Phrasal or Lexical Constructions?

Stefan Müller

Theoretische Linguistik/Computerlinguistik
Universität Bremen/Fachbereich 10
Postfach 33 04 40
D-28334 Bremen

`Stefan.Mueller@cl.uni-bremen.de`

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Abstract

Since the 1990s, more and more linguistic articles have been published in the framework of Construction Grammar. Although Kay and Fillmore (1999, p. 19) make it clear that Constructions are not necessarily phrasal, most of the authors suggest phrasal Constructions. This is especially apparent in Construction Grammar-inspired studies in the HPSG framework.

In what follows, I show that the difference between phrasal approaches and lexical approaches is not as great as is sometimes claimed, although selecting one approach over the other may nevertheless have serious consequences. This discussion focuses on resultative constructions, a phenomenon for which both phrasal and lexical analyses have been suggested. I show that a considerable number of different Constructions must be postulated to account for all the patterns that may arise from the interaction of the resultative construction with both constituent reordering and valence changing processes. It is shown that adjuncts, predicate complexes, and derivational morphology pose considerable problems for the phrasal approach, while they are unproblematic for lexical rule-based approaches.

The discussion is relevant for all frameworks that do not use transformations to map phrasal configurations to other phrasal configurations.[*]

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1   Introduction

Since the 1990s, more and more linguistic articles have been published in the framework of Construction Grammar (CxG). Some influential publications are Kay and Fillmore, 1999; Fillmore, 1999; and Goldberg, 1995. Although Kay and Fillmore (1999, p. 19) make it clear that Constructions[1] are not necessarily phrasal, most of the authors suggest phrasal Constructions. This is especially apparent in Construction Grammar-inspired studies in the HPSG framework. See for instance Sag, 1997; Ginzburg and Sag, 2001; Borsley, 2004; Haugereid, 2004.

In what follows I show that the difference between phrasal approaches and lexical approaches is not as great as is sometimes claimed, although selecting one approach over the other may nevertheless have serious consequences. This discussion focuses on resultative constructions, a phenomenon for which both phrasal and lexical analyses have been suggested. A considerable number of different Constructions must be postulated to account for all the patterns that may arise from the reordering of constituents or the realization of the resultative construction in connection with valence changing processes. It is shown that adjuncts, predicate complexes, and derivational morphology pose considerable problems for the phrasal approach, while they are unproblematic for lexical rule-based approaches.

An example of the resultative construction is given in 1. The resultative construction consists of a verb that denotes some event and a secondary predicate that provides information about the result of the event. In 1, the secondary predicate predicates over an NP that is not an argument of the verb. There are other patterns of resultative constructions, but they are not discussed here since they are irrelevant to the issue under discussion (see for instance Simpson, 1983 and Rothstein, 1985).

(1)   They drank the pub dry.

Such constructions have been analyzed as Small Clauses (see for instance Hoekstra, 1988; den Dikken, 1995), as complex predicates where *drank* and *dry* form a constituent at some level of representation (Dowty, 1979, Chapter 4.7 for English; Neeleman and Weermann, 1993; Neeleman, 1995 for English and Dutch; Müller, 2002, Chapter 5 for German), or as phrasal constructions (Goldberg, 1995; Jackendoff, 1997; Goldberg and Jackendoff, 2004). In the following, I mainly discuss the question of how the combination of the verb with the NP *the pub* and the predicate *dry* is licensed. Proponents of (phrasal) Construction Grammar suggest a phrasal Construction that licenses subject, verb, object, and secondary predicate as in 2a or a phrasal Construction that licenses verb, object, and secondary predicate as in 2b:

(2)   a. [SUBJ [V OBJ OBL]]   (Goldberg, 1995, p. 192)
      b. VP → V NP AP/PP   (Goldberg and Jackendoff, 2004)

The lexicon-oriented approaches, on the other hand, do not assume special phrase structure rules for resultative constructions, but rather additional lexical items that license the elements present in resultative constructions (see Simpson, 1983; Wunderlich, 1992, p. 45; Verspoor, 1997; Wechsler, 1997; Wechsler and Noh, 2001; Müller, 2002 for analyses of English, German, and Korean resultative constructions).

Approaches like Goldberg's face certain problems when the interaction with other phenomena (e.g. passive, middle) is considered. In the following, I transfer Goldberg's

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[1]Throughout the paper I use the term 'construction' in a theory-neutral way. For constructions in the sense of Construction Grammar, I use 'Construction'.

analysis to German and show that further problems arise since German has a much freer constituent order than English and allows interaction with derivational morphology. The problems that already exist in the analysis of English are thus much more apparent. The following sections deal with interactions between resultative constructions and syntax (Section 2) and morphology (Section 5). While there are several phenomena for which it is unclear what a phrasal analysis might look like, it is clear that a considerable number of phrasal Constructions is needed to account for the patterns that can be analyzed. Proponents of CxG argue that this is not a problem since the regularities are captured in an inheritance hierarchy and such inheritance hierarchies can be computed automatically from the set of Constructions that are stated by the grammar writer. I show in Section 3 that the algorithm that was suggested by Kay (2002, Section 7.1) does not work and that attempts to fix it lead to unwanted consequences. In Section 4, I discuss examples from Yucatec Maya that show that passive cannot be analyzed with reference to classification in an inheritance hierarchy. Section 6 discusses the alternative lexical rule-based approaches and compares them with the phrasal approach. Section 7 discusses the question of whether phrasal approaches are needed at all. I show how phrasal approaches to other phenomena such as idioms, for instance, can be converted into lexical approaches. Section 8 draws some conclusions.

2   Interactions between Resultative Constructions and syntax

Goldberg (1995, p. 192) assumes the following Construction for English resultative constructions:

(3)   [SUBJ [V OBJ OBL]]

If one wishes to extend Goldberg's analysis to German, one can assume a flat structure of the German clause and assign the structure in 4 to the example in 5:

(4)   [SUBJ OBJ OBL V]

(5)   (weil)   sie die Nordsee leer   fischen
      because they the North.Sea empty fish
      'because they fish the North Sea empty'

Alternatively one could use binary branching structures, but this would in no way simplify the grammar. On the contrary, one would be forced to specify constraints on trees of a depth greater than one, and thus the constraints would be non-local, something against which, for instance, Sag (To Appear) explicitly argues.

   To give a full account of German resultatives, one has to explain the following constituent order phenomena:

   1. Arguments can be reordered.

      (6)   a. weil   niemand   den Teich leer   fischt.
               because nobody$_{nom}$ the pond$_{acc}$ empty fishes
               'because nobody fishes the pond empty.'

            b. weil   den Teich niemand   leer   fischt.
               because the pond$_{acc}$ nobody$_{nom}$ empty fishes

2. The finite verb can appear in both initial (7) and final position (6).

   (7) Fischt jemand   den Teich leer?
             fishes somebody the pond empty
             'Does somebody fish the pond empty?'

3. Adjuncts may appear anywhere between arguments.

   (8) a. daß schnell jemand   den Teich leer   fischt.
            that quickly somebody the pond empty fishes
            'that somebody is fishing the pond empty quickly.'

        b. daß jemand   schnell den Teich leer   fischt.
            that somebody quickly the pond empty fishes

        c. daß jemand   den Teich schnell leer   fischt.
            that somebody the pond quickly empty fishes

4. Arguments and adjuncts belonging to resultative constructions and predicates that embed the resultative construction may be permuted and interleaved:

   (9) a. weil   niemand ihn   den Teich leer   fischen sah
            because nobody$_{nom}$ him$_{acc}$ the pond$_{acc}$ empty fish   saw
            'because nobody saw him fish the pond empty'

        b. weil   ihn   den Teich niemand leer   fischen sah
            because him$_{acc}$ the pond$_{acc}$ nobody$_{nom}$ empty fish   saw

    In 9, *niemand* ('nobody') is dependent upon *sah* ('saw'), but in 9b it is serialized between the resultative predicate and its subject.

In transformations-based accounts, constituent reordering, fronting, and passive can be explained by movement operations. Adjunct serialization can be explained by assuming that adjuncts attach to VPs and the material from inside of the VP is scrambled to positions preceding the adjuncts. Such analyses are usually rejected in nonderivational constraint-based frameworks, and thus they are not an option for proponents of phrasal CxG analyses. Instead additional Constructions have to be stipulated that account for patterns that are not covered by 4. In what follows, I show which Constructions one needs to account for the patterns mentioned so far and for other interactions with the grammar of German.

2.1 Local reordering of constituents

Since subject and object may be permuted and since the verb can appear both in initial and in final position, at least the following Constructions are needed:[2]

(10) a. [SUBJ OBJ OBL V]   c. [V SUBJ OBJ OBL]
       b. [OBJ SUBJ OBL V]   d. [V OBJ SUBJ OBL]

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[2]Of course it is possible to distinguish between immediate dominance and linear precedence, as is done in HPSG. The four Constructions in 10 could then be collapsed into one. But the reorderings come with information structure effects and given that other reorderings such as Heavy-NP-Shift (Kay, 2002) and Subject-Auxiliary-Inversion (Fillmore, 1999) in English are modeled by Constructions, it thus seems safe to assume that proponents of phrasal Constructions would posit Constructions for all the patterns. See also Goldberg, 1995, p. 7 for a statement regarding the representation of information about focused constituents and topicality in Constructions. Comments about Constructions and information structure can also be found in (Goldberg, 2006, p. 220).

In addition to cases like 6, there are examples with focus split, in which the resultative predicate is separated from the verb. Neeleman (1994, p. 85) gives a Dutch example with a resultative predicate separated from the base verb which transfers to German easily:

(11) a. daß so grün selbst Jan die Tür nicht streicht
       that that green even Jan the door not   paints
       'that not even Jan would paint the door that green.'

   b. daß so grün die Tür selbst Jan nicht streicht
       that that green the door even   Jan not   paints

   c. daß Jan so grün selbst die Tür nicht streicht
       that Jan that green even   the door not   paints

   d. daß eine solche Tür so   grün niemand streicht
       that a   such   door that green nobody   paints
       'that nobody paints such a door that green'

See also Lüdeling, 2001, p. 50 on resultative constructions and focus split.

As the examples show, the secondary predicate may be placed before the SUBJ and OBJ or between the two NPs. In each case, both SUBJ OBJ and OBJ SUBJ are possible. To account for such linearizations, one would need the following Constructions:

(12) a. [OBL SUBJ OBJ V]   e. [V OBL SUBJ OBJ]
    b. [OBL OBJ SUBJ V]   f. [V OBL OBJ SUBJ]
    c. [SUBJ OBL OBJ V]   g. [V SUBJ OBL OBJ]
    d. [OBJ OBL SUBJ V]   h. [V OBJ OBL SUBJ]

2.2 Fronting

German is a verb second language. The position in front of the finite verb is filled by a single constituent that is extracted from the remaining clause. The fronted element may be deeply embedded and, thus, a non-local dependency is involved.

As far as resultatives are concerned, the subject 13a, the object 13b, an adjunct 13c, or the resultative predicate 13d can be fronted:

(13) a. Er fischt den Teich schnell leer.
       he fishes the pond quickly empty
       'He is fishing the pond empty quickly.'

   b. Den Teich fischt er schnell leer.
       the   pond fishes he quickly empty

   c. Schnell fischt er den Teich leer.
       quickly fishes he the pond empty

   d. Leer   fischt er den Teich nicht.
       empty fishes he the pond not
       'He is not fishing the pond empty.'

The question how verbs are ordered is independent of the order of SUBJ and OBJ and Goldberg could assume an empty verbal head in clause final position that is related to an overt verb in clause initial position. 10a and 10b would then be sufficient and 10c and 10d would have the structure [V_i [SUBJ OBJ OBL $\_i$]] and [V_i [OBJ SUBJ OBL $\_i$]], respectively. However, empty elements are usually avoided in Construction Grammar. See Kathol, 1997 for a proposal regarding German clause structure and Footnote 3 below for remarks on traces.

In any case, for the passive and fronting cases discussed below additional Constructions are needed since the passive involves valence change and fronting involves a non-local dependency.

If one wants to avoid positing empty elements[3], additional Constructions for the introduction of non-local dependencies are needed:[4]

(14)   a. [V SUBJ OBL] (OBJ extracted)

        b. [V OBJ OBL] (SUBJ extracted)

        c. [V SUBJ OBJ] (OBL extracted)

        d. [V OBJ SUBJ] (OBL extracted, OBJ and SUBJ permuted)

If one follows the phrasal approach, information about extracted elements cannot be introduced lexically, since some parts of the Construction are contributed by the Construction itself and hence cannot be accessed at the lexical level. An analysis of extraction such as the one suggested by Bouma et al. (2001) is thus incompatible with the phrasal approach to resultatives.[5]

In addition to the Constructions in 14, one needs those in 16 to account for resultative constructions in relative clauses and resultative constructions in interrogative clauses like those in 15:

(15)   a. der Mann, der den Teich leer   fischt
           the man   who the pond empty fishes
           'the man who fishes the pond empty'

        b. den Teich, den Richard leer   fischt
           the pond   that Richard empty fishes
           'the pond that Richard fishes empty'

        c. Er hat gefragt, wie platt Max das Metall gehämmert hat.
           he has asked   how flat Max the metal hammered has
           'He asked how flat Max hammered the metal.'

The relative phrase and the interrogative phrase, i.e. the phrase containing the relative pronoun or the interrogative pronoun, respectively is usually analyzed as a phrase that is extracted from the rest of the clause.

(16)   a. [SUBJ OBL V] (OBJ extracted)

        b. [OBJ OBL V] (SUBJ extracted)

        c. [SUBJ OBJ V] (OBL extracted)

        d. [OBJ SUBJ V] (OBL extracted)

The Constructions in 16 differ from those in (14) with respect to the serialization of the verb: relative clauses and interrogative clauses are verb final. 16 contains patterns for the extraction of OBJ, SUBJ, and OBL (16a–c) and a fourth Construction in which OBL is extracted and SUBJ and OBJ are permuted.

We also need extraction patterns for the focus split + resultative construction:

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[3]See for instance Kay and Fillmore, 1999, p. 7, p. 14 for a traceless analysis of extraction and Michaelis and Ruppenhofer (2001, p. 49–50) and Goldberg (2006, p. 10) on the status of empty elements in Construction Grammar. The analysis of English relative clauses suggested by Sag (1997) was developed in order to eliminate the empty head that was necessary in the analysis of relative clauses in Pollard and Sag, 1994, Chapter 5.

[4]See also Müller, 2002, Chapter 6.2.5.1, Chapter 7.3 and Müller, To Appear for discussion. An approach that corresponds to 14 is proposed by Haugereid, 2004. Since Haugereid does not use a valence list that contains all the arguments of a head, he cannot capture the commonalities of Constructions with an extracted subject and those with an extracted object. The respective Constructions have to be stipulated in an inheritance network separately.

[5]Goldberg (2006, p. 155) cites Sag and Fodor (1994) for a traceless account of long-distance dependencies in a monostratal framework. This analysis is the predecessor of the Bouma, Malouf, Sag paper. It is also lexical and incomatibel with a phrasal analysis of resultative constructinos.

(17) a. [OBL OBJ V] (SUBJ extracted)

b. [OBL SUBJ V] (OBJ extracted)

c. [V OBL OBJ] (SUBJ extracted)

d. [V OBL SUBJ] (OBJ extracted)

The patterns in 17 are verb final and verb initial patterns with SUBJ or OBJ extracted and OBL and the other remaining element permuted.

This subsection dealt with local constituent reordering and extraction, but the surface pattern of the resultative construction may also change due to changes in argument realization. The next subsection discusses passives, modal infinitives, and the middle construction.

2.3   Passive, modal infinitives, and the Middle Construction

Resultatives can appear in agentive passive sentences (18a), in stative passive sentences (18b), in the middle construction (18c), and in modal infinitive constructions (18d):

(18) a. Der Teich   wurde leer   gefischt.
the pond$_{nom}$ was   fished empty

b. Der Teich   ist leer   gefischt.
the pond$_{nom}$ is fished empty

c. Der Weinkeller   trinkt sich schnell leer.[6]
the wine.cellar$_{nom}$ drinks self fast   empty
'What's in the wine cellar is drunk quickly.'

d. Der Teich   ist bis Montag leer   zu fischen.
the pond$_{nom}$ is until Monday empty to fish
'The pond has to be fished empty by Monday.'

The previous subsections show that one needs four Constructions for permutations of subject and object, eight permutations for focus split constructions in which the resultative predicate appears between or in front of the NPs, and twelve Constructions for traceless extractions (if we abstract away from local reordering, we still need four Constructions). In addition we need the following Constructions to account for passive together with reorderings, focus movement, and extractions:

(19) a. [SUBJ OBL V] (passive)   e. [V SUBJ OBL] (passive)
b. [OBL SUBJ V] (passive, focus m.)   f. [V OBL SUBJ] (passive, focus m.)
c. [OBL V] (passive, SUBJ extracted)   g. [V OBL] (passive, SUBJ extracted)
d. [SUBJ V] (passive, OBL extracted)   h. [V SUBJ] (passive, OBL extracted)

On top of that, one needs Constructions for the middle construction and for modal infinitives. The middle suppresses the logical subject of the verb and adds a dummy reflexive, which allows for additional permutations.

Since some of the arguments in the Resultative Construction can be introduced by the Construction, passive cannot be treated as a lexical process, but must be treated on the phrasal level. Therefore treatments in terms of lexical linking Constructions as suggested by Kay and Fillmore (1999, p. 12) and Michaelis and Ruppenhofer (2001, Chapter 4) or the more conventional analyses in terms of lexical rules (Bresnan, 1982; Pollard and Sag, 1987, p. 214–218; Müller, 2002, Chapter 3) are excluded. Goldberg

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[6]Wunderlich, 1997, p. 118. See also Koch and Rosengren (1995, p. 17) for similar data.

(1995, p. 78–79) seems to have in mind some device that is similar to transformations[7] or GPSG metarules, i.e., a rule that maps an active Construction onto a passive Construction.[8] The alternative to a metarule approach would be to assume an abstract Resultative Construction with constraints inherited by both an active and a passive phrasal Resultative Construction (see also Figure 2 on page 17). According to Kay, 2005, Goldberg assumes such an explicit cross-classification.[9] Goldberg and Jackendoff (2004, p. 536, Fn. 4) also mention the interaction, but the exact formalization of the interaction is not discussed:

> We set aside here passive and middle resultatives, such as *The metal was hammered flat* and *This metal hammers flat easily*. We take it that these expressions are formed by composing the passive and middle constructions with resultative constructions.

Although Constructions can be represented compactly in inheritance hierarchies, the need to stipulate a special passive Resultative Construction and special extraction variants for Resultative Constructions is rather unattractive. See Section 3 for a discussion of the automatic computation of Construction hierarchies.

2.4 Adjuncts

A further problem seems to be adjuncts like *schnell* ('fast') in 8. Since the adjunct scopes over the semantic contribution of the Resultative Construction, one needs a Construction like 20 to account for 8c, unless one is willing to assume a discontinuous Resultative Construction that allows an adjunct to appear between parts of the Resultative Construction:

(20)   [SUBJ OBJ Adjunct OBL V]

In what follows, I discuss approaches to adjuncts suggested in the Construction Grammar literature and show that these proposals cannot be used to analyze 8 and that therefore, the stipulation of Constructions like 20 seems unavoidable. I start with the analysis suggested by Kay and Fillmore (1999) and then turn to that of Kay (2005).

Constructional Introduction of Adjuncts   Kay and Fillmore (1999) assume that constituents in a VP are licensed if they appear in the valence set of the mother node of the VP. Adjuncts are licensed by unifying a verbal structure with an adjunct Construction. As an example, they give the following lexical entry for *arrive* (their Figure 5) and the *Setting Construction* (their Figure 4):[10,11]

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[7]Goldberg (1995, p. 7; 2006, p. 205) states that Construction Grammar is not transformational.

[8]Since Goldberg (1995, p. 192) assumes the complex structure in (i), GPSG metarules cannot be used to map active Constructions to passive Constructions. GPSG metarules apply to simple phrase structure rules only, not to trees with a depth greater than one.

   (i)   [SUBJ [V OBJ OBL]]

A metarule approach could be assumed if the Resultative Construction were a specialization of the rule in 2b.

[9]See Goldberg, 2006, p. 22, Fn. 3 for the stipulation of the *Passive ditransitive Construction*, that is, a specific passive Construction that is relevant for ditransitive verbs only.

[10]The '{ }' stands for an unspecified set, not for the empty set.

[11]Setting adjuncts are, for instance, those of time, place, and condition. Such adjuncts are licensed by the Setting Construction.

(21)   a. lexical entry for *arrive*:

$$
\begin{bmatrix}
\text{cat v} \\
\text{sem} \left\{ \begin{bmatrix} \text{I} & \text{FRAME} & \text{ARRIVE} \\ & \text{ARGS} & \{\,\text{A}\,\} \end{bmatrix} \right\} \\
\text{val} \left\{ [\text{sem}\{\text{A}\}] \right\}
\end{bmatrix}
$$

   b. Setting Construction:

$$
\begin{bmatrix}
\text{cat v} \\
\text{sem} \left\{ \begin{bmatrix} \text{I} & \text{FRAME} & [] \\ & \text{ARGS} & \{\} \end{bmatrix}, \begin{bmatrix} \text{II} & \text{FRAME} & [] \\ & \text{ARGS} & \{\,\text{I}\,\} \end{bmatrix} \right\} \\
\text{val} \left\{ [\text{sem}\{[^{\text{II}}\ \,]\}] \right\}
\end{bmatrix}
$$

The items in 21 provide information about the part of speech of the respective object (represented as value of CAT), information about the meaning of the linguistic object (represented as the value of SEM), and also refer to the valence of a linguistic object (represented under VAL). In 21a the semantics of a dependent element—that is an element that is contained in VAL—is identified with an argument slot in a semantic frame. This is indicated by the 'A'. The Setting Construction is a Construction that has to be unified with a verbal constituent already containing the scene indexed as I. The Setting Construction adds a scene, typically a locational or temporal setting, indexed as II.

Kay and Fillmore want to extend the valence set of the lexical entry by unification with the *Setting Construction*. The intended result is a structure that contains both the element the verb originally selects in 21a and an additional element, namely the adjunct contributed by the *Setting Construction*. According to Kay and Fillmore the unification of 21a and 21b plus additional information provided by the lexical item *before* is:

(22)   Unification of 21a and 21b and the information in the lexical entry of *before*, according to Kay and Fillmore:

$$
\begin{bmatrix}
\text{cat v} \\
\text{sem} \left\{ \begin{bmatrix} \text{I} & \text{FRAME} & \text{ARRIVE} \\ & \text{ARGS} & \{\,\text{A}\,\} \end{bmatrix}, \begin{bmatrix} \text{II} & \text{FRAME} & \text{BEFORE} \\ & \text{ARGS} & \{\,\text{I, E}\,\} \end{bmatrix} \right\} \\
\text{val} \left\{ [\text{sem}\{\text{A}\}], \begin{bmatrix} \text{CAT} & \text{p} \\ \text{LEXICAL-HEAD} & \text{before} \\ \text{VAL} & \left\{ \begin{bmatrix} \text{GF} & obj \\ \text{SEM} & E \end{bmatrix} \right\} \end{bmatrix} \right\}
\end{bmatrix}
$$

But this presupposes a special definition of set unification that allows the extension of the number of elements in a set. Since an element of a set may also be unified with one element of the other set (the first element in SEM in (21b) with the element in SEM in (21a)), Kay and Fillmore's version of unification cannot be understood as a (multi) set union as in Krieger et al., 2004.[12] If set unification can result in set union and in element unification, the result of the unification of the elements in SEM should be a disjunction of the value given in 22 and a set that contains the set union of the two SEM

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[12]A multi set may contain an element several times. Thus { a, a, b } is a multi set but no set.

sets. Thus the notion of set unification that Kay and Fillmore assume seems not to be sound.

The unification of two structures FS_1 and FS_2 is defined to be the structure FS_3 that is subsumed by both FS_1 and FS_2 and that is not subsumed by any other structure that is subsumed by both FS_1 and FS_2. Intuitively, this states that the information represented in FS_1 and the information represented in FS_2 is also represented in FS_3, but includes no additional information. FS_1 and FS_2 are less than or equally specific as FS_3. If set unification is assumed to be set union, the definition of unification would require the following understanding of valence representations: a valence value { NP } says something like the following: this lexical item needs at least one NP argument. A valence value { NP, NP } says: this lexical item needs at least two NP arguments. This means that the last valence list is more specific than the first one. The set of objects that are described by the first valence list includes the set of objects described by the last one. In particular, transitive verbs are a special case of intransitive verbs, which is not what is usually assumed when linguistic objects are classified with respect to their valence.[13]

It is interesting to note that if set unification is (multi) set union, the result of unifying a structure with itself differs from the structure.

(23) $[F \{ a \}] \wedge [F \{ a \}] \overset{?}{=} [F \{ a, a \}]$

This is not consistent with the definition of unification given above since the unification of X with X should be X and not a more specific structure. In some knowledge representation systems that are used in Artificial Intelligence, the unification of two sets S_1 and S_2 is defined in a way that elements in S_2 that are compatible with elements from S_1 are unified while elements that are not compatible with any element of S_1 are added to the result set. The examples given in Clark and Porter, 2004, p. 36 are shown in 24:

(24)   a.   { cat, dog } $\wedge$ { dog, elephant } = { cat, dog, elephant }
        b.   { cat } $\wedge$ { cat } = { cat }

But since adjunction is recursive (see below), one needs multi sets: it has to be possible that one predicate appears more than once in a set. With the above definition of set unification, the unification of *arrive* with two adjunct constructions would be 25a and not the intended 25b:

(25)   a. $\{ [\text{sem} \{ A \}] \} \wedge \{ [\text{sem} \{ [^{II}] \}] \} \wedge \{ [\text{sem} \{ [^{II}] \}] \} =$
             $\{ [\text{sem} \{ A \}], [\text{sem} \{ [^{II}] \}] \}$
        b. $\{ [\text{sem} \{ A \}] \} \wedge \{ [\text{sem} \{ [^{II}] \}] \} \wedge \{ [\text{sem} \{ [^{II}] \}] \} \neq$
             $\{ [\text{sem} \{ A \}], [\text{sem} \{ [^{II}] \}], [\text{sem} \{ [^{II}] \}] \}$

The following example by Frey and Gärtner (2002, p. 47–48) shows that recursion is needed for handling adjuncts:

(26)   dass Hans den Tisch ungeschickt geschickt ungeschickt abräumte
        that Hans the table clumsily   skillfully clumsily   cleared

Regarding the utterance context, Frey and Gärtner write:

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[13]In HPSG, it is assumed that two sets of different arity do not unify unless some elements in the set that has more elements describe the same object. See for instance Pollard and Sag (1987, p. 47–49), Pollard and Moshier (1990) and Carpenter (1992, p. 34) for discussions of set unification. With the HPSG definition, neither transitive verbs are more special than intransitive verbs nor vice versa.

> Assume Hans is an actor whose assignment it is to clumsily clear the table. He will thus muster all his skills to skillfully clumsily clear the table. He may, however, fail in this effort. In this sense, he can be taken to have clumsily skilfully clumsily cleared the table. As long as our imagination doesn't fail us, this stacking of "manners" can continue unboundedly.

Recursion as in 26 cannot be modeled by unification as it is usually defined. If we unify a certain adjunct construction—say a *Manner Construction*—with another construction two times, the result will not differ from the first unification.

Apart from the non-canonical understanding of sets, there is another problem in Kay and Fillmore's treatment of adjuncts: there is nothing that guarantees that the elements in the sets in 21b are unified with the right elements, i.e., there is nothing that enforces the unification of the first element in SEM of 21b with *arrive*. The Setting Construction is unified with a VP Construction and the VP contains in the SEM set all semantic representations of the elements in the VP (Kay and Fillmore's Subset Principle, 1999, p. 9). Thus the first element in SEM of 21b could be unified with any of the verbal frames from the complete VP (for instance if there is an adjunct clause). Similarly the element in VAL could be unified with some other dependent of the head.

Lexical Introduction of Adjuncts   Van Noord and Bouma (1994) and Kay (2005) suggest the lexical introduction of adjuncts. This approach cannot be applied to Goldberg's analysis since the resultative meaning is contributed at the phrasal level. Since the adjunct in 8 scopes over the resultative meaning, it cannot be introduced as part of the meaning of a lexical item for the verb *fischt* ('fishes').

Conclusion for Phrasal Treatments of Resultatives   The previous subsections show that Kay and Fillmore's phrasal analysis of adjuncts does not work and that a lexical analysis is incompatible with the phrasal approach to resultative constructions. It thus seems necessary to explicitly stipulate a Construction like 27 that mentions adjunct daughters and says something about the relation between the adjunct and the material it attaches to.

(27)   [SUBJ OBJ Adjunct OBL V]

Since the number of adjuncts is not restricted, one would need infinitely many Constructions, unless one uses abbreviations like the Kleene star.[14] Using the Kleene star, one could represent the Resultative Construction for German as follows:

(28)   [Adjunct* SUBJ Adjunct* OBJ Adjunct* OBL Adjunct* V]

This description does not represent the fact that there are other non-resultative sentences that contain adjuncts. The fact that adjuncts can appear in German sentences has to be restated within various Constructions. Furthermore, adjuncts can only appear between OBL and V if there is a focus split. This means that subconstructions are necessary. One would be the *Resultative Construction with Focus Split and Adjuncts between the Split Elements*.

If one uses a Kleene star as in 28, one has to explain how the adjuncts contribute their meaning to the mother node. This is possible, but it would make the use of relational constraints or equivalent mechanisms necessary (see Kasper, 1994 for such a

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[14]The Kleene star says that a certain pattern may be repeated any number of times, i.e., XP* stands for zero or any number of XPs.

proposal in the framework of HPSG). Relational constraints are powerful devices and should be avoided, if possible.

2.5 Interleaving of dependents of complex forming predicates

The examples in 9—repeated here as 29 for convenience—show that an argument of a predicate embedding a resultative construction may appear between the parts that belong to the resultative construction. In 29b, *niemand* separates *den Teich* and *leer*:

(29) a. weil   niemand   ihn   den Teich   leer   fischen sah.
        because nobody$_{nom}$ him$_{acc}$ the pond$_{acc}$ empty fish   saw
        'because nobody saw him fish the pond empty'

      b. weil   ihn   den Teich   niemand   leer   fischen sah.
        because him$_{acc}$ the pond$_{acc}$ nobody$_{nom}$ empty fish   saw

This is explained by the lexical analysis: *leer fischen* and *sah* form a complex predicate and the arguments of this complex predicate may be permuted as arguments of simplex heads can. The technical apparatus for this was formalized by Geach (1970) in the framework of Categorial Grammar and later adapted to HPSG by Hinrichs and Nakazawa (1994). A complex predicate analysis for resultative predicates in the framework of HPSG was first suggested in Müller, 2002.

With the phrasal analysis, transformations (or trace-based simulations thereof) are the only option available for analyzing such permutations, but some researchers working in GB and more recent variants of this theory have argued that constituent ordering as observed in 29b is not movement but base generation (see for instance Fanselow, 2001, 2002).

Analyzing the Resultative Construction in 29b as a discontinuous constituent, as was suggested by Reape (1994) for other clause union phenomena, leads to problems with subject verb agreement and the so-called remote passive in German, as Kathol (1998) shows. Furthermore, discontinuous constituents are a very powerful device that is not really needed to account for the syntax of German (Müller, 2005c); on the contrary, analyses like those suggested by Müller (1999, 2002) and Kathol (2000) which use discontinuous constituents to account for verb placement cannot cope with multiple frontings as shown in Müller, To Appear and Müller, 2005d.

2.6 Free datives

Andrew McIntyre (p. c., 2004) pointed out the interaction of several other phenomena with resultatives. I mention only one particularly interesting example that shows interaction with all the phenomena discussed so far: free datives. Free datives, such as the one in 30b, can be interpreted as benefactive or malefactive: If *he* refers to a famous painter, the benefactive interpretation may be appropriate; if it refers to a little child, the malefactive interpretation may be the intended one (Wegener, 1985, p. 100). The example in 30c shows that such datives allow for the so-called dative passive, in which a dative argument is realized as nominative.

(30) a. Er   bemalt den Tisch.
        he$_{nom}$ paints the table$_{acc}$
        'He paints the table.'

      b. Er   bemalt ihr   den Tisch.
        he$_{nom}$ paints her$_{dat}$ the table$_{acc}$
        'He paints the table for her.'

    c. Sie   bekommt den Tisch   bemalt.
       she$_{nom}$ gets   the table$_{acc}$ painted
       'She is getting the table painted.'

The interesting thing is that such datives are possible with resultatives as well. 31a shows an example for the active case and (31b, c) show the two passive variants.

(31) a. daß jemand   ihm   den Teich leer   fischt
         that somebody$_{nom}$ him$_{dat}$ the pond$_{acc}$ empty fishes
         'Somebody is fishing the pond empty for him.'

      b. daß ihm   der Teich   leer   gefischt wurde
         that him$_{dat}$ the pond$_{nom}$ empty fished   was
         'The pond was fished empty for him.'

      c. daß er   den Teich leer   gefischt bekommt
         that he$_{nom}$ the pond$_{acc}$ empty fished   was
         'Somebody fished the pond empty for him.'

Of course all of the constituents in these examples may be permuted or fronted. Since the example in 31a involves three NPs instead of the two NPs in the examples discussed earlier, the number of required Constructions would increase even more dramatically: We would get ones like: *The Dative Passive of Resultative with Free Dative and the Subject Extracted Construction.*

2.7   Interim summary

The previous subsections show that an enormous number of Constructions is needed to cover all the patterns the resultative construction can appear in. To account for permutations of SUBJ, OBJ, and OBL, including special permutations due to focus movement, one needs 2×3 Constructions. Due to two possible verb positions, the number of Constructions is doubled. One of the tree elements is extracted in the fronting examples. Since the other elements can be reordered, we need 2×3 Constructions. Since the verb can be in initial or in final position, depending on the clause type (main clause vs. interrogative or relative clause), this number has to be multiplied by two.

    In passivized resultative constructions, only two elements remain (SUBJ OBL). If we take into account focus movement, these elements allow for two permutations. Since there are two verb orders, we need four Constructions. The same number of Constructions is needed to handle the extraction cases.

    Reordering is much more restricted in middle constructions. The reflexive pronoun can be reordered with respect to other NPs, but reordering of the adjunct which is an obligatory part of the middle construction and reordering of the resultative predicate is at least highly marked, if not excluded at all. The reflexive pronoun may not be extracted.

    For sentences with free datives, we have one more element that can be permuted or extracted: one needs 96 Constructions for the active, 24 Constructions for the passive, and 24 Constructions for modal infinitives. In addition, 24 Constructions for the dative passive are needed. The middle construction seems to be impossible with free datives and the resultative construction. The following table summarizes this.

Constituents	Phenomenon	Number of Constructions
SUBJ OBJ OBL V	Active RC	24
SUBJ OBL V V-Aux	Passive RC	8
SUBJ OBL V V-Aux	Modal Infinitive RC	8
SUBJ Refl Adj OBL V	Middle RC	10
SUBJ Dat OBJ OBL V	Active RC + Dat	96
SUBJ Dat OBL V V-Aux	RC + Dat + Passive	24
SUBJ Dat OBL V V-Aux	Modal Infinitive RC	24
SUBJ OBJ OBL V V-Aux	RC + Dat + Dat-Passive	24
		218

This results in a total of 218 Constructions. These Constructions account for most of the phenomena discussed so far. Adjuncts and complex predicates, as discussed in Section 2.5, are not included, and there are probably other phenomena that interact with the resultative construction in a way that would make the stipulation of further Constructions necessary.

If local reordering of constituents is accounted for by separating dominance from precedence information, as was done in GPSG (Gazdar et al., 1985), the following number of Constructions is needed (see Footnote 2 on page 5 on reordering):

Constituents	Phenomenon	Number of Constructions
SUBJ OBJ OBL V	Active RC	1
	Extraction	3
SUBJ OBL V V-Aux	Passive RC	1
	Extraction	3
SUBJ OBL V V-Aux	Modal Infinitive RC	1
	Extraction	3
SUBJ Refl Adj OBL V	Middle RC	1
	Extraction	3
SUBJ Dat OBJ OBL V	Active RC + Dat	1
	Extraction	4
SUBJ Dat OBL V V-Aux	RC + Dat + Passive	1
	Extraction	4
SUBJ Dat OBL V V-Aux	Modal Infinitive RC	1
	Extraction	4
SUBJ OBJ OBL V V-Aux	RC + Dat + Dat-Passive	1
	Extraction	4
		32

Various readers ask whether it is sufficient for arguing against an analysis to show that one has to pose 218 rules to describe certain phenomena.[15] There are certainly cases in the literature (e.g. Janda, 1998) where the formulation of large numbers of rules is justified.

I agree that sometimes the stipulation of special rules or phrasal Constructions is justified. For example, computational grammars are often required to analyze phenom-

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[15] I would like to thank editors Brian Joseph and James McCloskey for raising this question.

ena that are (for diverse reasons) seldom if ever mentioned in the literature on grammatical theory. One example of this is date expressions, where it is probably sensible to assume special rules that cover these expressions. The difference between such cases and the Constructions discussed so far is that the syntax of date expressions cannot be made to follow from something, while it is sufficient to state one resultative lexical rule (Müller, 2002, p. 241 and Section 6 below), one participle formation lexical rule (Müller, 2002, p. 151), one infinitive formation lexical rule (Müller, 2002, p. 153), one lexical rule for free datives, and syntactic rules for verb positioning (a lexical rule that licences fronted verbs (Kiss and Wesche, 1991; Müller, 2005c)), scrambling (as part of the general schema for head argument combination (Müller, 2005c)), and extraction (Pollard and Sag, 1994; Müller, 2005c) to get the effect of the 218 Constructions above. The participle formation lexical rule and the infinitive lexical rule are responsible for an appropriate inflection of the infinitives, something that has to be accounted for in a phrasal model as well (in addition to the 218 Constructions). Thus these lexical rules do not count in terms of a comparison. An adjunction rule (Pollard and Sag, 1994, Chapter 1.9) together with binary branching structures accounts for the placement of adjuncts in 8 and the predicate complex schema (Hinrichs and Nakazawa, 1989; Müller, 2005c, p. 21) together with appropriate lexical entries for *sehen* ('see') licences 29. For the phrasal approach no analysis exists for 29. A further difference between the lexical and the phrasal model is that the lexical approach states one resultative rule and the interaction with the rest of the grammar follows from constraints on syntactic structures and from input conditions of other lexical rules. In comparison the phrasal approach has to stipulate a Construction for every single case, since Kay's algorithm that was suggested to compute interactions of Constructions is not sound, as is shown in the next section.

Joseph, 1997 argues that there are no complete generalizations and that one has to be prepared to find counter examples and subregularities, which may originate from language contact for instance. He discusses the claim that Adj N is the normal order in NPs like *the fat cat* and that *the cat fat* is ungrammatical. He states the corresponding generalization in 32:

(32)   [NP ADJ N] / * [NP N ADJ]

Sequences like *attorney general* contradict the negative pattern.[16] This problem can be fixed easily in theories that allow for a more fine grained categorization of linguistic objects: if it is possible to distinguish adjectives that have to appear in prenominal position from those that appear postnominally, grammatical theory has no problem. If a linguistic grammar contains a statement like 32 and it is pointed out that examples like *attorney general* contradict this statement, the description that describes ADJ has to be made more specific. The same applies for the case at hand: resultative constructions interact with the normal syntax as expected, but if there were a particular resultative construction that did not allow for the placement of the finite verb in initial position (no such thing exists), one would have to specify subclasses and rule out the positioning of the finite verb in initial position for one of the subclasses. So, I believe it to be valid to assume one lexical rule in addition to a general syntactic system containing the six parts mentioned above to account for the data discussed so far and this solution has to be preferred over the phrasal alternative.

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[16]See also Dürscheid, 2002 for a discussion of the German *Forelle blau* 'trout blue' and *Deutsche Syntax deklarativ* 'German syntax declarative'.

3 Automatic computation of Construction-Like Objects

It might appear that an analysis based on 218 distinct constructions is unobjectionable, given that Kay (2002, Section 7.1) has suggested an algorithm that computes so-called *construction-like objects* from a small set of specified Constructions. *Construction-like objects* are descriptions of phrasal configurations or lexical items which result from the interaction of Constructions. For the analysis of resultative constructions one would specify the Construction hierarchy in Figure 1 and the algorithm would compute construction-like objects for all compatible Constructions. The result of this computation would be equivalent to a Construction hierarchy with explicitly specified Constructions for the respective combinations (Figure 2).
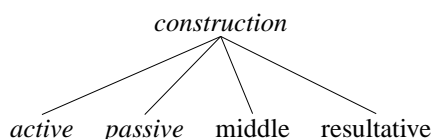

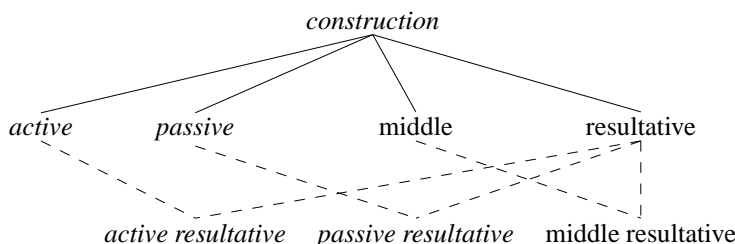Figure 1: Construction Hierarchy for Resultative Constructions

Figure 2: Extended Construction Hierarchy for Resultative Constructions

Kay (2002, Section 7.1) suggests the following in his *Informal Sketch of a Formal Architecture for Construction Grammar*:

> Unlike LFG phrase structure rules and lexical items and unlike HPSG maximal types, distinct maximal constructions can span the same (piece of) FT [*Feature Structure Tree*, St. Mü.]. For example, the English VP construction, which provides for a lexical verb followed by an arbitrary number of constituents (subject to valence restrictions), can unify with a construction specifically licensing a VP displaying the 'heavy NP shift' property. In order to specify an explicit recursive licensing procedure for sentences, we need some way to deal with this overlap of constructions. We wish to reduce the set of constructions of a grammar to a set of construction-like objects (let's call them CLOs) with the property that in licensing a given sentence, exactly one CLO licenses each node. To obtain the set of CLOs from the set of constructions C: (1) form the power set of the set of constructions $\wp(C)$; (2) for each set of constructions in $\wp(C)$, attempt to unify all the members, matching the root nodes; (3) throw away all the sets that don't unify; (4) the remainder is the set of CLOs.

Unfortunately, this algorithm does not work, as can be demonstrated by applying it to a set that contains the two Constructions mentioned by Kay. The power set of the set in

33a is 33b.[17] The unification of Constructions in all sets in 33b is defined. Therefore we get as a result a set of the three CLOs in 33d and not the intended singleton set in 33c, which contains only the unification of the two original Constructions.

(33) a. C = { VP Construction, Heavy NP Shift Construction }

   b. $\wp(C)$ = { {},

         { VP Construction },

         { Heavy NP Shift Construction },

         { VP Construction, Heavy NP Shift Construction } }

   c. desired result:
       CLOs = { VP Construction $\wedge$ Heavy NP Shift Construction }

   d. result according to Kay's algorithm:
       CLOs = { VP Construction,

            Heavy NP Shift Construction,

            VP Construction $\wedge$ Heavy NP Shift Construction }

To obtain the intended result, Kay's algorithm needs to use a subsumption check, i.e., the result of the unifications of elements in sets is only added to the set of CLOs if it does not subsume any other unification result.[18]

However, the modified algorithm would fail in one particular case that is otherwise considered a highlight of Construction Grammar, namely idiomatic expressions: since idiomatic Constructions are subconstructions of regular Constructions, having idiomatic Constructions in the power set would cause the non-idiomatic Constructions to be eliminated from the set of CLOs since non-idiomatic constructions are more general and subsume the idiomatic Constructions.

For the purpose of illustration let us assume that we have Constructions for the VP, for Transitive, and an idiomatic construction for *kick the bucket*. So the set of Constructions is 34a. The power set of this set is 34b. If we allow the set of CLOs to contain the most specific construction-like objects only, the result would be 34c, but this is a set that contains a construction-like object that describes *kick the bucket* and no other VP with a transitive verb. The intended outcome is 34d, which also admits normal, nonidiomatic VPs with transitive verbs.

(34) a. C = { VP, Transitive, *kick the bucket* }

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[17]At first glance, one might get the impression that the algorithm could be fixed by replacing "power set" by "restricted powerset". Restricted powersets are defined as follows and were used, for instance, for the computation of greatest lower bounds in type hierarchies (Aït-Kaci et al., 1989):

> The *restricted powerset* of a poset $S, \leq$ is the set $2^{(S)}$ of nonempty finite subsets of pairwise incomparable elements of S.

But in the case discussed here, only maximally specific Constructions (leaves in the inheritance hierarchy) are considered. Therefore the restricted powerset of the set of Constructions under consideration is identical to the powerset of this set without the empty set.

[18]There is a problem with the understanding of valence and semantics sets assumed in Kay and Fillmore, 1999. Since { a } subsumes { a, b }, a Construction C_1 that differs from another Construction C_2 by containing more information in semantics sets or valence sets will be subsumed by C_1. This would result in the elimination of C_1 from the set of Constructs. An example for such a situation might be adjuncts or free datives if they are introduced at a phrasal Construction.

b. $\wp(C) = \{$ $\{\}$,

            $\{$ VP Construction $\}$,

            $\{$ Transitive $\}$,

            $\{$ *kick the bucket* $\}$,

            $\{$ VP Construction, Transitive $\}$,

            $\{$ VP Construction, *kick the bucket* $\}$,

            $\{$ Transitive, *kick the bucket* $\}$,

            $\{$ VP Construction, Transitive, *kick the bucket* $\}$ $\}$

c. Result with a subsumption test in the algorithm:
   CLOs = $\{$ VP Construction $\wedge$ Transitive $\wedge$ *kick the bucket* $\}$

d. Desired result:
   CLOs = $\{$ VP Construction $\wedge$ Transitive,
                 VP Construction $\wedge$ Transitive $\wedge$ *kick the bucket* $\}$

It could be argued that idiomatic Constructions have to be specified in a way that does not include the information contributed by more general Constructions (this is what Kay and Fillmore (1999) do in the case of the *What is X doing Y? Construction*[19]). For our artificial example in 34 this means that the *kick the bucket* Construction does not contain information about the VP Construction and the Transitive Construction. The information that was left out on purpose could then be obtained by the CLO computation. However, idioms vary in syntactic flexibility (Fleischer, 1982; Nunberg et al., 1994). For instance, some idiomatic expressions resist passivization, and others do not allow fronting of idiom parts or relativization. So, for instance the *kick the bucket* Construction would not have a passive subconstruction, since the idiom cannot be passivized without losing the idiomatic reading. One way to capture such syntactic idiosyncrasies of idioms is to cross-classify idioms with respect to the Constructions they may appear in—if an idiom can appear in a certain configuration, it has to inherit from the respective Construction. If no such inheritance link exists, the idiom cannot appear in the Construction. Therefore, the fact that an inheritance link is missing from the grammar implicitly encodes that the idiom does not occur in the respective Construction. If the CLO computation were to introduce the unification of the idiom with all compatible Constructions into the CLO set, we would license feature structure trees for ungrammatical utterances.

There are two ways of fixing the problem of the modified algorithm. First one could say that idioms are not Constructions, thereby explicitly excluding them from CLO computation. This would require a special marking of idioms and would be conceptually unattractive since, after all, idioms *are* specialized versions of Constructions (as for instance the *What is X doing Y? Construction*). The other way of dealing with this problem is to introduce an auxiliary feature IDIOM that has no value for the general Constructions (as for instance VP or Heavy NP Shift in the previous example). For each general Construction, we would stipulate a subconstruction (for instance nonidiomatic-VP) that has *false* for the value of IDIOM. (For our example in 34, we have to stipulate a *Nonidiomatic VP Construction* and a *Nonidiomatic Transitive Construction* as subconstruction of *VP* and *Transitive*, respectively) All idioms would have the IDIOM value *true*. During CLO computation, idioms could be unified with the general

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[19]Examples of instances of this Construction are:

(i)   a. What is this scratch doing on the table?

       b. What is it doing raining?

Construction, since the IDIOM value of the general Construction would be unspecified. The additionally specified subconstruction would remain in the set of CLOs since it would be more specific than the general Construction, but nevertheless different from all idiomatic Constructions. To rule out the unification of idiom Constructions with other Constructions that are not attested for a particular idiom, one would have to introduce additional features that state that a particular idiom is incompatible with a particular other Construction.

This approach would thus need a large number of additional features and the stipulation of non-idiomatic Subconstructions for all Constructions that are direct super Constructions of idiom Constructions and that also license non-idiomatic phrases.

The conclusion is that the CLO computation does not work in the desired way, and therefore, which Constructions actually do license feature structure trees has to be stipulated, it does not follow from anything. This means that subconstructions for resultatives and passive, resultatives and extraction, and so on have to be specified by the linguist. Consequently the fact that a verb with a subject and an object with appropriate case can be passivized is not captured by the grammar but has to be stipulated throughout the grammar again and again. In comparison, in the lexical rule-based approach, an item can be passivized if it fits the input description of the passive lexical rule. No explicit marking of Constructions with regard to passivizability is necessary.

Section 2 shows that there is massive interaction between resultatives and other phenomena. In this section, I have shown that the necessary phrasal Constructions have to be stipulated independently, since they cannot be deduced from more general Constructions. Yet there is another type of interaction which is even more problematic for the phrasal approach, namely the interaction between the resultative construction and derivational morphology, to which I turn in Section 5. The next section deals with the passive, which is also problematic for inheritance-based approaches.

4   Passive and inheritance-based analyses

In the previous section, I showed that Kay's algorithm for the computation of interactions between Constructions does not work. This section deals with passive and shows that inheritance-based analyses of passive are not appropriate for all languages. The conclusion is that—if one wants to analyze passive crosslinguistically in a uniform way—neither English nor German passives should be analyzed with reference to inheritance hierarchies.

As mentioned in Section 2.3, Goldberg assumes a cross-classification of the Resultative Construction with regard to the active and passive dimension, that is, she assumes a hierarchy of the kind shown in Figure 2 on page 17. This cross-classification of Constructions with respect to active and passive is also suggested by Kay and Fillmore (1999, p. 12) and Michaelis and Ruppenhofer (2001, Chapter 4).[20] Kay, Fillmore, Michaelis, and Ruppenhofer's analysis differs from Goldberg's in that they assume that linking patterns are verb-level Constructions, which unify with the lexical entries of verbs (Michaelis and Ruppenhofer, 2001, p. 39). However, with respect to the data which I discuss below it does not matter whether a phrasal or a lexical approach is chosen: the data shows that inheritance-based analyses are inappropriate to handle passive.

The examples in (35), which are Yucatec Maya, show that multiple passivization of a word is possible, if a causative morpheme intervenes: 35a shows an active sentence

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[20]See also Davis and Koenig, 2000 for such a proposal in the framework of HPSG.

with the verb *learn* and 35b its passive variant.[21] 35c demonstrates that the verb *learn* can be causativized. The result is equivalent to the English *teach*. Interestingly, it is possible to embed a passivized verb under the causative morpheme as is shown in 35d. The causative morpheme adds an argument for the causer, which can be affected by passivization, as is shown in 35e.

(35) a. k=u   kan -ik   le teòria-o'
          INCOMPL=3.ERG learn -IMPF Det theory-D1
          'He is learning the theory.'

     b. k=u   ká'an   -al   le teòria-o'
          INCOMPL=3.ERG laern.PASS -IMPF Det theory-D1
          'The theory is being learned.'

     c. k=u   kan -s   -k   -en le teòria-o'
          INCOMPL=3.ERG lern -CAUS -IMPF me Det Theorie-D1
          'He teaches me the theory.' (He causes that I learn the theory.)

     d. k=u   ká'an   -s   -ik   le teòria-o'
          INCOMPL=3.ERG lern.PASS -CAUS -IMPF Det Theorie-D1
          'He is teaching the theory.' (He causes that the theory is being learned.)

     e. k=u   ká'an   -s   -á'al   le teòria-o'
          INCOMPL=3.ERG learn.PASS -CAUS -PASS.IMPF Det Theorie-D1
          'The theory is being taught.' (Somebody causes that the theory is being learned.)

Thus we have the following situation in 35e: the agent of a bivalent verb is suppressed by passivization, another agent is added by the causative morpheme, and this agent is suppressed by the second passive morpheme. This situation cannot be modeled in an inheritance hierarchy that classifies objects according to a active/passive and a causative/noncausative dimension. The reason for this is that one can say about an object that it has a certain property only once. Consider the hierarchy in Figure 3: if we cross-classify the lexeme *kan* ('learn') according to active/passive and a causative/ noncausative, we get among others a description for *passive ∧ causative ∧ kan*. But
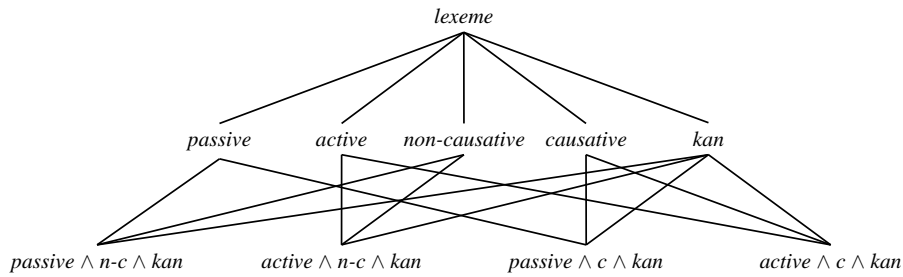

Figure 3: Inheritance hierarchy with subtypes of *active*, *passive* and *causative*

for 35e one needs a double application of *passive* and this is impossible to model in the inheritance hierarchy.

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[21]The data is inspired by Wunderlich (1999, p. 508–509). I thank Thomas Stolz for a modification of the examples which made the arguments overt.

In this section, I showed that Yucatec Maya passive cannot be handled by cross-classification. Therefore analyses for the English passive that are based on inheritance are language particular solutions that cannot be accepted as valid analyses from a cross-linguistic perspective. It follows that Goldberg's analysis of the Resultative Construction is not able to account for passive in a cross-linguistically adequate way. In comparison, a lexical rule-based approach has neither problems with the data in 35 nor with the interactions of resultative constructions and passive.

5 Interactions between resultative constructions and morphology

In the following subsections, I discuss the interaction between resultative constructions and derivational morphology (nominalization and adjective formation). Various possibilities to combine the phrasal approach to resultative constructions with the derivation data are discussed. The only sensible approach seems to be an inheritance-based one. In Subsection 5.3, I show, however, that inheritance is not suited for handling derivational morphology.

5.1 Resultative constructions and nominalization

As the examples in 36 show, resultative constructions also enter into various types of nominalizations:

(36) a. *-ung* nominalizations:
          Leerfischung[22] 'empty.fishing',
          Kaputterschließung[23] 'broken.development',
          Kaputtmilitarisierung[24] 'broken.militarization',
          Gelbfärbung[25] 'yellow.dyeing'

      b. *-er* nominalizations:
          Totschläger[26] 'dead.beater' or 'cudgel',
          SFB-Gesundbeter[27] 'SFB.healthy.prayer',
          Ex-Bierflaschenleertrinker[28] 'ex.beer.bottles.empty.drinker'

      c. marginally in *Ge- -e* nominalizations:
          Totgeschlage[29] 'beating.to.death'

An analysis that derives such nominalizations from phrasal configurations seems rather unattractive.[30] To derive the phrase *die Leerfischung der Nordsee*, one has to map the Construction that licenses 37a onto one that licenses the corresponding phrase in 37b or onto the noun in this phrase with an appropriate valence specification.

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[22]taz, 20.06.1996, p. 6. The *taz* is a newspaper that appears nation-wide in Germany (http://www.taz.de).

[23]taz, 02.09.1987, p. 8.

[24]taz, 19.04.1990, p. 5.

[25]taz, 14.08.1995, p. 3.

[26]taz, bremen, 24.05.1996, p. 24 and taz, hamburg 21.07.1999, p. 22

[27]taz, 25.08.1989, p. 20.

[28]taz, 13./14.01.2001, p. 32.

[29]Fleischer and Barz, 1995, p. 208.

[30]Goldberg (1996, Section 4.2; 2003, Section 3.3) argues that the fact that Persian complex predicates interact with derivational morphology is evidence for the zero level status of the complex predicates. Following this line of argumentation (German) resultative constructions should be V0s as well. Goldberg (2006, p. 25) explicitly argues against the derivation of deverbal NPs form clauses.

(37) a. jemand   die Nordsee   leer   fischt
         somebody*nom* the North.Sea*acc* empty fishes

      b. wegen   der *Leerfischung* der   Nordsee[31]
         because.of the empty.fishing of.the North.Sea*gen*

To make this work, one has to assume a Construction that licenses *jemand die Nordsee leer fisch-*, i.e., a sentence with a verb that is not inflected. Without this assumption, one has to reverse the inflection of *fischt* to be able to append the suffix *-ung* contained in *Leerfischung*. The alternative to the assumption that phrases or phrasal rules serve as input to morphology or morphological rules is to assume a very general Resultative Construction which does not contain information about the phrasal realization of the elements involved in resultative constructions. A phrasal SUBJ-OBJ-OBL-V Construction and the *-ung*-Construction inherit from this general Construction.

Since the automatic computation of possible Constructions in a hierarchy is problematic (see Section 3), one has to specify explicitly that there is a Construction that inherits from the general Resultative Construction and the *-ung*-Construction. The same applies to *-er* and *Ge- -e* nominalizations, which are also compatible with resultative constructions.

Therefore, the phrasal approach has to make explicit statements about the interaction of phenomena which are unnecessary in a lexicon-based system since the interaction between phenomena is governed by rules designed to cover a single phenomenon: either the output of a lexical rule satisfies the input description of another lexical rule or it does not. If it does not, the second lexical rule cannot apply. For instance, 38b is ruled out, since the passive lexical rule cannot apply to the unaccusative verb *schmilzt* that is the output of the resultative lexical rule.

(38) a. Die Butter schmilzt zu einer Pfütze.[32]
         the butter melts   to a   puddle

      b. * weil   zu einer Pfütze geschmolzen wurde.
         because to a   puddle melt   was

Miriam Butt (p.c. 2005) argued that the nominalizations can be seen as compounds and that therefore the interpretation of the compound is not taken care of by the grammar, but is left underspecified. It is clear that an analysis that derives the readings of the nominalizations 36 without reference to grammar external principles should be preferred. Apart from this it should be noted that the noun *Fischung* does not exist in German in the relevant sense. The noun exists, but it refers to a plank on a boat. So *Leerfischung* is not a compound of *leer* and *Fischung*, but a nominalization of *leer fisch--*. We find a similar situation with derivations of particle verbs: there is a word *Ausraubung* 'robbing', which is derived from *ausraub-* 'to rob', but there is no word *Raubung* (Fleischer and Barz, 1995, p. 173), so *Ausraubung* cannot be the combination of a nominalization of *rauben* 'to steal' with *aus*, but should be treated as the nominalization of *ausrauben*. See Müller, 2003a for an analysis of the morphology of particle verbs. Since particle verbs and resultative constructions behave similar in many respects, the problem of nonexisting bases for particle verb derivation is additional support for the analysis of *Leerfischung* as true nominalization rather then compounding.

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[31]taz, 20.06.1996, p. 6.
[32]Kaufmann (1995, p. 146).

5.2   Resultative constructions and adjective derivation

But even if one accepts a compound analysis, not all problems are solved, since the problem with derivation is not restricted to nominalizations as the examples in 39 show:

(39)   a.   der leer   gefischte Teich
           the empty fished   pond
           'the pond that was fished empty'

        b.   das zu Schrott   gefahrene Auto
           the to scrap.metal driven   car
           'the car that was driven to a wreck'

In 39a *Teich* is not an argument of *fischen* and there is a reading of 39b where some other vehicle – for instance a bicycle – is used in the driving event that caused the destruction of the car. See Wunderlich, 1997, p. 123 on examples like 39b. The example in 39b is important since it shows that prepositional phrases can appear with prenominal adjectives and that therefore the construction has phrasal status. The problem with examples like the ones in 39 for Goldberg and also for phrasal analyses of complex predicates as they were suggested by Butt (1997) in the framework of Lexical Functional Grammar (LFG) is the following: If the resultative meaning and the respective argument structure is licensed at the phrasal level, the adjectival derivation and inflection has to happen there as well. But if inflection is assumed to be a lexical process, the input to this process has to be lexical too (Dowty, 1978, p. 412; Bresnan, 1982, p. 21). Since both Construction Grammar and Lexical Functional Grammar assume the principle of Lexical Integrity (Bresnan and Mchombo, 1995; Goldberg, 2003), an analysis in which a derivational affix attaches to a phrase is not compatible with basic assumptions of these frameworks. The only possible option is to form the adjectival participle in a component that precedes syntax, but the information that is needed for doing so is not available: verbs that do not govern an accusative object cannot be used as adjectival passive participles:

(40)   a.   * der geschlafene Student
              the slept   student

        b.   * der geholfene Mann
              the helped   man

40a is ruled out since *schlafen* ('to sleep') does not take an object and 40b is out, since *helfen* ('to help') takes a dative object. The adjectival derivation determines the argument that is the subject of the derived adjective and that predicates over the noun. In a phrasal analysis of resultative constructions the derivation of adjective forms that are needed to analyze 39 would be ruled out, since the verbs are used intransitively: it is not the object role of *fischen* that is coindexed with *Teich*, but the subject role of *leer* ('empty') and the information that there will be such an argument and that it will have object status in the complete construction is missing from the lexical items for the verbs. As a consequence, neither the phrasal analysis of complex predicates in LFG nor Goldberg's analysis of resultative constructions can be adapted for German resultative constructions.

5.3   Derivation and inheritance

In Section 5.1, it was shown that modeling the interaction between resultative constructions and nominalization makes it necessary to introduce many subconstructions.

In this subsection, I make a more general point and show that inheritance is not suited as a general means for describing derivation.

In inheritance hierarchies, information specified at higher Constructions is taken over by subconstructions. If a Construction has more than one super Construction, the values of the features of the super Constructions have to be compatible. If they are not, a conflict arises and one has to take care of the resolution of this conflict. One can solve the conflict by either stating at the super Constructions which value may be overridden by subconstructions, or one can throw away the conflicting information and possibly state new values at the inheriting Construction. It is important to note that one can only refer to features inside of a Construction. It is impossible to refer to features in a super Construction if the values of the respective features are overridden. Thus, if we have a general Resultative Construction, as for example in 41a, a nominalization Construction that would be needed to account for *Leerfischung* in 37b cannot be related to 41a by inheritance:[33]

(41)   a. general Resultative Construction:

> syn val { NP$_{\#1}$, NP$_{\#2}$, Pred$_{\#3}$, V$_{\#4}$ }
> sem cause-become(#1, #2, #3) by #4

       b. nominalization Resultative Construction for 37b:

> syn val { Det, NP$_{\#2}$, Pred$_{\#3}$, V$_{\#4}$ }
> sem nominal-semantics(cause-become(#1, #2, #3) by #4)

The reason for this is that the semantic properties of the Constructions are different: the general Resultative Construction has a verbal semantics and the nominalization construction has a nominal semantics in which the resultative semantics is embedded. By overriding the SEM value of the super Construction, the semantic information of the super Construction is lost. Therefore, we also lose linkings to arguments (#1, #2, #3, #4), and these have to be respecified by hand in the subconstruction.[34] If such respecifications are necessary in an analysis, this indicates that generalizations are lost. If values at subconstructions cannot be inherited but have to be specified, this also

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[33]The '#' followed by a number is used to mark identity of values. See Kay, 2002. The subscript '#1' in NP$_{\#1}$ is used to refer to the discourse referent of a referring NP.

[34]One way of solving this problem is to use auxiliary features to represent a prototypical semantic representation and specify a mapping from this auxiliary feature to the SEM feature of the subtype. See Kathol, 1994, p. 263 and Koenig, 1999 for similar suggestions. Koenig (1999, Section 4.1.1) also argues against an inheritance-based analysis of derivational morphology. For the inheritance approach to work for the cases at hand, one needs auxiliary features for all features that differ in various instances of the resultative construction, i.e., for part of speech, valence, and semantic contribution. If more than one value changing Construction interacts (as for instance in the complex derivation *Leerfischbarkeit* ('empty fishability') or in the interaction of resultative, free dative, and Accusative with Infinitive construction), one has to stipulate complex systems of interacting mappings from auxiliary features, which makes this proposal very unattractive. See **?** for a discussion of inheritance.

Another solution is to use lists to represent semantic information. If relations embed other relations, the embedded relations are stored in the lists and pointers are used to refer to the respective list element. A special pointer is used to mark the main semantic contribution of a sign. In such a setting, one could inherit the resultative semantics from the super Construction and add the nominal semantics at the end of the list (see Müller, 2005a for a partial implementation of this idea). The nominal semantics points to the resultative semantics, and the pointer that points to the main semantic contribution is overridden such that it points to the nominal semantics.

Minimal Recursion Semantics (**?**) is a formalism that uses such pointered lists. This framework is also assumed by Kay (2005).

means that there is no way to derive the respective subconstruction by some general mechanism as the one that was discussed in Section 3.

Apart from such problems, inheritance-based proposals have other problems: firstly, recursion, as for example in *Vorvorvorversion* ('preprepreversion'), cannot be covered in inheritance networks (Krieger and Nerbonne, 1993). If one assumes that *Vorversion* is an object that inherits information from *vor-* and from *Version*, one has problems with the analysis of *Vorvorversion*, since information about the prefix *vor-* is contained in *Vorversion* already and inheriting this information a second time from *vor-* would not add anything. Secondly, in an inheritance-based approach to derivation, it cannot be explained why *undoable* has the two readings that correspond to the two bracketings in 42 (Krieger and Nerbonne, 1993).

(42)   a.   [un- [do -able]]

       b.   [[un- do] -able]

If we inherit information about *un-*, *do*, and *-able*, the order of the combination of this information does not matter and hence, only one representation for *undoable* will result in an inheritance-based analysis, which is not adequate.

The conclusion is that embedding Constructions are needed for derivation. The *-ung* Construction could be stated as in 43:

(43)   embedding *-ung Nominalization Construction*:


```
syn N
sem nominal-semantics(#1)
phon #2 ⊕ ⟨ ung ⟩

              syn V
              sem #1
              phon #2
```
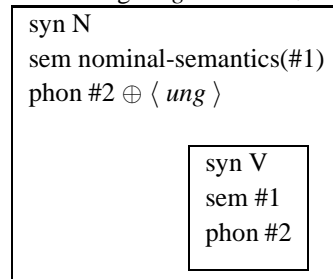
In this Construction, a verbal stem is embedded. The embedding is marked by the box in 43. The embedded stem has the syntactic category V (syn V), while the whole Construction has the syntactic category N. The PHON value of this verbal stem (#2) is used for the computation of the PHON value of the whole construction, which is the result of appending *-ung*. The semantic contribution of the construction consists of the nominal semantics, into which the contribution of the embedded verb (#1) is integrated.

This embedding Construction is equivalent to an HPSG analysis that uses lexical rules.[35] The analysis requires the existence of a verbal stem that can function as an embedded construction or as input to the respective lexical rule. No such stems exist in the phrasal analysis. This analysis is therefore incompatible with an embedding analysis of derivation.

Concluding this section, it can be said that interactions between resultative constructions and derivational morphology can be represented in inheritance hierarchies that allow for default specifications and overriding. Such representations would, however, be stipulations that do not capture the general properties of derivational morphology.

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[35]See Meurers, 2001 for a formalization of lexical rules in HPSG and Pollard and Sag, 1987, Chapter 8.2, Orgun, 1996, Riehemann, 1998, Ackerman and Webelhuth, 1998, Kathol, 1999, Koenig, 1999, and Müller, 2002 for analyses of inflection and/or derivation that use lexical rules.

6 Lexical rule-based approaches

This section gives an outline of the lexical rule-based analysis, compares it with the phrasal approach, and discusses crosslinguistic aspects of the respective analyses.

6.1 Outline of the basic analysis

Lexical rule-based approaches assume a lexical rule that takes an intransitive (version of a) verb as input and licenses a special lexical item that selects for an additional object and a secondary predicate. One formalization of such a lexical rule in the framework of HPSG (Pollard and Sag, 1994) is shown in 44:[36]

(44) Lexical rule for resultatives:

$$
\begin{bmatrix}
\text{CAT} & \begin{bmatrix} \text{HEAD} & \textit{verb} \\ \text{SUBCAT} & \boxed{1}\, \langle\, \text{NP}[\textit{str}]\, \rangle \end{bmatrix} \\
\text{CONT} & \boxed{2} \\
\textit{stem}
\end{bmatrix}
\;\mapsto
$$

$$
\begin{bmatrix}
\text{CAT} & \begin{bmatrix} \text{SUBCAT} & \boxed{1} \oplus \boxed{3} \oplus \left\langle \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{HEAD} & \textit{adj-or-prep} \\ \text{SUBCAT} & \boxed{3}\, \langle\, \text{NP}_{\textit{ref}}\, \rangle \end{bmatrix} \\ \text{CONT} & \boxed{4} \end{bmatrix} \right\rangle \end{bmatrix} \\
\text{CONT} & \begin{bmatrix} \text{ARG1} & \boxed{2} \\ \text{ARG2} & \begin{bmatrix} \text{ARG1} & \boxed{4} \\ \textit{become} \end{bmatrix} \\ \textit{cause} \end{bmatrix} \\
\textit{stem}
\end{bmatrix}
$$

This lexical rule takes a verb stem as input (an object of type *stem* with a HEAD value *verb*). The input verb has to have a subject and no object. This is represented by the valence specification in the SUBCAT list. The rule licenses an item that selects a predicate that has a referential subject. This subject is raised to the object of the output of the lexical rule, which is indicated by the tag $\boxed{3}$ which appears simultaneously before the value of the SUBCAT list of the selected predicate and in the SUBCAT list of the output of the lexical rule. The output item thus selects for a subject (the element in $\boxed{1}$), an object that is raised from the secondary predicate, and the secondary predicate. As was suggested by Dowty (1979, p. 221), the semantic content of the input verb ($\boxed{2}$) is embedded under the *cause* relation and the semantics of the secondary predicate ($\boxed{4}$) is embedded under *become*.

The output of the lexical rule is a stem. This stem may be inflected and then used to analyze sentences like 5, repeated here as 45, or it may be the input to derivational lexical rules.

(45) (weil)   sie die Nordsee leer   fischen
         because they the North.Sea empty fish
         'because they fish the North Sea empty'

---

[36]I omit feature paths like SYNSEM or SYNSEM|LOC since they are not relevant in the current context. I also omitted feature value pairs that are important for distinguishing unaccusative verbs from unergative ones. See Müller, 2002, p. 241 for the full analysis.

One such derivational lexical rule licenses *-ung*-nominalizations, so from *fisch-* ('to fish') one can derive *fischung-*. This *fischung-* is special in that it selects for a secondary predicate and can be used in words such as *Leerfischung*. The stem that is the output of 45 can also be used to derive the passive form or other forms with respective valence patterns. The case of subjects and direct objects is underspecified in the lexicon. The arguments are marked for structural case. Whether the case value is nominative, accusative, or genitive depends on the syntactic context in the actual utterance and is determined by a case principle. See Meurers, 1999 for details.

Several readers suggested that Embick (2004) is relevant here. He claims that lexical approaches to resultatives cannot explain why adjectival passive formation interacts with the resultative constructions. The following is a quote from this article:

(73) a. The door remained opened.
      b. The metal remained flattened.
      c. the recently hammered metal

[...]

(75) The metal is [hammered [$_{aP}$ flatter than a pancake that has been run over by a steamroller and stomped on by elephants]].

Clearly, one would not want to derive the predicate (75) in the lexicon; it is a syntactic structure. Within standard Lexicalist assumptions, a lexical process cannot form an adjective out of *hammer* and the resultative secondary predicate in (75) because lexical processes cannot follow syntactic processes. Thus, the formation of resultative participles that have resultative secondary predicates must be syntactic, according to Lexicalist assumptions. If the Lexicalist view is to be maintained, this means that there must be two ways of forming resultative participles: one lexical rule for forming adjectival passive predicates like those in (73); and a second, syntactic process that creates an adjective out of *hammer flat* and the like. (Embick, 2004, p. 389)

This argument is probably due to a misguided understanding of what it means to encode things in the lexicon. Sentences like Embick's 75 are unproblematic for a lexical analysis of resultatives, provided the results of the resultative analysis can be input to passive and inflection. An integrated account of all three phenomena is provided in Müller, 2002. Due to space limitations I cannot explain all components of the analysis here, but I give a sketch and point the interested reader to my book. The passive analysis that I assume in Müller, 2002, Chapter 3 is a formalization of Hubert Haider's proposals (Haider, 1986; Müller, 2003b): A so-called designated argument (usually the agent of an unergative or transitive verb) is blocked in participle formation. The participle can be used in the agentive passive and in the perfect. In perfect constructions, the perfect auxiliary deblocks the blocked argument and it has to be realized as an argument of the auxiliary. In passive constructions, the blocked argument remains blocked. This analysis interacts without problems with the analysis of resultative constructions given above: The subject of the input verb is the designated argument and this NP is blocked in participle formation. The auxiliaries for the perfect deblocks it (46a) and the auxiliary of the passive leaves it blocked (46b):

(46) a. Jemand   hat den Teich leer   gefischt.
          somebody has the pond empty fished
          'Somebody fished the pond empty.'

    b. Der Teich   wurde leer   gefischt.
       the pond$_{nom}$ was   fished empty

The lexical rule that is responsible for participle formation licences a stem. This stem can be input to an adjective formation lexical rule. This lexical rule requires the input to have an argument with structural case that is not blocked. This argument is turned into the subject of the adjective. The output of the adjective formation lexical rule is a stem, which has to be inflected before it can be used in syntax. 47 shows examples for the respective rule applications:

(47)   a. der angekommene Zug
         the arrived   train

       b. der reparierte Wagen
         the repaired   car

47a contains an adjective that is derived from an unaccusative verb. Since the unergative verb does not have a designated argument, nothing is blocked by the participle formation rule. Therefore the only argument of *angekommen* is accessible and can be turned into the subject of the adjective *angekommen* by the adjective formation lexical rule. 47b demonstrates how the analysis works for a transitive verb: The designated argument of *reparieren* is blocked. The participle *repariert* has one argument that is not blocked, namely the underlying object. This argument is turned into the subject of the adjective *repariert*. If no accessible argument with structural case exists as in the case of *helfen* ('to help') and *schlafen* ('to sleep') in 40 on page 24, the lexical rule cannot apply and it is correctly predicted that adjectival derivation is not possible in such cases.

    This analysis interacts very nicely with the lexical analysis of the resultative construction: The output of the lexical rule that licences resultative constructions is input to the participle formation lexical rule, the output of which is in turn input to the adjective formation lexical rule. The participle formation lexical rule blocks the subject of the resultative construction as explained in the discussion of 46b. The adjective formation lexical rule takes the only remaining accessible argument, which is the subject of the resultative predicate, and turns it into the subject of the adjective. The adjective is inflected and can be used to analyze phrases like 48:

(48) der leer   gefischte Teich
      the empty fished   pond
      'the pond that was fished empty'

So this shows that Embick's claim is wrong. In addition it shows that nothing special has to be said about adjectival passives in interaction with the resultative constructions. Everything follows from the normal principles in (German) grammar. In comparison to this it seems impossible to analyze this phenomenon in a phrasal approach in frameworks like Construction Grammar, HPSG, or Lexical Functional grammar, since such frameworks assume lexical integrity and do not use transformations.

6.2 Comparison with the phrasal approach

In the conclusion of their article, Goldberg and Jackendoff write: *We leave it as a challenge for practitioners of other approaches to develop comparably detailed accounts.* A response to this is that it is easy for people who suggest lexical rule-based accounts to develop a comparably detailed account since the phrasal approach can be

more or less directly converted into a lexicon-based approach. For example, consider the graphical representations of the phrasal approach and the lexical approach given in Figure 4. This figure shows the analysis that the German sentence in 45 would re-

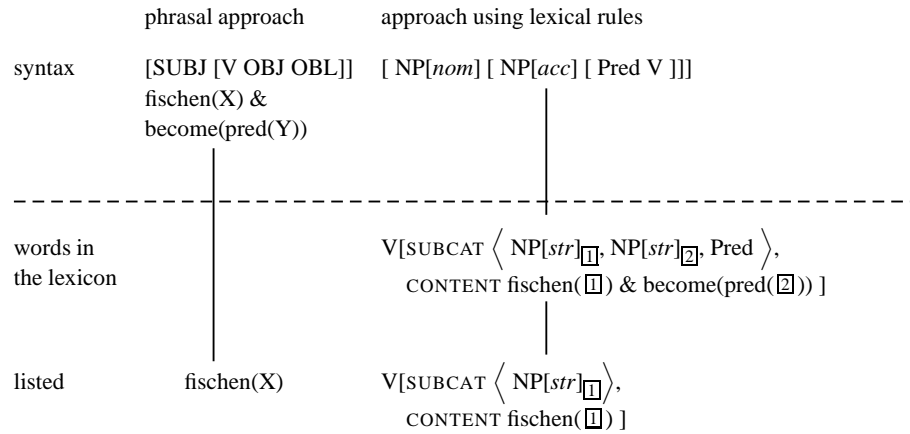|	phrasal approach	approach using lexical rules
syntax	[SUBJ [V OBJ OBL]] fischen(X) & become(pred(Y))	[NP[*nom*] [NP[*acc*] [Pred V]]]
words in the lexicon		V[SUBCAT ⟨ NP[*str*][1], NP[*str*][2], Pred ⟩, CONTENT fischen([1]) & become(pred([2]))]
listed	fischen(X)	V[SUBCAT ⟨ NP[*str*][1] ⟩, CONTENT fischen([1])]

Figure 4: Phrasal vs. Lexical Rule-Based Analyses

ceive. In the phrasal approach, the listed verb *fischen* ('to fish') would be plugged into the Construction right away. The Construction licenses the additional object and the resultative predicate and accounts for the resultative meaning. In a lexical rule-based approach, a (semi-productive) lexical rule maps the listed lexical entry onto another one which in turn selects the arguments of the input lexical item plus the subject of a secondary predicate and the secondary predicate itself (this is represented in the SUB-CAT lists in Figure 4.). The semantic representation of the input of the lexical rule is incorporated into the output of the lexical rule and the resultative semantics is added (this is represented in the CONTENT values in Figure 4.). The additional lexical item is used in the syntax in the way predicted by the syntactic system of a language. No special mention of resultatives must be present in the syntax. All constraints that can be attached to headed phrasal Constructions can also be attached to lexical rules. Instead of specifying what is dominated by a Construction, one specifies what is selected by the lexical item that is the output of a lexical rule. Since lexical rules can be organized in type hierarchies in the same way phrasal Constructions can, there is no advantage offered by the Construction-based approach. Goldberg considers the need to stipulate new verb senses to be a crucial disadvantage of lexical rule-based approaches, but note that one does not say that the intransitive verb *fischen* gets a new meaning. Rather, it is said that when the verb *fischen* is used together with a secondary predicate and the subject of this predicate, the whole complex has a resultative meaning.

Thus, as far as the encoding of constraints is concerned, the approaches are equivalent. Yet the phrasal approach interacts in various undesirable ways with the rest of the grammar.

6.3 Crosslinguistic considerations

It is obvious that the syntax of English, Korean, and German resultative constructions differ, to name but some languages for which lexical rule-based approaches were suggested (see Wunderlich, 1992, p. 45; Verspoor, 1997; Wechsler, 1997; Wechsler and

Noh, 2001; Müller, 2002). But this is not due to peculiarities of the construction in the respective languages. Rather the constructions behave as expected, given the overall syntactic systems of the languages, that is, there is no need to say anything special about extraction, about passivization, or verb position that is relevant in the context of resultative constructions only.

Lexical rule-based approaches to resultatives capture this, while the phrasal approach has to mention the particular language specific phrasal realization.

Having shown that lexical rule-based analyses are better suited for the analysis of resultative constructions, I now turn to the question whether phrasal Constructions are needed at all.

7 Do we need phrasal Constructions at all?

In their classic paper, Fillmore et al. (1988) show that one has to assign special meaning to certain phrasal configurations, since the meaning of the utterance cannot be determined solely on the basis of the meanings of its parts.

However, the question is what the meanings of the parts are. As it is possible to shift syntactic information around between lexicon and syntactic rules (Constructions), it is also possible to represent semantic information at non-canonical places and, by doing so, to obtain a grammar that can derive the meaning of all utterances compositionally. I demonstrate this by explaining idiom analyses developed in the framework of HPSG.

Instead of representing the meaning of a certain expression at the phrasal level, one can represent it in the lexical entry of the head.[37] The specification of the meaning goes hand in hand with lexical restrictions regarding the syntactic context in which the head may be used, meaning that the lexical entry contains a statement of the following kind: if the head X is used with certain arguments or modifiers, it means Y. The meaning provided with such special entries for idioms may be different from the canonical reading of the respective head.

For example, Krenn and Erbach (1994) suggest a lexical entry for the analysis of *jemandem den Garaus machen* ('somebody the GARAUS make') = ('to kill somebody') that has the following SUBCAT list:

(49) *machen*: SUBCAT $\langle$ NP[*nom*], NP[*dat*], NP[*acc*] $\rangle$

In addition they specify that the NP[*acc*] has to contain the bound word *Garaus* and that the article has to be definite. The meaning of this *machen* is specified to be *kill*'. Since this lexical entry is similar to other ditransitive verbs, it is explained why the NPs can be reordered or fronted and why the idiom can be passivized: the normal rules of German syntax apply.[38]

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[37]If there is no constituent that can be regarded as the head, an empty head can be stipulated. Of course this comes with a cost and should be motivated by other theoretical considerations.

[38]The examples in (i) are the respective examples for reordering (i.a) and fronting (i.b–c) of arguments and passive (i.d).

(i) a. weil   ihm   jemand   den Garaus   gemacht hat
         because him$_{dat}$ somebody$_{nom}$ the GARAUS$_{acc}$ made   has

     b. Jemand   hat ihm   den Garaus   gemacht.
         somebody$_{nom}$ has him$_{dat}$ the GARAUS$_{acc}$ made

     c. Ihm   hat jemand   den Garaus   gemacht.
         him$_{dat}$ has somebody$_{nom}$ the GARAUS$_{acc}$ made

In connection with this example, it should be noted that, in a grammar employing a lexical entry like the one suggested by Krenn and Erbach (1994), it is orthogonal to the issue discussed here whether binary branching or flat structures are assumed. In his Radical-Construction-Grammar-FAQ, Croft (2001, Chapter 1.6.2) says that his proposals can be formalized in feature-based theories like Categorial Grammar, but that it is a disadvantage of such frameworks that they assume binary branching structures since there are constructions with more than two parts. Croft notes that a representation like that in 50a can be converted into a Categorial Grammar notation like 50b.[39]

(50) a. [$_{VP}$ V NP]
      b. VP/NP

The representation in 50b stands for an entity that will be a VP if an NP is added. However, contrary to Croft's claim, such a conversion is also possible for Constructions with three or more parts. The result of converting 51a is 51b:

(51) a. [$_{VP}$ V NP NP]
      b. (VP/NP)/NP

The representation in 51b says: if we combine (VP/NP)/NP with NP we get VP/NP and if we combine this with NP we get VP. The representation given in 49 corresponds to ((S/NP)/NP)/NP, i.e, to a statement saying: if we combine a verb with three NPs, we get a sentence.[40] What the meaning of the sentence will be is specified to a large extent in the lexical representation of the head.

In fact, Kay and Fillmore (1999, p. 20) give a representation of the *What is X doing Y?-Construction* that could be a lexical entry. The only argument they put forward for a phrasal Construction is that they avoid stipulating additional senses for the copula *be* as it appears in this construction. However, the lexical introduction of adjuncts suggested by Kay (2005) amounts to saying that each head has infinitely many meanings.

A drawback of the Krenn/Erbach approach is that it involves non-local selection since the verb *machen* states constraints on the determiner of the NP *den Garaus*. However, locality is not recognized as an issue by those working within Construction Grammar. For instance Goldberg's Resultative Construction is specified as [Subj [V OBJ OBL]], and thus the constraints regarding resultatives involve trees of a depth greater than one. In the analysis outlined in Kay and Fillmore, 1999, all information about adjuncts and arguments of a head is available at the top-most node in a tree. Since the representation of arguments and adjuncts in turn contains their internal structure, basically the whole internal structure of a linguistic object is represented at the top-most node and it is also possible to select internal parts of it. Selecting internal parts is what Kay and Fillmore do in their analysis of the *What is X doing Y?-Construction*.

In HPSG, non-local selection is usually made much harder by assuming a feature geometry that does not allow for the selection of daughters of selected elements (Pollard and Sag, 1994, See also Sag, To Appear on locality). Yet even with this restrictive feature geometry it is possible to specify restrictions on the syntactic context in which a lexical item is uttered. For instance, Sailer (2000) has developed a collocation module that allows a lexical item to look at the whole surrounding sentence. This is possible

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      d. weil   ihm   der Garaus   gemacht wurde
          because him$_{dat}$ the GARAUS$_{nom}$ made   was

[39] See for instance **?** on the Categorial Grammar notation.
[40] **?**, p. 159 gives a parallel lexical entry for the Dutch verb *gaf* ('gave').

if one uses relational constraints. This approach was recognized to be too powerful, however, since it did not place enough constraints on what kind of information may be selected. The approach that was developed in Soehn and Sailer, 2003 is more restrictive in this respect.

This discussion shows that it is possible to control everything from the lexicon. Whether this is motivated and whether a particular analysis is too expensive or too powerful because of heavy usage of relational constraints or other devices has to be decided on a case by case basis.

8   Conclusions

Comparing the phrasal approach to the lexical rule-based one, it can be said that the lexical rule-based approach is much simpler: stating lexical rules for the resultative construction is sufficient. Nothing has to be said about the interaction with other phenomena. The output of the resultative lexical rules can serve as the input to the passive lexical rule or for lexical rules that account for derivational morphology. Alternatively, the output of the resultative lexical rules can be inflected and then enter the syntax directly and function as the head in active clauses. Verb placement, constituent reordering, relative clause formation, interrogative clause formation, fronting and adjunction follow straightforwardly from the normal patterns of syntax, and no reference to resultative constructions is necessary in the parts of the grammar that deal with these phenomena. Specific rules like 2b are not necessary—the more abstract head-argument-structure of HPSG which basically says 'combine a head with its argument' is sufficient.

The discussion of Figure 4 on page 30 shows that information that can be attached to phrasal Constructions can be attached to lexical items as well. The representation of such information can be done at a phonologically filled head (as in the case of the resultative construction) or it can be attached to a phonologically empty head. An example of the latter is the analysis of relative clauses in Pollard and Sag, 1994, Chapter 5. As the discussion of the idiom analysis shows, even the tiniest bit of a sentence may be controlled from within a lexical entry. If one does not follow the lexical approach and specifies phrasal Constructions instead, one encounters problems in explaining the interactions between syntax and morphology. This suggests that a lexical treatment of resultative constructions is more appropriate. Such a lexicon-based analysis was suggested by Boas, 2003 in the framework of Construction Grammar. The lexical rules that Boas refused to formulate can be formulated as suggested by authors working in the HPSG framework or as lexical Argument Structure Constructions similar to the ones proposed by Kay (2005). So, this paper does not argue against CxG as a framework, but rather against a specific type of analysis within this framework and other nontransformational frameworks. Goldberg and Jackendoff (2004) are right in claiming that one needs a tight connection between form and meaning and that some approaches will have difficulties in capturing Goldberg and Jackendoff's findings, but the question is how the resultative Construction is stated. I maintain that stating it in the lexicon is the better solution.

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