPolla 1997: 354–355), but they can be promoted to subject. Benefactives are semantically modifiers.[12] Some datives

[11] Kallmeyer & Osswald (2013: 316) assume explicit statements about incompatible types ruling out subtypes of the respective incompatible types which would result by automatic combination without such an incompatibility statement. For example, the hierarchy of lexical frames developed by Seyffarth (2023: 115) explicitly states incompatibilities between *animate* and *inanimate*, between *entity*, *event*, and *path* and between *intransitive_action* and *transitive_action*. If no incompatibility is stated, open-world reasoning (Krieger & Schäfer 1994: 9) applies and the types can be conjunctively combined. An example for this is shown in Figure 8 where the type of the outermost AVM is the conjunction of *causation* and *activity*.

[12] I treat them as selected elements (Müller 2018a: 68). They are introduced into the argument structure list of a verb in parallel with the respective semantics. This is similar to the lexical rule suggested by van Noord & Bouma (1994) for the introduction of adjuncts into valence lists.

are body-part datives, which are also not semantic arguments of a verb. So even if one assigned datives macroroles (a further hack to get semantic raising to work), one would have to assume strange percolation mechanisms that include benefactive datives and body-part datives while excluding other datives, for example datives that are arguments of modifying prepositions.

3 A simple solution using mappings to new linguistic objects

This section discusses the simple way out, which has been argued for for several decades now in lexicalist frameworks like Categorial Grammar, LFG, HPSG, and variants of TAG. What is needed is a tool that maps one linguistic representation onto another. Since general transformations of the kind used in earlier transformational grammar are psycholinguistically implausible (Bresnan 1978) and computationally intractable (Kay 2011: 9–10, Peters & Ritchie 1973), metarules or lexical rules of the type Goldberg (2013) called lexical templates are used in HPSG (Briscoe & Copestake 1999, Meurers 2001, Davis & Koenig 2024) and some versions of CxG (Kay 2005, Sag et al. 2012). Lexical rules relate lexical items with information about *potential* structure to other lexical items (Müller 2019) rather than relating objects representing *actual* structure as in GB or transformational variants of TAG (that is, variants with lexical rules or metarules mapping elementary trees to other elementary trees).

For the data described here, the following lexical rules (LRs) are needed:

1. Participle lexical rule blocking the designated argument (for perfect and passive; Haider 1986, Müller 2003a)
2. Benefactive lexical rule adding the dative argument for verbs that take a nominative and accusative (Müller 2018a: Chapter 7.2.3.1)
3. Resultative lexical rule adding an accusative object and a result predicate to a strictly intransitive verb (Simpson 1983, Verspoor 1997, Wechsler & Noh 2001: 399, Müller 2002: Chapter 5.2, 2018a: Chapter 7.2.3.2, Butt, King & Raza 2025: 23–24)
4. *-bar* '-able' derivation lexical rule (Riehemann 1998, Müller 2003b: Section 5.2.2)
5. *Ge- -e*-nominalization lexical rule (Müller 2002: Chapter 6.2.5.4, 2003b: Section 5.2.1)

The morphological rules are independent of the benefactive and the resultative lexical rules but interact in necessary ways with these.

Figure 12 shows the example analysis of (12i). The resultative lexical rule applies to a mono-valent version of *fisch-* 'fish'. It adds an accusative object and a result predicate to the argument structure list and takes care of the semantic embedding and the linking. The benefactive LR needs a verbal stem selecting a nominative and an accusative (two NPs with structural case) as input and adds a dative argument. The lexical rule for verbal inflection applies on top of this and then the combination with arguments takes place. Note that the stem resulting from the application of the benefactive lexical rule can be used in dative passives (12l) and in normal passives (12k). The monovalent stem

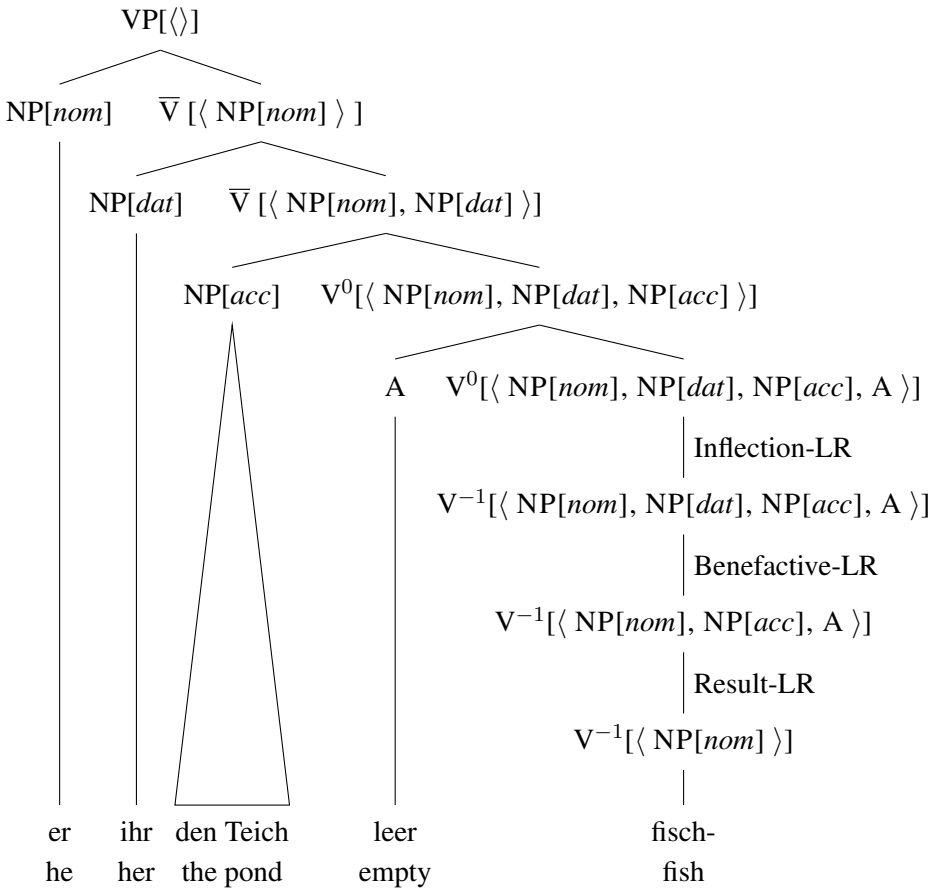

Figure 12: Analysis of [*dass*] *er ihr den Teich leer fischt* 'that he fishes the pond empty for her', an example in which the benefactive and the resultative construction interact

and the resultative stem can also be used in passives with the passive auxiliary *werden* ((12b) and (12f)). The lexical rules can only apply in the order given in Figure 12. There is a natural order of application. The problem of rule ordering that is frequently mentioned in the literature on argument structure (Goldberg 1995: 107, Crabbé et al. 2013: 596) does not exist. It does not exist in the fragment described here and I did not experience any rule ordering problems in any other part of grammars I worked on in the past 32 years (see Müller 2015 for a list of implemented grammars). Cases of alternation for which one does not want to assume a basic item from which other items are derived can be handled by disjunctions or by underspecification in the type hierarchy. See Bredenkamp, Markantonatou & Sadler (1996) on the latter.

4 Comments on lexical rules, Distributional Morphology, and LFG

The lexical rules that are assumed in HPSG are basically what Booij (2002, 2010) suggested under the name Construction Morphology. The general idea was suggested by

Riehemann (1993, 1998) much earlier within the framework of HPSG: lexical rules are basically unary branching rules in which material can be added to the phonology of the daughter. So for instance, in the lexical rule for *-bar* '-able' derivation, a verbal stem is taken as input and ⟨ *bar* ⟩ is added to the phonology of the verb. The projected category is an adjective stem contributing a modal operator scoping over the semantic contribution of the verbal daughter.

Among the arguments for this view of morphology was the point that one does not need to stipulate empty affixes (Riehemann 1998: 71), which would be needed in word-syntactic proposals of conversion and inflection. One does not need to assume subtractive morphemes or abstract morphs like Umlaut for the plural of *Mütter* 'mothers' of *Mutter* 'mother', since the projection of information allows the manipulation of phonological information within the rules.

It is sometimes claimed that lexical rules are non-monotonic and that the passive is derived from the active. This was true for transformational approaches and would be true for TAG approaches that map unfolded structures for active sentences onto complete structures for passive sentences. But it is not true for HPSG proposals which map verbal stems to finite word forms with an active argument structure and to participle word forms with passive argument structure. Lexical rules are monotonic. They do not change anything. The input lexical item is embedded within the output lexical item. It is just the usual mother–daughter relation. Daughters can be different from mothers. Having a mother does not change the daughter (Briscoe & Copestake 1999, Meurers 2001). Of course, the mother can differ from the daughter in arbitrary ways, but this is also true for approaches allowing for empty heads. For example, an empty nominal head can take a verbal argument and project its own part of speech and gender information and require arguments not required in this form by the verb.

Figure 13 shows the analysis of inflection using an empty affix and a unary branching rule. German feminine nouns have zero inflection in the singular. So, some affix-based approaches assume an empty affix.[13] Lexical rule-based approaches simply map a stem to a word without adding to the phonology. Recent LFG approaches (Lexical-Realizational Functional Grammar, L_RFG; Asudeh & Siddiqi 2025) assume something like Distributed Morphology (Halle & Marantz 1993) at the sublexical level. LFG syntax avoids empty elements by assuming a principle called "Economy of expression" (Dalrymple, Kaplan & King 2016). This principle basically prefers syntactic structures without empty elements, which results in branching with fewer daughters. The interesting thing is now that, if one applies this to the left picture, this results in unary branching rules for inflection as well. This is shown in Figure 13: if one removes the empty affix from the left figure, one gets the figure in the middle. See Bar-Hillel, Perles & Shamir (1961) for a general procedure to remove empty elements from phrase structure grammars. As I showed in Müller (2016: Chapter 19.5), the empty heads in Minimalist theories (Chomsky 1995) are like lexical rules: they can license additional arguments and add semantic information or change the semantic type. Of course these empty heads are also used in syntax, but the analog to unary branching lexical rules is also used in syntax in other frameworks. For example, syntactic type-shifting rules were suggested by Partee (1986), Flickinger (2008: 91–92), and Müller (2009, 2012).

[13] Others assume that the noun stem and the case affix are mapped to the form *Frau* as in the right picture in Figure 13. For analogous suggestions see Merchant (2015: 290), Asudeh, Bögel & Siddiqi (2023: 39).

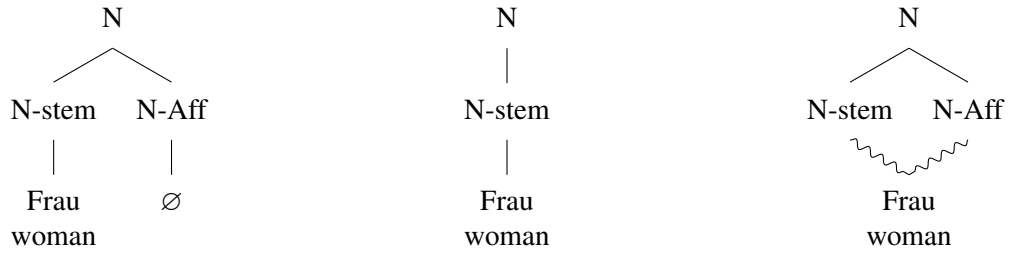

Figure 13: Empty affix vs. unary branching rule vs. approach with spanning

Turning to the details of L_RFG, consider Figure 14. It contains nodes familiar from the DM literature: VoiceP, AgrP, TP. These categories are standard in Mainstream Generative Grammar but usually frowned upon in alternative theories. Non-mainstream theories usually assume that syntax is about distribution classes. They follow a what-you-see-is-what-you-get approach. So, if we talk about verbs and verbal projections, we assume that they are of the category *verb* or V. Of course, there are additional features that record finiteness and agreement information and so on. But there are no categories like NationalityP (Cinque 1994: 96, 99), VoiceP, HearerP, SpeakerP, TopicP, FocusP and so on (see Müller 2016: Section 4.6.1.1 for a list and discussion). These categories have been introduced into syntax because of the principle of Autonomy of Syntax (Chomsky 1977: 41–42), which does not allow reference to semantics, pragmatics and other "modules" of grammar (Müller 2023: Section 4.10.2.1).

So, the projected part-of-speech information should not be Voice or Agr but verb. But since lexical rules in HPSG are typed feature descriptions, they have "names". The passive lexical rule could have a type named *voice-lr*; the agreement lexical rule would be *agr-lr*. The feeding relation between lexical rules (mother-daughter relations) is like phrase structure rules:

(14) a. Agr′ → VoiceP Agr (L_RFG)
b. agr-lr → voice-lr (ordered LRs)

So, after all, the approaches are similar enough to be comparable.

But there is an important point here when it comes to lexicalism. Lexicalists think that morphology differs from syntax and that there may also be other mechanisms at work. As already mentioned above, there are phenomena that would make the stipulation of subtractive morphs (Zimmermann 2017: 7) necessary. Furthermore, morphology is more templatic than syntax (Nordlinger 2010). So, Crysmann & Bonami (2012) and Bonami & Crysmann (2016) follow ideas of Matthews (1974), Spencer (1991), and Stump (2001) and argue that combinations and realizations of material in morphology are fundamentally different from syntactic combinations. (This does not preclude the option that morphology is described with AVMs like syntax. It can be AVMs and constructions all the way down, but the constructions may be different nevertheless.)

So instead of assuming a cascade of lexical rules or trees for functional projections that may or may not add phonological material, one lexical rule is assumed for inflection that can add material or not, or even subtract material. This provides a uniform mapping from uninflected to inflected words and avoids problems with languages in which parts of inflectional material are added in an order that is not predicted by the hierarchy of

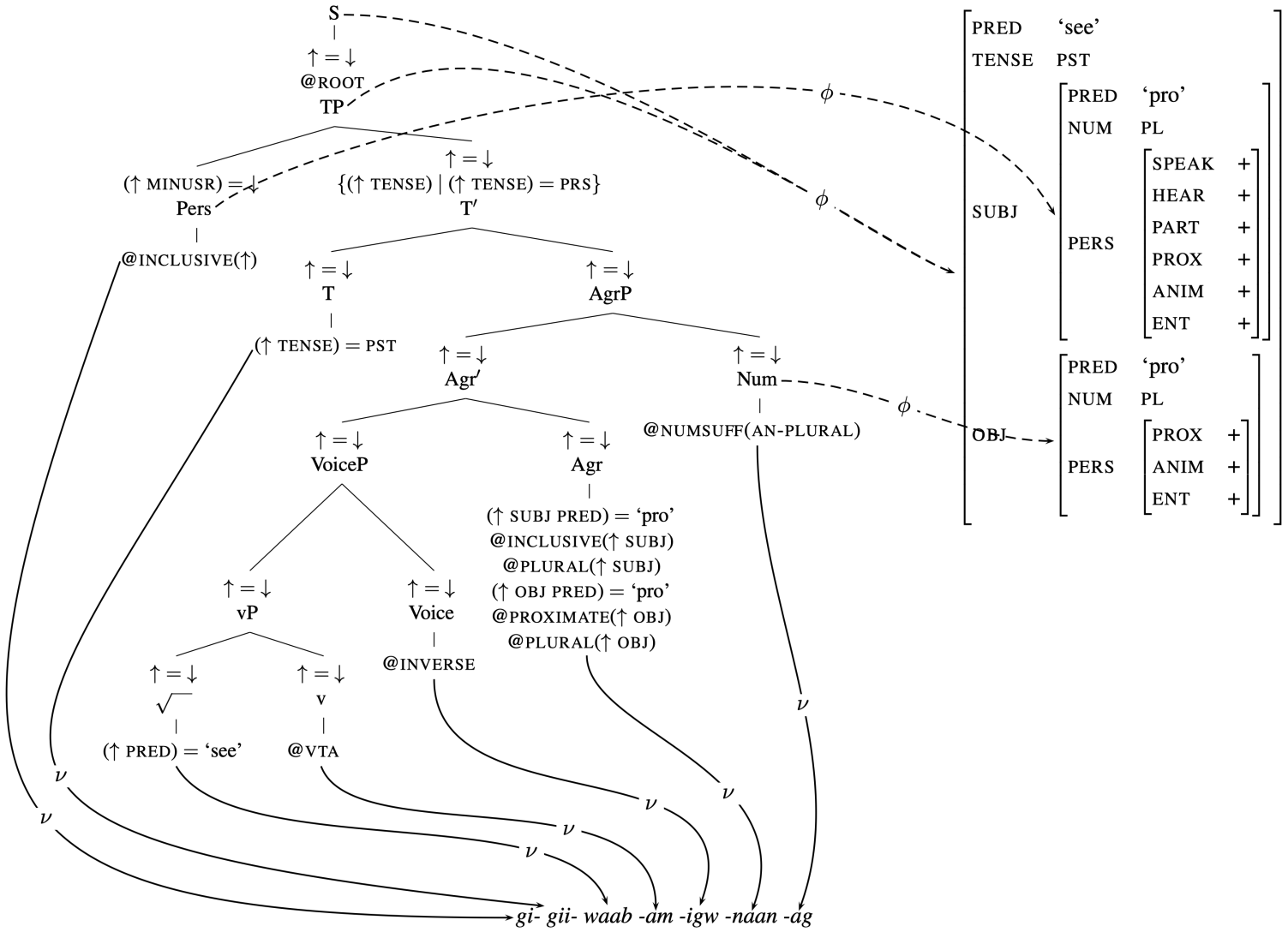

Figure 14: L_RFG c-structure, f-structure, and (simplified) v-structure for Ojibwe *gigiiwaabamigwnaanag* ‘They saw us(incl)’ according to Asudeh & Siddiqi (2023)

functional categories (see Crysmann & Bonami 2016: Section 3 for a general discussion of problems with the Mirror Principle).

Pointing out the templative nature of morphology and the existence of subtractive processes/morphemes and portmanteau phenomena will probably not impress proponents of Distributed Morphology and L_RFG, but if the claim is that syntax and morphology basically use the same structures, arguments against functional projections in syntax should be relevant for the complete morpho-syntactic system. Haider (2010: 62–64) and Müller (2023: Section 4.10.2) argued against functional projections on various grounds. A relevant category is IP or TP, which is argued to be non-existent in grammars of German (Haider 1993, 1997, Berman 2003: Section 3.2.3.2, Müller 2018b: Section 3.5). TP and Agr projections, as present in Figure 14, are not assumed in grammars of German, although there is morphological information relevant for tense and subject-verb agreement. But if such functional projections are not assumed in syntax, their assumption in the morphological domain, which is claimed to be indistinguishable from syntax, would not make sense.

5 Conclusion

Lexicalism deals with several questions: "Where are arguments licenced?" and "What is visible to syntax?" I argued again for a lexical treatment of valence information and valence alternations. I also looked at more recent proposals in LFG that attempt to fuse LFG with work in Distributed Morphology. DM does not distinguish between syntax and morphology, but assumes that there are syntactic structures all the way down. I showed that at least the L_RFG approaches make assumptions about the sublexical level that are not made in LFG syntax proper. This means that there is an implicit assumption that morphology is different from syntax and this is what lexicalists believe.

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