

Two Sides of the Same Slim Boojum: Further Arguments for a Lexical Approach to Argument Structure

Stefan Müller
Freie Universität Berlin

Stephen Wechsler
The University of Texas at Austin

June 23, 2014

1 Introduction

Our target article defends the following thesis:

- (1) *The Lexicalist Hypothesis*. The grammars of natural languages include the following: (i) lexical items consisting of a word together with its lexical valence structure; and (ii) lexical rules and/or other mechanisms representing relations between such lexical items, to capture valence alternations, voice alternations, cognate relations, and other systematic aspects of the lexicon.

We are not arguing against any formal mechanism, but only against the claim that such mechanisms should replace lexical rules or lexical valence structures. We examined the proposed replacements and argued that they are inadequate or inferior to lexical rules.

Our claim is neither new nor radical. Rather, we are defending a traditional view against various alternatives that could be seen as radical. Some of the respondents even suggest that our claim is uncontroversial and seem to question the need to discuss it. But others demonstrate very clearly that the controversy is alive and well!

We thank all of the respondents for their valuable commentaries. Some of the comments directly address the issue of our target article, while others have no direct bearing on it but are interesting for other reasons. So in this response we primarily focus on those replies that are germane to the issue, while also addressing some other matters.

2 Clarifying the debate

The various opponents of the Lexicalist Hypothesis in (1) within the field of linguistics do not form a natural class. Advocates of Minimalism or Distributed Morphology would replace lexical rules with syntactic devices such as transformations or silent light verbs. Other opponents of lexicalism reject transformations but would instead replace lexical rules with meaningful phrasal structures that are combined using multiple inheritance. Still others would replace lexical rules with argument structure constructions that are not phrasal in nature, but are still

[†]We thank Adele Goldberg, Joachim Jacobs, László Kálmán, Paul Kay, and Greg Kobele for comments on an earlier version of this reply. We thank Afra Alishahi, Colin Bannard, Joachim Jacobs, Timm Lichte, Gerald Penn, and Friedemann Pulvermüller for discussion. The usual disclaimers apply.

combined using multiple inheritance. There is no appropriate single term encompassing all of these, except perhaps a negatively specified term like *anti-lexicalist*. In our target article we used the term *phrasal* for proposals of the second type, and *constructional* for proposals of either the second or third types (the use of the last term follows Croft (2003)). A more precise but unwieldy term might be *eliminative constructionism*, that is, proposals to *eliminate* lexical rules and replace them with phrasal constructions and inheritance. The use of such a term would continually remind readers that we do not oppose the idea that phrasal structures or other multi-word combinations can have a grammatically specified meaning. We oppose the idea that such structures can replace lexical rules.

In his commentary, Kay (2014) agrees with us and suggests that people working in construction grammar should adopt a lexicalist framework of the sort we advocate. Kay was involved in the development of Sign-Based Construction Grammar (SBCG), the ‘explicitly lexical’ framework that we mentioned in footnote 1 of our target article: “The phrasal approaches are usually called *constructional*, but we use that label cautiously since it is also used for approaches that are explicitly lexical. See for instance Kay (2005); Sag (2012).” Sag (2012) is a 133-page description of this ‘explicitly lexical’ framework.

Ivan Sag (1949–2013), to whom our article is dedicated, was a longtime proponent and developer of the lexical approach we favor. Over several decades he developed, modified, and improved upon lexical frameworks for syntactic description and theory, the best-known name being Head-Driven Phrase Structure Grammar. Sign-Based Construction Grammar was the name given to the last variant of HPSG that he helped to develop before his death. Like earlier versions of HPSG, SBCG includes lexical rules modeled as unary branching structures. SBCG grew out of collaboration with Berkeley ‘constructionists’, including Charles Fillmore (1929–2014), that other great linguist whom we recently lost, as well as Paul Kay and others. Some of the terms such as *construction* and *frame* were borrowed from them.

The note about SBCG being ‘explicitly lexical’ was meant to prevent possible confusion arising from the words *Construction Grammar* in the name of the SBCG framework. But some of the commentaries show that we did not entirely succeed in being clear about this. Kálmán (2014, fn. 4) sees SBCG as a phrasal approach. Similarly, Boas endorses SBCG, which he describes as one of the ‘more formalized versions of CxG’ (p. 104), pointing the reader to various analyses in SBCG and noting that the phenomena that we discussed can be analyzed in that framework.¹ When Boas defends SBCG he is defending lexical rules of exactly the type we argue for in our target article.

¹He mentioned passive (p. 98), filler-gap constructions (p. 104), and special constructions for the omission of arguments (p. 101, p. 104).

In fact Boas is a co-author on a paper arguing for lexical rule analyses on some of the same grounds we use in our target article. Sag, Boas and Kay (2012) present a lexical analysis of resultatives, noting that “as Müller demonstrates, attempts to treat English and German resultatives via construction inheritance fail to predict the observed interactions of resultatives with other well studied constructions.” (Sag, Boas, and Kay 2012, p. 12) That paper includes an extended argumentation for such a treatment (p. 10–12), which is based on arguments from Müller, 2006 and Müller, 2010b. In place of construction inheritance, Sag, Boas, and Kay (2012) use lexical rules that feed other lexical rules, modeled as unary branching lexical structures, that is, exactly what we are arguing for.

Terminological differences may be causing confusion. In SBCG, *lexical rules* in our sense—rules licensing unary branching lexical structures, where the (single) daughter and mother correspond to the input and output respectively—are called *derivational constructions*. So Boas writes about the passive in SBCG as a derivational construction (p. 98). But in fact the passive derivational construction is just a lexical rule in the sense that we suggested.²

We will make this really explicit by discussing the derivational construction that Michaelis (2013, p. 149) suggested for caused motion.³

²SBCG has a slightly different feature geometry. Instead of SYNSEM, which was used in Pollard and Sag, 1994, SYN and SEM are used as in Pollard and Sag, 1987. Instead of a RELS list as in Copestake et al., 2005 SBCG uses a FRAMES list and the elementary predications have relation names ending in *-fr*, which is a short hand for *frame*.

³We corrected an error in the original, where L was combined with the *caused-motion-fr* via ‘ \oplus ’, which is ill-defined. Instead, the list containing this frame has to be combined with *L*. Mentioning the type *deriv-cxt* is superfluous, since this is a supertype of *caused-motion-cxt*.

$$(2) \text{ caused-motion-cxt} \Rightarrow \left[\begin{array}{l} \text{MTR} \\ \text{DTRS} \\ \text{deriv-cxt} \end{array} \left[\begin{array}{l} \text{FORM} \langle X \rangle \\ \text{ARG-ST} \langle NP_i, NP_j, [PP \text{ VAL} \langle NP_k \rangle] \rangle \\ \text{SYN} Y \\ \text{SEM} \left[\begin{array}{l} \text{IND} \quad s \\ \text{FRAMES} \langle \left[\begin{array}{l} \text{EFFECTOR } i \\ \text{THEME } j \\ \text{LOCATION } k \\ \text{caused-motion-fr} \end{array} \right] \rangle \oplus L \end{array} \right] \\ \text{FORM} \langle X \rangle \\ \text{ARG-ST} \langle NP_i, \dots \rangle \\ \text{SYN} Y \\ \text{SEM} \left[\begin{array}{l} \text{IND} \quad s \\ \text{FRAMES } L \end{array} \right] \end{array} \right] \right]$$

This construction is equivalent to what Wechsler (1997b) and Müller (2002, p. 241) suggested for resultative constructions. The format differs from what we suggested in the target article ((4) on page 7) only in the presence of a MOTHER feature in (2). On the MOTHER feature see Section 10 below.⁴

While Boas' commentary endorses the SBCG framework described in Sag, Boas and Kay, 2012, with its lexical rules feeding other lexical rules, Boas also inexplicably argues against such lexical rules. He says they suffer from ordering paradoxes, although he does not offer any examples. We never encountered any paradoxes since it is always clear whether arguments are to be added or removed.⁵ For more on overrides, rule ordering and transformations see Section 4.5.⁶

⁴See Copestake, 1992; Briscoe and Copestake, 1999 and Meurers, 2001 for lexical rules that have the format in (2). Instead of MTR and DTR the cited authors use 0= and 1= or IN and OUT.

⁵In fact Müller (2003a) argues that some of the bracketing paradoxes that were discussed by morphologists like Bierwisch (1987), Stump (1991) and Stiebels and Wunderlich (1994) disappear if particle verbs are analyzed lexically, since this allows for the attachment of affixes in the right positions, explains formations like *eindosen* ('put into a tin') which have non-existing base verbs (**dosen*) and explains why particles can scope below inflection.

⁶Boas criticizes the lexical rule suggested by Müller (2002, p. 241) on the grounds that the lexical rule "abruptly changes the valence property of the verb without any explanation of why or how this comes about" (p. 103). We do not understand this. Explaining *how* this comes about is exactly what the lexical rule does. The question of *why* means different things to different people: functional motivations for using the resultative, for example. In any case there is no difference in this respect between the lexical rules by Wechsler and Müller (which Boas opposes) and the one

Boas discusses argument reduction constructions and claims that they can be handled in SBCG. He points to Michaelis, 2012 for a solution. This is what Michaelis wrote:

The null-complementation construction is a type of derivational construction, i. e. one whose mother and daughters are all feature structures of type lexeme (Sag this volume). The null-complementation construction builds a lexeme with a covert valence member from a lexeme with an optionally covert valence member. (Michaelis, 2012, p. 51)

So what Michaelis suggests is a genuine lexical approach. In order to suppress something, it has to be present in the valency list of a lexical item.

Boas mounts a general defense of syntactic research carried out in ‘Construction Grammar’ frameworks. His complaints that we did not adequately describe constructionist research or ideas suggest that he mistook our article for a general attack on all things constructional. But the issue of our target article is being addressed *within* the construction grammar community, and one can agree with our position without therefore rejecting construction grammar wholesale. For example, proposals to replace lexical argument structures with phrasal representations were discussed at Construction Grammar network meetings, at network workshops, and at workshops in Bremen and Berlin and other international workshops and conferences (Stanford, 2007⁷; Berlin, 2007⁸, 2009⁹, 2009¹⁰, 2011¹¹; Prague, 2010¹²; Barcelona, 2011¹³).

by Michaelis (which he endorses).

As far as motivation is concerned, one could say that the output of the lexical rule/derivational construction is something that is similar to an existing underived caused-motion verb like *blow* and *push* (Boas, 2011, p. 54; Pulvermüller et al., 2013, Section 3.3). In HPSG (and hence in Sign-Based CxG) this would be captured by saying that *blow* and the output of the lexical rule would have a common super type. See Flickinger, 1987 for an early work on using lexical rules in which the type of the output sign was specified.

⁷<http://hpsg.stanford.edu/HPSG07/workshop.html> with Adele Goldberg, Paul Kay, Ivan Sag, Gert Webelhuth

⁸http://www.geisteswissenschaften.fu-berlin.de/izeus/zentrum/veranstaltungen/Archiv/2007/2007_10_26_workshop_comparing.html with Adele Goldberg, Richard Kayne, Gereon Müller, Anatol Stefanowitsch

⁹Workshop at the Wissenschaftskolleg with George Lakoff, Friedemann Pulvermüller, Luc Steels

¹⁰<http://hpsg.fu-berlin.de/Events/ring2009.html> with Richard Kayne, Anatol Stefanowitsch, Helen Leuninger, Gereon Müller, Michael Tomasello, Adele Goldberg, Gisbert Fanselow, Luc Steels, Gert Webelhuth, Jürgen Meisel

¹¹<http://hpsg.fu-berlin.de/Events/2011-cxg++.html> with Adele Goldberg and Geert Booij

¹²<http://www.constructiongrammar.org/iccg6/>

¹³Workshop *The Future of Linguistics* with Stephen Levinson, Luc Steels, Mirjam Fried, Holger Diessel, Kenny Coventry, Nancy Chang

3 Some orthogonal issues

Several commentators raised the issues of over- and under-generation of argument expression patterns. We agree that it is important to solve these problems. As far as we can tell, the available solutions under the two approaches are parallel. For example, Goldberg (2014b) notes that *break* has an optional agent. She illustrates her use of typeface to indicate optionality, boldface for obligatory and normal font for optional. We use parentheses for optionality, hence the ARG-ST of *break* looks like $\langle (NP_x,) NP_y \rangle$. The difference is purely notational. Also, where the lexicalist posits a lexical rule, the eliminative constructionist posits a construction. Some versions of constructions differ from lexical rules, as discussed in our target article, but constructions are not simpler than lexical rules.

Similarly, Boas feels that both our lexical representations and Goldberg's are 'not detailed enough' (p. 101), observing that 'corpus-based methods have revealed that the degree of idiosyncrasy in established verb classes appears to be far greater than previously thought' (p. 102). The lexical framework itself does not place any upper bound on the amount of detail in a lexical valence list. The amount of detail is determined by whether there is evidence that the information really is associated with the word.

Probabilistic and gradient phenomena can also be treated equally well under either approach. This is discussed in Section 7 below.

A more specific eliminative constructionist refrain is that gradient grammaticality judgments can be understood as better and worse fits between the constructional meaning and the meaning of the word that fills the slot in the construction. But exactly the same explanation works in the lexical approach in terms of better and worse fits between a word and the conditions on a lexical rule, or better and worse fits between two words that are combined. Wechsler (1995a, Section 5) used the latter idea in a lexicalist approach to verb-preposition combinations, where the preposition supplies the situation (state of affairs) type and the verb supplies the relation, noting that "This formal decoupling allows a certain degree of fluidity in the classification of relations." For example, the preposition *to* is used for communicative acts in *explain to*, *talk to*, *complain to*, *sing to*, and so on. But the relation denoted by the verb *cough* can appear in such a communicative act, if coughing is understood as a signal of some sort, as in *John coughed to the auctioneer* (Wechsler, 1995a, ex. 27). Eliminative constructionist proposals are similar except that they lose the lexical basis of meaning, substituting a construction meaning for a preposition meaning. This leads to problems in the interaction with the rest of the grammar.

In a closely related comment, Boas points to "semantic constraints that regulate the fusion of verbs and constructions in CxG (see Goldberg (1995: 50–53) and Boas (2003a: 100–104))". But there can be semantic constraints on the ap-

plication of a rule to a word, or semantic constraints arising from word combinations. For example, in a series of papers on English resultatives, Wechsler (2001, 2005a,b, 2012) specifies the relation between the lexical semantics of the verb and the adjective that conditions their combination by the resultative lexical rule. The specific condition is the following: *if the verb has durative aspect, it combines with a gradable, maximal endpoint closed-scale adjective; if the verb is punctual, it combines with a non-gradable adjective*. This semantic generalization was supported with a large controlled quantitative study using a sample that Boas himself collected from a 100 million word corpus.¹⁴ Lexical rules can be subject to semantic conditions.¹⁵

Yet another orthogonal issue is how to capture productivity. A lexical rule captures productivity under the assumption that it applies to any lexical item that satisfies the conditions imposed by the grammar. A construction captures productivity under the assumption that it can combine with any lexical item that satisfies the conditions imposed by the grammar. As for semi-productivity and exceptional forms, the same range of mechanisms is available under the two approaches. For example, Boas (2014, p. 103) sees a problem with a lexical rule approach to *-able* (or German *-bar*) suffixation. In the target article (footnote 14) we stated that the *productive* rule applies only to transitive verbs and also noted words with *-able* that are not the result of applying this rule, citing the examples of *laughable* and *dependable*. The point is that the rule applies to new transitives while other intransitive verbs cannot be counted on to behave like *laugh (at)* or *depend (on)*: the verbs in *They sneer at us*, *They scream at us*, *They snicker at us*, etc. do not produce the adjectives in * *We are sneerable*, * *We are screamable*, or * *We are snickerable*; and the verbs in *We count on her*, *We lean on her*, etc. do not give us * *She is*

¹⁴The statistical correlation in support of that generalization is highly significant (Wechsler, 2012). Nevertheless Boas (2003, p. 134–139) rejected that semantic analysis on the grounds that he found some exceptions: sentences on the web that violate the generalization; and constructed examples that he rated as unacceptable, but that abide by the generalization. He did not offer an alternative correlation to improve upon it. Responding to that critique, Wechsler (2012, p. 133) cites web examples of the sort Boas deemed unacceptable, concluding that “Neither cherry-picking from the web nor the use of isolated constructed examples is sufficient to undercut a claim that has been established through a controlled quantitative study.”

¹⁵Boas mentions two more putative differences that we do not understand. First, he writes that “the lexical approach does not posit independently existing meaningful constructions (or some other type of parallel concept or mechanism) capable of supplying additional arguments to a verb’s argument structure” (p. 94) But the lexical rule is a mechanism capable of supplying additional arguments. Second, Boas sees a difference concerning the treatment of ‘semantic compatibility and coercion effects based on background knowledge’, contrasting his own work with Briscoe and Copestake (1999). He does not indicate what difference he has in mind: perhaps richer detail in his own work. If so then this is another contingent differences that does not depend on the framework. See also Müller, 2005, 655–656 and Müller, 2007, Chapter 20 for remarks concerning refutations of theories.

countable or **She is leanable*. Boas assumes that we would be forced to convert intransitive verbs like *laugh* and *depend* to transitive verbs in order to allow these to be the input to the derivational construction that licenses *-able* adjectives. But as we note in footnote 14, we do not assume such an analysis. We follow Riehemann (1993, 1998), who suggested a solution in construction morphology for German *-bar* derivation.¹⁶ Riehemann assumes a network of derivational *-bar* constructions, some of them fully lexicalized like for instance *brennbar* (‘inflammable’, lit: ‘burnable’). In any case, Boas does not suggest any alternative to the lexical rule analysis. In fact his own paper (Sag, Boas and Kay, 2012, p. 12) proposes a lexical rule approach to *-able* suffixation.

4 Empirical evidence

4.1 Feeding relations

On our view one lexical rule can feed another. Goldberg (2014b) provides an interesting argument against such feeding relations. On the lexical approach we derive a resultative like (3a) by a lexical rule that adds an object and a telic result phrase to the valence structure of *sneeze*. That derived transitive verb feeds the passive rule to produce the passive verb in (3b).

- (3) a. She sneezed the foam off the cappuccino.
- b. The foam was sneezed off the cappuccino.
- c. * The foam is sneezable off the cappuccino.

Goldberg points out that our putative transitivity resultative rule does not feed the rule for *-able* suffixation, as shown in (3c), a problem for us since *-able* otherwise applies to transitive verbs. She makes the following proposal: ‘On the constructionist account, we can say that *-able* applies productively only to (a subclass of) verbs that are *lexically* transitive.’ Since *sneeze* is lexically intransitive, *-able* cannot apply.

We take Goldberg’s point to be that the stipulation against applying *-able* to derived forms would be unnatural for the lexicalist, but reasonable for the eliminative constructionist. We are not sure about that. The lexicalist could make the same stipulation. On the other hand, one would prefer to avoid making unmotivated stipulations, and try to explain the facts without them. We think that we can, while maintaining that stronger hypothesis that the grammar of *-able* suffixation does not systematically discriminate between basic (‘*lexically* transitive’) words and derived inputs.

¹⁶As far as we know this is the first work in constructional morphology and it is undercited.

Assuming that stronger hypothesis, we predict that whatever condition on *-able* suffixation prevents it from applying to the ‘resultativized’ transitive verb *sneeze* in (3a) should also prevent it from applying to basic transitive verbs. That is, we predict that basic transitive verbs should also reject *-able* suffixation, if their basic valence frames are similar to the derived transitives like *sneeze* in (3a). A resultativized verb like *sneeze* in (3a) selects an object NP and an oblique (PP or secondary predicate) telic phrase, that is, a phrase specifying a goal or result state. It has often been noted that the telic phrase is syntactically obligatory, as shown in (4b).

- (4) a. She sneezed the foam off the cappuccino.
 b. * She sneezed the foam.

Now consider basic verbs, such as *put* and *turn*, that share those valence properties:

- (5) a. She put the books into boxes.
 b. * She put the books.
 c. She turned straw into gold.
 d. (*) She turned straw.

As it turns out, *-able* affixation resists the inheritance of such *obligatory*, *telic*, *oblique* arguments—regardless of whether the verb is derived or basic:

- (6) a. * The books are puttable into boxes.
 b. * Straw is turnable into gold.

The telic oblique is obligatory for *put*, as it is for *turn* in the ‘transform’ sense in (5c). But on the ‘rotate’ sense *turn* lacks the oblique, so it accepts *-able*:

- (7) a. She turned the knob.
 b. The knob is turnable.

This generalization can be further illustrated with a diathesis alternation like the following. The valence list for *washed*₁ is a simple transitive list, while *washed*₂ has an obligatory telic oblique:

- (8) a. He washed₁ his shirt.
 b. He washed₂ the grease out of his shirt.
 c. (*) He washed₂ the grease.

As predicted *washed*₁ feeds *-able* affixation while *washed*₂ does not (both allow passive, as also predicted):

- (9) a. He washed₁ his shirt.

- b. His shirt was washed₁ (by someone).
 - c. His shirt is washable.
- (10)
- a. He washed₂ the grease out of his shirt.
 - b. The grease was washed₂ out of his shirt (by someone).
 - c. * The grease is washable out of his shirt.

A similar semantic condition applies also to *re-* prefixation, although the semantic effects are different because the meanings of the affixes differ (Wechsler, 1990; Keyser and Roeper, 1992).

If we are right then the problem with deriving **sneezable* is not that the input verb's transitivity is derived by a lexical rule, but rather that the verb selects an obligatory telic oblique. The prefix *out-* transitivizes a verb without also adding the obligatory telic oblique, so verbs transitivized by *out-* should not encounter this problem. As predicted, the *-able* rule applies to verbs that are lexically intransitive but have been transitivized with *out-*:

- (11)
- a. She ran (*Zombie).
 - b. She outran Zombie.
 - c. Zombie is slow and easily out-runnable.¹⁷

Note that this violates Goldberg's eliminatevely constructionist proposal, since *run* is not, in her terms, 'lexically transitive'.¹⁸ But its valence feature lacks the offending telic oblique so nothing prevents it on our account.

Like English, German has both resultatives and the *-bar* suffix that selects transitive verbal inputs. But it lacks the constraint against inheriting valence specifications for telic obliques, so more interactions with lexical rules are possible. Examples of the interaction of *-bar* derivation and the caused-motion/resultative construction are given in (12)–(14):

- (12) Gibt es schnell und einfach herauswaschbare Haarfarbe?¹⁹
 gives it quick and simply out.washable hair color
 'Is there hair color that can be washed out simply and quickly?'

(12) is the German analogue of the ungrammatical English example in (10c).

Note that this even works with full PPs, so accounts that assume that examples like (12) are possible because *heraus* is somehow lexically related to the verb stem will not cover examples like (13):

¹⁷<http://de.roblox.com/Forum/ShowPost.aspx?PostID=113802407&PageIndex=2>. 01.05.2014.

¹⁸We assume that by 'lexically transitive' she means a verb root that is already transitive without combining with a construction that transitivizes it.

¹⁹<http://www.gutefrage.net/frage/gibt-es-schnell-und-einfach-herauswaschbare-haarfarbe>. 19.05.2014.

- (13) Nix Schuhcreme, das ist ein Teufelszeug, obwohl das ja
nothing shoepolish this is a hellish.stuff although it yes
unheimlich gut aus den Haaren waschbar sein soll.²⁰
eerie well out the hair washable be should
‘Do not use shoepolish although it is supposed to be possible to wash it out
of ones hair well.’
- (14) a. Sie nieste den Schaum herunter.
she sneezed the foam off
b. der herunterniesbare Schaum
the off.sneezable foam
- (15) a. Teilweise werden einige Schadstoffe verbrannt, aber viele auch nur
partly are some pollutants burned but many also just
„zerkleinert“ und damit von den Lungenhärchen des
hackled and there.with by the lung.hairs of.the
Menschen nicht mehr fassbar und somit auch nicht herausnieß-
human.being not more graspable and hence also not out.sneeze
oder heraus hustbar.²¹
or outcoughable
‘Some pollutants are burned but many are just hackled and therefore
the human lung hairs cannot grasp them and it is impossible to sneeze
or cough them out.’
- b. Es gibt zwei Arten von Feinstaub, einmal den ungefährlichen,
it exist two types of fine.particles, one.time the dangerous
der an der Oberfläche mikroskopisch glatt ist und einfach
which at the surface microscopically smooth is and simply
ausgehustet wird. Dann den gefährlichen, wie in Asbest oder
out.coughed is then the dangerous as in asbestos or
früher Mineralwollen, der kleine Häkchen hat und sich in
formerly mineral.wool which small hooks has and REFL in
Lunge und Bronchen festsetzt und nicht mehr „aushustbar“ ist.²²
lung and bronchia solid.sets and not more out.coughable is
‘There are two types of fine particles the one that is not dangerous
whose surface is microscopically smooth and which is simply coughed
out. On the other hand there is the dangourous one as in asbestos or

²⁰<http://daoc-guide.4players.de/forums/showthread.php?2186-F%FCr-Samigina/page275>.
09.06.2014.

²¹<http://www.hondapower.de/forum/archive/index.php/t-203822.html>

²²A similar example can be found at <http://www.gutefrage.net/frage/wie-wirkt-feinstaub-genau-auf-den-koerper>, 26.02.2014.

formerly mineral wool which has small hooks and sets itself into the lungs and bronchia and cannot be coughed out anymore.’

(16) shows a use of the verb *fischen* (‘to fish’). The NP *den Teich* is not a semantic argument of *fisch-* and Müller (2002, Chapter 5) argued that the lexical rule for resultative predicates applies to an intransitive verb.

- (16) a. Sie fischt den Teich leer.
she fishes the pond empty
b. der leerfischbare Teich
the empty.fishable pond
‘the pond that can be fished empty’

As was pointed out in Müller, 2006, p. 871, *leerfischbar* can even be input to a further derivation resulting in *Leerfischbarkeit* (‘the possibility of becoming empty by fishing’). So the German resultative rule feeds *-bar* derivation suffixation. See Müller, 2006, Section 5 for other interactions between the resultative construction and derivational morphology. In fact this interaction was used in a series of papers to argue for the lexical treatment of resultative constructions.

4.2 Cutting up idioms with Ockham’s razor

Section 2.3 of our target article, ‘Meaningful phrasal constructions’, briefly describes a lexicalist view of idioms. (*Multi-word expressions* (MWEs) is a more general and less theory-laden term, but we use the term *idiom* since it is more familiar.) Some idioms are fixed phrases (*kick the bucket*, but **the bucket was kicked*), others are syntactically analyzable (*keep (close) tabs on*, *close tabs were kept on her*), and still others combine the two. So the grammar includes *phrasal lexical items* (phrases in which more than one word is fixed (Abeillé and Schabes, 1989; Richter and Sailer, 2009)), as well as words that select particular lexemes in their valence features (Sag, 2007). To capture the full range of idiom types, from fixed phrases to syntactically analyzable idioms, the two approaches are combined (Sailer, 2000; Soehn and Sailer, 2008).

Goldberg (2014b, Section 2.4) (‘Idioms are phrasal & argument structure patterns can be idiomatic’) suggests instead that all of them should be phrasally analyzed, proffering an Ockhamian argument: ‘the distinction between argument structure constructions and idiomatic phrases is often hard to detect. [...] It is thus theoretically desirable to treat idioms and argument structure constructions [...] alike, which means treating either both phrasally or both lexically.’ (p. 122) Since some of them must be treated phrasally, she concludes that it is desirable to treat all of them phrasally. The problem of course is that others (the analyzable ones) must be treated lexically because of their interaction with other phenomena

that were discussed in our target paper. So we think this is an over-application of Ockham's razor.

Lexicalist research addresses the important question of how idioms interact with the rest of the syntax. The systematic treatment of idioms along the full spectrum from fixed to syntactically analyzable has been a goal of lexicalist research for over 30 years, from a classic, much-cited study by three lexicalists (Wasow, Nunberg and Sag, 1982; Nunberg, Sag and Wasow, 1994), to the work cited in the first paragraph of this section, and continuing to this day (Kay and Sag, 2014).

4.3 Coordination

We wrote that verb coordination poses a problem for the phrasal approach, noting two examples: coordination of a two-place and three-place verb (*offered and baked*) and coordination of active and passive (Swedish *begärde och beviljades* 'requested and was granted'). Goldberg addresses the first problem under her theory by positing the following condition: "coordinated verbs must be used in the same argument structure constructions." The idea is that the ditransitive construction is consistent with either *offered* or *baked*, so it can combine with the coordinate structure *offered and baked*, adding an argument to the second verb but not the first. Until this is formalized precisely, we cannot know whether there are any strange, unwanted interactions with other parts of the grammar. But even assuming that it works, it does not seem to solve the problem of active-passive coordination. There the coordinated verbs are not "used in the same argument structure constructions": one is used in a passive construction and the other is not. And because of this the argument structure constructions may be different as well: in the Swedish example that was given above and in our original paper, *begärde* is used transitively and *beviljades* is the passive of a ditransitive verb.

4.4 Relying on each other's methodology

Goldberg (2014b, Section 4) observes that many combinations of an English verb with the preposition *on* have related meanings. In keeping with the constructional vernacular she calls such combinations a 'construction', and dubs the one underlying this set of combinations the Rely On construction. With this she attempts to score a point for the eliminative constructionist methodology, suggesting that unless we identify constructions 'we will fail to see the systematicity that exists.' (Goldberg, 2014b, p. 128).

We think these differences in methodology are matters of personal preference that need not divide us. For many years lexicalists, as well as other scholars of language, have described just this sort of systematicity. Instead of positing a 'construction', we describe this systematicity by saying that the preposition has a

meaning. The meaning of the preposition combines with the meaning of the verb. On one view this effectively constrains which combinations are possible (Gawron 1986; Wechsler 1995b, Section 3.1; Wechsler 1995a).

Prepositions are polysemous. When a verb selects a preposition, it is not merely selecting an empty form, rather it is selecting a word with a sense. The claim that a preposition carries meaning even when it is obligatorily selected by a verb is supported with evidence from zeugma effects. For example, the word *on* has the ‘reliance’ sense discussed by Goldberg, as in *rely on*, *depend on*, *count on*, and a rather different sense in *focus on*, *concentrate on*. Two verbs selecting the same preposition sense can be coordinated and share a single occurrence of the preposition (17a), but with different senses a zeugma effect is felt (17b) (from Wechsler 1995b, p. 68, example 125):

- (17) a. John relied and depended on Mary.
b. * John relied and concentrated on Mary.
c. John relied on— and concentrated on— Mary.

(See Wechsler (1995b, Section 3.1), and Wechsler (1995a) for more data.) The idea is that the preposition and verb share their arguments. In *John relies on Mary*, *John* and *Mary* are both arguments of *rely* and they are also both arguments of *on*. Gawron (1986) called this argument-sharing ‘copredication’. Evidence for copredication comes from the fact that a preposition can protect its arguments from omission, including arguments other than its object (see Wechsler 1995b, Section 3.1; Wechsler 1995a). Wechsler (1997a) provides further evidence from anaphoric binding.

The formulation of Goldberg’s Rely On construction seems to be compatible, at the very least, and perhaps even identical, with the argument structure posited for one sense of the preposition *on* under the existing lexicalist view of preposition semantics. She has added some insightful observations to the semantic description. We suspect that some researchers find it easier to think in terms of constructions, while others prefer to think in terms of the compositional semantics of prepositions. But the results of that research can be shared and combined.

4.5 Overrides, rule ordering, or transformations

Phrasal approaches often assume that semantic representations are linked to constituents labeled with syntactic categories like NP and AP (Goldberg and Jackendoff, 2004, p. 538; Boas, 2011, p. 58; Goldberg, 2003, 2014a). The representation given in (18) is an example:

- (18) Causative property resultative (Goldberg and Jackendoff, 2004, p. 538)
Syntax: NP₁ V NP₂ AP₃

Semantics: X_1 CAUSE [Y_2 BECOME Z_3]
MEANS: [VERBAL SUBEVENT]

It is often claimed that such representations are combined with active or passive and various other constructions in order to get the pattern that is actually realized. But note that there is a severe problem: once we have linked the arguments to two NPs, we have a structure that is incompatible with passive since in passive one argument is linked to a *by*-PP or not realized at all.²³

Some authors solve this problem by allowing constructions to override certain values. In principle such overrides might be a solution to this problem, although this has not been worked out in detail. However, we want to point out what such suggestions really mean. Recall that Boas argued against lexical rules because they require a rule ordering (p. 103). Accounting for reorganization of linking by phrasal constructions that allow overrides requires an explicit rule ordering as well, since only if we know that NP₂ in (18) is remapped to subject and NP₁ is remapped to oblique or zero we can apply further constructions.

We also want to point out that such overriding constructions that map representations like (18) to linkings like (19) are basically transformations that are similar to what was suggested by Chomsky (1957, p. 43).

(19) Causative property resultative after remapping to passive
Syntax: NP₂ V PP₁ AP₃
Semantics: X_1 CAUSE [Y_2 BECOME Z_3]
MEANS: [VERBAL SUBEVENT]

Unlike transformations in early TG, which apply to fully populated trees, these transformations apply to constructional schemata. In that sense they resemble GPSG meta-rules. On the other hand proponents of phrasal approaches often assume a VP construction that is fused with descriptions like those in (18) and (19), so the transformation that relates (18) and (19) would not apply to local trees as in GPSG but to trees with a greater depth, hence it would have more of the Chomskyan flavour.

One could argue that transformations applying to constructional schemata (GPSG meta-rules) are better than those that apply to fully populated trees (TG

²³Goldberg (1995) does not have this problem as dramatically since she links the semantics to grammatical functions like SUBJ, OBJ, and OBL rather than categories like NP and PP. Because of this extra level of representation it is possible to have different mappings to NP, PP, and so on. Culicover and Jackendoff (2005) used GF₂ and GF₃ instead of SUBJ and OBJ, perhaps because it seems strange to link SUBJ to a *by*-PP, while it is less objectionable to link GF₂ to a *by*-PP. However, as was pointed out in the target article, the extra level of representation can be used only once, so it cannot handle cases where the assignment to categories is changed more than once, as in the examples from Turkish, Irish, and Lithuanian.

transformations) because the latter were found to be psycholinguistically unrealistic in processing studies (Fodor, Bever and Garrett, 1974, p. 320–328). But the fact that such meta-rule-like transformations reorganize a structure shows that they have to apply in a certain order. Transformations, meta-rules, and over-rides all have that property.

5 Morphology

5.1 Lexical Integrity

Asudeh and Toivonen (2014) are right: their phrasal analysis of a certain Swedish construction does not violate lexical integrity. What we tried to say in our paper is that a similar phrasal analysis of the corresponding German construction would have to violate lexical integrity because of the way it interacts with derivational morphology. As we noted above, languages include fixed phrases with special meanings, while other multi-word expressions are syntactically analyzable, and still others lie in between. HPSG provides one way to model the parallels across these different types; Asudeh and Toivonen (2014) provide another way. There may turn out to be some grounds for preferring one formal mechanism over the other, but in any case this does not bear on the issues discussed in our target article, on which we are all in agreement, as far as we can tell.

5.2 Resultatives

Kálmán (2014) discusses our example in (20) and argues that there is a semantic explanation for this:

- (20) a. Er tanzt die Schuhe blutig / in Stücke.
he dances the shoes bloody into pieces
b. die in Stücke / blutig getanzten Schuhe
the into pieces bloody danced shoes
c. *die getanzten Schuhe
the danced shoes

We pointed out that the role assigned by the participle to the noun it modifies is not an argument of *tanzen* unless the verb has undergone a lexical rule. The problem is that “If the accusative object is licensed phrasally by configurations like the one in (20a) it cannot be explained why the participle *getanzte* can be formed despite the absence of an accusative object.” Kálmán’s answer is to say that the resultative construction can license different configurations depending on the form of the verb:

In a phrasal approach, the resultative construction need not only license the finite (transitive) use of an intransitive verb with the “theme” expressed as a direct object (plus the resultative complement), but also the non-finite version of such expressions, in which the participle of the same verb is used as a modifier, while the head noun expresses the “theme”, as it usually does when the modifier is a participle (phrase).

Kálmán does not explain how this would work. The construction is supposed to specify the phrasal form but the forms in (20a) and (20b) are different. Meanwhile, the semantic relations are the same: the shoes became bloody or in pieces as a result of (his) dancing. To capture the semantic parallels across different syntactic expressions is the function of a lexical rule (or a syntactic transformation). Kálmán would need two different constructions and has not indicated what would connect them.

Kálmán argues that (20c) is ruled out because the participle modification rule requires the participle to assign a theme role to the noun it modifies. Since *getanzten* does not have a theme role, (20c) is ruled out and since *blutig getanzte* does have a theme role, the phrase in (20b) is acceptable. A theme constraint was suggested in early work on English adjectival passives (Anderson, 1977), but Levin and Rappaport (1986) showed this thematic condition is wrong for English and that the real generalization is that the role must correspond to the syntactic object of the cognate verb.²⁴ For German there is also evidence for a direct (accusative) object condition rather than a thematic condition. This would explain the contrast between (21a) and (21b):

- (21) a. der unterstützte Mann
 the supported man
 b. *der geholfene Mann
 the helped man

The two verbs are semantically rather similar and unless one wants to claim that *unterstützen* takes a theme argument, while *helfen* does not, the contrast in (21) cannot be explained by a theme condition. If one requires that the participle has an argument with object properties and structural case (that is, the verb is either a transitive or an unaccusative verb), then the contrast in (21) is explained (Haider, 1986; Heinz and Matiassek, 1994; Müller, 2002, Section 3.2.1). If one has this requirement, it follows that the accusative argument of the participle in resultative constructions must be introduced lexically.

²⁴Levin and Rappaport (1986) allowed for ‘deep objects’, including both objects of transitives and subjects of unaccusatives, the latter as in *the fallen leaf*. But Bresnan (2001, Chapter 3) later argued that the latter are derived from active, not passive, participles such as the verb *fallen* in *The leaf has fallen*.

Furthermore, it should be noted that the phrase in (21b) is possible in Swedish, which has no dative case (Platzack, 2005, p. 490):

- (22) den hjälpta mannen (Swedish)
the helped man

This suggests that the case information on the object of the verb in the active plays a crucial role for deciding whether a participle can function as a prenominal modifier in German.

Kálmán could modify his reply and say: The participle-noun construction requires the participle phrase to have a subject that is coreferential with the modified noun. Since datives cannot be subjects in German, (21b) would be ruled out. However, this would allow for the existence of the form * *gehoffene* and would only rule out its combination with other material.²⁵ Competent speakers of German do not accept this form as a well-formed word of German independent of any construction. So, rather than having syntactic constructions imposing constraints on participles that occur in them, the constructions that license the participles (morphological constructions) should impose the constraints.

Further psycholinguistic and neuro-linguistic experiments are necessary to determine whether the deviance of * *gehoffene* is due to the fact that the morphological rules do not permit the formation of a word * *gehoffene* or to the fact that the word *gehoffene* cannot be used in any structure. According to Friedemann Pulvermüller (p. c. 2014) it may be possible to distinguish the two options by looking at brain responses: if the ill-formedness of the word * *gehoffene* is detected directly, the brain response should differ from the brain responses that would result if possible syntactic environments are checked.

So, concluding this section, we prefer a system of constraints that excludes non-existing word forms right away (experimental support is still lacking). In such a system the rules for forming adjectival participles require the participle to select an accusative object in the active. If this is correct, the accusative object of resultative constructions with intransitive verbs has to be introduced lexically. In any case there has to be a connection between the sentential resultative construction and its adjectival version, something that is lacking in Kálmán's proposal.

5.3 Morphology and interaction with argument structure constructions

We pointed out in our target paper and in several other publications (Müller, 2010b, 2013c) that phrasal approaches to argument structure constructions have

²⁵One can find examples with * *gehoffene* but these were written by foreigners or are explicitly marked as Feldbusch slang (Verona Feldbusch, a B-promi, used the verb like a transitive verb in a commercial).

problems with derivational morphology. For instance, the commonalities of the two occurrences of the *rumble* construction cannot easily be explained if the meaning of the construction is associated with a certain phrasal construction, as was suggested by Jackendoff (2011). Jackendoff claimed that the VP configuration in (23) contributes the meaning indicated in the example:

- (23) The bus rumbled around the corner.
 [_{VP} V PP] = ‘go PP in such a way to make a V-ing sound’

The equivalent to his English example is given in (24a) and this construction can also interact with derivational morphology as shown in (24b):

- (24) a. dass die Straßenbahnen um die Ecke quietschen
 that the trams around the corner squeak
 ‘that the trams squeak around the corner’
 b. wegen des Um-die-Ecke-Gequietsches der
 because.of the around-the-corner-squeaking.GEN of.the
 Straßenbahnen
 trams
 ‘because of the (annoying) squeaking around the corner of the trams’

This *Ge-* *-e*-derivation is a standard derivation that is independent of the *rumble* construction.

In a lexical approach the lexeme of the noise emission verb would be related to a lexical item that selects both for a subject and a PP that specifies the direction. The licensed lexical item contributes the meaning that was identified by Jackendoff. The newly licensed verbal stem can be fully inflected and used in a sentence or it can undergo derivation and inflection and then can be used as in (24b).

If the meaning of the *rumble* construction is to be tied to a phrasal configuration, that structure would be (25).

- (25) [_N PP [_N [_{N-stem} ge- V-stem -e] -s]]

Boas (2014) states that

constructionist proposals about how morphology interacts with what is traditionally known as the lexicon and syntax do exist (see e.g. Booij 2010/2013). That Goldberg’s ASCs do not address the morphological issues raised by M&W does not mean that constructionist accounts cannot handle morphological derivation or other morphological phenomena.

Booij (2014) provides solutions to some of the bracketing paradoxes that were discussed with respect to particle verbs (Stiebels and Wunderlich, 1994; Müller, 2003a). He assumes that there are paradigmatic relationships between particle

verb combinations and their respective nominalizations. For instance the particle verb *herumhopsen* is related to *Herumgehops* by the paradigmatic relation in (26):

$$(26) \quad \langle [\text{PART}_i \text{V}_j]_k \leftrightarrow [\text{SEM}]_k \rangle \approx \\ \langle [\text{PART}_i [\text{GE-V}_j\text{-E}]_N]_N \leftrightarrow [\text{NOM SEM}_k]_l \rangle$$

This statement says that if there is a particle verb combination with a certain semantics, then there is also another configuration, namely the *Ge- -e*-nominalization paired with the particle and the semantics of this item embeds the semantics of the particle verb under the nominalization operator.

Note that similar statements would be needed for the nominalizations of the *rumble* construction which were discussed above. It may be the case that complex relations like the ones in (26) are needed for the determination of the semantics of phrasal units (for instance for the analysis of the Italian *chitarrista elettrico* ‘electric guitarist’), but we do not agree that such devices are needed for particle verbs and for the *Ge- -e*-nominalizations that were discussed above. If a lexical analysis is chosen, statements like (26) that relate complex structures are not necessary for the analysis of particle verbs or more complex constructions involving pre-nominal PPs (Müller, 2003b). The semantics can be determined straightforwardly when lexical rules apply: the analysis of *Um-die-Ecke-Gequitsche* was already sketched above and the analysis for *Herumgehops* would be parallel. A lexical rule for the derivation of particle verbs would apply to the verb stem *hops-*. The licensed verb stem selects for a subject and an adverbial. This verbal stem can be inflected and then be used in sentences or it can undergo *Ge- -e*-nominalization and nominal inflection, then combine with *herum* and be used as a noun.

Note also that Booij’s analysis of particle verbs with fixed phrasal constructions cannot account for the fronting of particles, as we already pointed out in Müller and Wechsler, 2014, p. 12.

6 Comprehension and acquisition

Goldberg (2014b, Section 2.2) makes the important point that linguistic theories should be compatible with both comprehension and production of natural language. She sees comprehension as a problem for the ‘projectionist’ architecture of lexicalism, worrying that “The notion that different verb templates “project” distinct argument structures can only possibly work from the perspective of language production.” But the lexicalist theories we favor, such as HPSG, its variant SBCG, and LFG are declaratively rather than procedurally formulated. These grammar formalisms do not allow for transformations or other procedures (see footnote 2 of our target article). The grammar determines a relation between the

set of lexical items and the set of syntactic structures, and that knowledge of that relation can be exploited by language users to go in either direction.

By way of illustration, consider the example analysis of (27) in Figure 1.

(27) Jim baked Sue a cake.

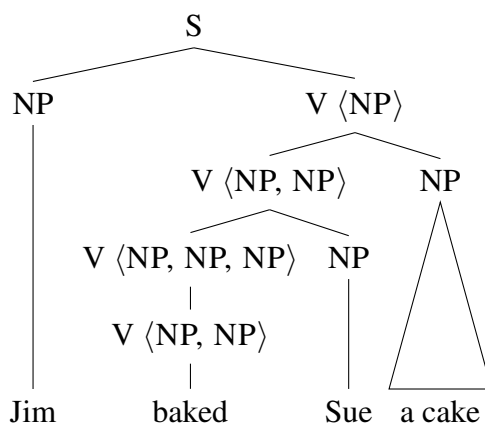


Figure 1: Lexical analysis of a sentence with a ditransitive verb

When a hearer hears *Jim* and *baked* a certain hypothesis concerning the valence frame of *baked* is made in the lexical model. In the phrasal model a hypothesis is formed as to which phrasal construction is used. Let us assume the strictly transitive valency frame/construction is chosen in both approaches. Now, if the hearer hears *Sue* (depending on the cultural context and the actual reference of *Sue*) the strictly transitive valence frame/construction becomes implausible and an alternative valence frame/construction has to be chosen: the ditransitive one. At this point of processing the lexical approach would assume a structure like the one in Figure 2, that is, the constraints of English grammar predict that the next node will be an NP.

Theories like HPSG do not make any claims about the order of applications of constraints. We do not assume that there is projection of arguments from the lexicon in the way it is done in some Minimalist approaches (Chomsky, 2008). The constraints can be used in either direction.

A closely related point concerns acquisition evidence from nonce verbs. Alishahi defends the idea of a *transitive construction* that (probabilistically) carries a causal meaning. She describes experiments (Fisher, 1996) suggesting that children interpret the subject of a nonce verb like *blick* as a causal agent in sentences like *Which one is blicking her over there?* more often than in sentences like *Which one is blicking over there?*. Alishahi writes: “Accounting for these findings would be difficult without assuming the existence of abstract but meaningful phrasal constructions. M&W acknowledge this fact, but they argue that such constructions

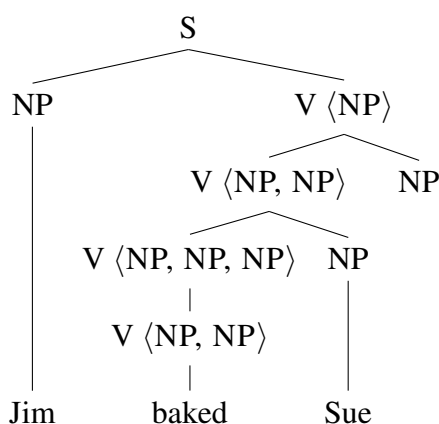


Figure 2: Partial lexical analysis of a sentence with a ditransitive verb

co-exist with lexical rules [...]” (p. 80). But we do not acknowledge this necessarily to be a fact. We find an alternative explanation more plausible. To see why, consider two alternative hypotheses to explain such experimental results:

In Fisher (1996) the children were presented with videos depicting scenes of pulling and spinning around, and asked questions like the ones in the previous paragraph, with transitively and intransitively used nonce words. Under the lexical approach we may hypothesize that the child, faced with this artificial task, figures that transitive *blicking* is a synonym for some transitive word she already knows, such as *pulling*, while intransitive *blicking* is a synonym for some intransitive verb she already knows, such as *spinning around*. Or perhaps their meanings are new hypernyms or hyponyms of such known words. Either way, the meaning she assigns to the nonce word will resemble that of the known verbs, with the roles expressed as they are for known verbs. The phrasal context of the verb in the stimulus tells the child what sort of verb it is. If the nonce verb *blicking* is presented with transitive clothing, the child takes it to be a transitive verb. This explains the correlation.

On the eliminative constructionist hypothesis, the child interpreting the nonce word *blicking*, when it occurs in a transitive phrasal context, gets an agentive meaning from the ‘transitive construction’. An obvious problem for that view is that many transitive clauses lack that agentive meaning. The transitive verbs in *I love you*, *She wants a cookie*, *I like you*, *I hate spinach*, *Can you see me?*, *I can feel the wind*, *She owns a car*, *The cereal contains sugar* and many, many other verbs that a child is likely to know, lack any notion of causation. They are stative verbs. Instead, the agentive causal meaning is restricted to a subset of verbs: namely, the ones describing agentive, causal actions. After all, such verbs retain their meaning even when they appear in other, non-transitive syntactic contexts. Alishahi gives

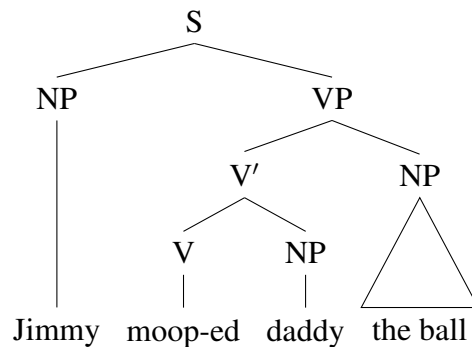


Figure 3: Lexical analysis of a sentence with a ditransitive verb

examples like *he baked a cake*, but *bake* retains exactly the same agentive, causal meaning in a deverbal event nominal like *The baking was fun*. It is quite clear that the agentive causal meaning in *he baked a cake* comes from the meaning of *bake* and is not contributed by the supposed transitive construction.

Echoing some acquisitionists, Alishahi suggests that meaningful phrasal constructions perform a crucial role in acquisition. For example, Alishahi writes that:

overgeneralisation errors seem to be semantically motivated, for example in cases where a typically intransitive verb is used in a transitive construction to emphasise the existence of a causal agent.

In lexical models we see such errors as indicating that a verb has been (mis-)classified as a transitive verb. We need not assume that an intransitive verb is (mis-)used in a meaningful phrasal transitive construction.

Similarly she claims that:

Other studies show that humans use their knowledge of form-meaning associations to guide word learning and reduce ambiguity, by using a familiar linguistic construction to infer the potential meaning of a novel word (e.g., Fisher et al., 2006; Gertner et al., 2006).

We agree that linguistic constraints can be used to infer properties of unknown words; indeed, this is one highlight of constraint-based theories (Pullum and Scholz, 2001). But again this does not prove that we are dealing with phrasal constructions rather than with lexical ones. To see this consider the analysis of (28) in Figure 3.

(28) Jimmy mooped daddy the ball.

NPs can stand in several relations to other material in a clause: they can be arguments, adjuncts or predicates. In the example in (28) it is clear that the NPs

have to be arguments, since they refer to people and objects rather than times or locations. The child knows from the verb inflection that *mooped* is a verb. So, even if the valence of the verb is unknown the child can infer that it must be a ditransitive verb, since there is no other way to combine the material.²⁶ The structure in Figure 3 is only licenced if the verb *mooped* is a ditransitive verb. Hence a child (or an adult, for that matter) can infer that the speaker has uttered a sentence with a ditransitive verb. Since ditransitive verbs are transfer verbs, this verb is a transfer verb. The same reasoning applies for the example that Alishahi disusses on page 85.

7 Probability and gradience

Alishahi (2014) emphasizes the point that grammars should have a probabilistic component. We agree on this, as do many lexicalists whose grammars include probabilities, such as many implementations of HPSG since the 1990s. In our article we mentioned that Briscoe and Copestake, 1999 propose lexical rules with a probabilistic component. As observed by Manning (2003), probability distributions can run over the elements of any type of grammar. So this is orthogonal to the issues addressed in our paper.

Alishahi uses the issue of probabilistic syntax to make a point about complexity:

M&W repeatedly argue that a working construction-based approach is not simpler and more powerful than a lexical approach, because in both cases it is necessary to stipulate which verbs can appear in which construction/rule. The probabilistic account discussed in this paper suggests that such extra machinery is not necessary. In fact, establishing a hard link between verbs and their constructions restricts creative language use.

However, as far as we can tell the probabilistic approach does not favor one framework over the other. On Alishahi's view, frames for verbs (lexical items) are matched probabilistically against phrasal constructions. We assume that lexical items are matched (probabilistically) against lexical rules or schemata. What is good for the goose is good for the gander.

²⁶In HPSG terms, *mooped* and *daddy* are combined using the head-complement schema, *mooped daddy* and *the ball* are combined using the head-complement schema and *Jimmy* and *mopped daddy the ball* are combined using the specifier-head schema. We could have used flat structures for the VP, but we choose this representation to make it as clear as possible that the inferences also work with structures that are maximally unlike what is assumed in some very flat phrasal approaches.

In a related point, Alishahi (2014) repeats a common fallacy about lexical approaches, that rule application must be all-or-none:

According to a lexical approach, the valence structure for each verb is stored individually, but the combination patterns or lexical rules are verb-independent. Therefore, once a child forms a lexical rule and starts using it productively for a subset of verbs, s/he should be able to apply it to any new verb which satisfies the constraints of a rule. (Alishahi, 2014, p. 75)

The last sentence is literally correct, but ‘the constraints of a rule’ include constraints on which verbs it applies to, that is, the rules are not necessarily verb-independent. Also, lexical approaches do not exactly assume that ‘the valence structure for each verb is stored individually’. Instead, lexicalists assume that the lexicon has structure. For example, from the earliest days of HPSG, an important feature of the theory has been the organization of verbs and other words into type hierarchies (Flickinger, 1987, Wechsler, 1995b, ch. 4, Davis, 2001). Lexical rules can be restricted to apply to words belonging to a type, and that type can appear at any level in the hierarchy. The hierarchical lexicon allows for a very natural modeling of the gradual widening of the application domain of a rule during acquisition: the child starts at the bottom of the hierarchy with individual words and works her way up, acquiring higher and higher (more and more general) supertypes. Type inheritance hierarchies typically allow default inheritance, which captures the blocking of more general types by more specific ones. Whether this formal device is the best solution or not, the fact is that all this has to be reflected somewhere in linguistic theories, and this is the case for both lexical and phrasal approaches. Lexical approaches have to restrict the application of lexical rules and phrasal approaches have to restrict the combination of verbs with phrasal constructions.

Kálmán writes that our critique of phrasal approaches is “misguided”, because the more important issue is “the categorical versus gradient character of grammatical regularities.” This too is orthogonal to the issue addressed in our paper. As was discussed for instance by Pullum and Scholz (2001), one advantage of constraint-based theories over generative-enumerative ones is that they can model gradient phenomena. Both the phrasal and the lexical approaches can use weighted constraints to model the gradient character of grammatical phenomena.

8 Probability distributions as ‘constructions’

Alishahi (2014) uses the term ‘construction’ to refer to a probability distribution over semantic features of a valency pattern. The ‘transitive construction’ is calcu-

lated by collecting patterns with the form X Verb Y, tagged with semantic features and a feature for the verb lemma. Each such pattern with its features is called a *frame*. The meaning of the transitive construction is the collection of all the semantic features associated with X, Y, and the verb, and the respective likelihoods of these restrictions: volition and sentience are more likely for X than for Y, for example. Alishahi and Stevenson's (2012) acquisition model was trained on inputs consisting of patterns with the form X Verb Y coded with semantic properties of X and Y, as well as semantic properties of the event associated with the sentence. So their 'transitive construction' represents the properties of transitive verb usages, in the form of a probabilistic association between the various features of the verb and its arguments. Some aspects of acquisition are modeled by allowing this probability distribution to predict the values of any unknown features.

Alishahi and Stevenson (2012)'s training data consisted entirely of simple kernel declarative sentences like *he baked a cake*. Within that highly restricted subset of human language there is a one-to-one mapping between elements of the lexical valence list and syntactic positions in the sentence pattern. The information in Alishahi and Stevenson (2012)'s frame is the same as the information in our lexical argument structure. So while Alishahi (2014) refers to the probabilistic distribution of features as a construction, we can reinterpret it as a distribution over a set of lexical argument structures.

There is an interesting difference, however, concerning the existence of lexical rules. As noted in Section 6, transitive verbs retain their meaning even when they appear in other, non-transitive syntactic contexts. The root *bake* denotes the same type of event whether in *he baked a cake*, in *The baking was fun*, or in *freshly baked bread*. In our target article we argue that lexical rules capture that parallel across different phrasal constructions. In contrast, Alishahi and Stevenson (2012) propose a true eliminative constructionist (see Section 2 above) computational model of acquisition that builds distinct probability distributions for each syntactic pattern. It induces clusters from correlations of features, but it does not perceive correlations *between* clusters. It would acquire semantic profiles for adjectival passives like *baked* in *freshly baked bread* from an input of adjectival passive frames; it would acquire semantic profiles for deverbal *-ing* nominals like *the baking* from an input of deverbal *-ing* nominals; and so on. But the model would be forbidden from exploiting the systematic correlations between those patterns. For example, all of the the semantic features of the object of the transitive construction are paralleled by those features attributed to the noun by the adjectival passive that modifies it. It is a very strong correlation and a great deal of evidence for it would accrue in the input. But no matter how strong the correlations become, the eliminative constructionist acquisition device would be prevented from taking advantage of that evidence, because to do so would mean that the language learner is acquiring a lexical rule.

The stage is set for a contest to see which acquisition model would perform better: one that learns and exploits the systematic relations between different syntactic uses of a root, or one that does not. We are putting our money on the former.

9 Semantics without lexical valence information

Kálmán (2014) argues for a phrasal approach on the grounds that it places the burden of determining whether a certain item can enter a phrasal construction on the semantics. He adds in a footnote that “It is also unclear whether semantic information alone is sufficient to decide in all cases, but this issue will not be addressed in what follows.” We think that it is not unclear at all and in fact provided examples that show that semantic information is not sufficient (Müller and Wechsler, 2014, Section 7.4).

10 Computational complexity

Kobele (2014) notes that our efforts to compare phrasal and lexical approaches are hampered by the fact that the phrasal and other constructional theories are not worked out in detail. We fully agree: most such proposals lack an explicit formalization.²⁷ In some cases we were forced to speculate on how a certain approach might handle phenomena that appear to be problematic.

In Section 1 Kobele compares our lexical rules with an approach that is compatible with current Minimalist assumptions. He notes that one can be translated into the other and thereby confirms a claim we made in our target article and reiterated in this reply. Kobele also confirms our claim in Section 7.6 (‘Is there an alternative to lexical valence structure?’) that Borer’s 2003 ‘idioms’ are equivalent to lexically fixed valence representations. In the quotation in our Section 7.6, Borer characterizes her treatment as a ‘concession of sorts’ to the lexical valence view that she argues against in much of the remainder of her book.

Kobele concludes from the intertranslatability of some aspects of the analyses that the lexical/phrasal distinction addressed in our article may not be ‘useful’ or even ‘meaningful.’ (p. 172) We cannot agree on this. While specific components

²⁷The work in SBCG and the work by Steels (2011) and Bergen and Chang (2005) is an exception. See also van Trijp (2011) for a formalization of argument structure constructions.

The lack of formalization is not unique to Construction Grammar. Chomsky explicitly argued against formalization (Chomsky, 1990, p. 146). Missing details, sloppy or inconsistent definitions were criticized by Pullum and others working within GB/Minimalisms or in alternative frameworks (Pullum, 1985, 1989; Pullum, 1991, p. 48; Stabler, 2010, p. 397, 399, 400). See also Müller, 2013a, Section 1.2 on the importance of precision and formalization and further details and references.

of the respective analyses are translatable into each other, the devil is in the details of how those components interact with other aspects of the grammar. We pointed out in our target paper several areas in which there are differences and where eliminative phrasal Construction Grammar approaches and Neo-Constructionist approaches make predictions that distinguish them from lexical approaches. Further evidence for or against particular linguistic objects can come from studies of acquisition (Section 9 of the target article), historical processes (mentioned in Section 7.3 of the target article), developmental and cognitive psychology, neurolinguistics, and other interfaces between a natural language grammar and the world around it. Koble focused instead on technical aspects and computational complexity and generative capacity. We will discuss complexity issues in the remainder of this section.

Complexity in the sense of the Chomsky hierarchy (Chomsky, 1959) is interesting to mathematicians. But for those who study language, the usefulness of such calculations has long been controversial. Complexity analysis can tell us whether certain languages are describable using a certain type of grammar, as in Chomsky's (1959) original argument that finite state grammars are inadequate for the analysis of natural languages. And it can tell us how long recognition will take in the worst possible case. But we think that complexity of the formalism in the sense of the Chomsky hierarchy does not currently play a useful role in the comparison of theories (see Müller, 2010a, Section 11.6 for discussion.)

Instead we follow Pollard in taking the theory, not the formalism it is couched in, to be the main factor of interest:

If physicists required the formalism to constrain the theory

Editor: Professor Einstein, I'm afraid we can't accept this manuscript of yours on general relativity.

Einstein: Why? Are the equations wrong?

Editor: No, but we noticed that your differential equations are expressed in the first-order language of set theory. This is a totally unconstrained formalism! Why, you could have written down ANY set of differential equations! (Pollard, 1996)

In the study of natural language as in the study of the physical world, it is important to compare different theories even if they are stated in the same formalism or in formalisms at the same complexity level.

Formalizations of CxG like Bergen and Chang, 2005 are basically notational variants of HPSG (see Müller, 2010a, Section 9.6.2) and hence have the same complexity. So HPSG and the formalized versions of CxG (Bergen and Chang, 2005; Steels, 2011) have the full power of a Turing machine. As far as we know,

researchers in those frameworks are not trying to reduce computational complexity, with the exception of work on Sign-Based Construction Grammar. Ivan Sag tried to get the complexity of SBCG down towards GPSG's complexity by modifying the feature geometry to make things more local. Instead of using the feature geometry in (29a), he suggested using the one in (29b).

- (29) a. classical HPSG:
- $$\left[\begin{array}{l} \text{PHON} \quad \textit{list of phonemes} \\ \text{SYNSEM} \quad \textit{syntactic and semantic information} \\ \text{DTRS} \quad \textit{list of signs} \\ \textit{sign} \end{array} \right]$$
- b. Sign-Based Construction Grammar:
- $$\left[\begin{array}{l} \text{MOTHER} \quad \left[\begin{array}{l} \text{PHON} \quad \textit{list of phonemes} \\ \text{SYN} \quad \textit{syntactic information} \\ \text{SEM} \quad \textit{semantic information} \\ \textit{sign} \end{array} \right] \\ \text{DTRS} \quad \textit{list of signs} \end{array} \right]$$

This new feature geometry ensures that the information about daughters is not contained in phrasal signs or in internally complex lexical signs. In order for a grammar with such constructions to work as a theory that licenses linguistic objects, a meta statement is needed which is not needed in classical HPSG (Sag, Wasow and Bender, 2003, p. 478). This need of a meta statement basically changes the fundamental assumptions so much that the formalization of HPSG that was suggested by Richter (2004) cannot be used without further modification. However, the locality restrictions of SBCG can be circumvented easily by structure sharing (Müller, 2013b, Section 9.6.1). To see this consider a construction with the following form:

- (30)
$$\left[\begin{array}{l} \text{MOTHER} \quad \left[\begin{array}{l} \text{PHON} \quad \textit{list of phonemes} \\ \text{SYN} \quad \textit{syntactic information} \\ \text{SEM} \quad \textit{semantic information} \\ \text{NASTY} \quad \boxed{1} \\ \textit{sign} \end{array} \right] \\ \text{DTRS} \quad \boxed{1} \textit{list of signs} \end{array} \right]$$

The feature NASTY in the MOTHER sign refers to the value of DTRS and hence all the internal structure of the sign that is licensed by the constructional schema in (30) is available. Of course one could rule out such things by stipulation, but one could also continue to use the old feature geometry and stipulate constraints like

“Do not look into the daughters.”²⁸ The discussion above shows that all current construction grammars are in the same complexity class. We tried to imagine formalizations of the phrasal analyses that lay in the scope of current constraint-based theories and we think that it is legitimate to compare these assumed solutions. It is basically a comparison of various HPSG dialects.²⁹

From a mathematical-computational perspective it is interesting to see that Stabler’s Minimalist Grammars (Stabler, 2001; Kobele, 2006; Stabler, 2009), Tree-Adjoining Grammars, and Combinatory Categorical Grammar all have a complexity somewhere between context free and mildly context sensitive, while HPSG and other constraint-based frameworks have the power of Turing machines. However, other factors have a greater effect on the performance of grammar implementations. We will give two examples. While some HPSG parsers can analyze sentences within milliseconds even for non-trivial grammar fragments and input of non-trivial length, the parse time of simple German sentences with certain TAG systems (a TT-MCTAG parser) is much longer (Timm Lichte p. c. 2013).³⁰ The point that is important here is that all complexity measures come with a grammar constant. If this grammar constant is very large it can influence the overall performance so much that it does not help that the system would be faster than other systems for a sentence with more than 100 words (see also Berwick and Weinberg, 1984, Chapter 3 for a detailed discussion of worst case approximations for grammar classes and the actual behaviour of parsers for concrete grammars). Another example is the comparison of a parser that allows for discontinuous constituents with one that only admits continuous constituents (Müller, 2004). German clause structure was dealt with by linearization with the first parser and by empty elements and head movement with the second. Despite being at a lower complexity level, the parser that used empty elements and head movement was much worse, due to the properties of the grammars.

11 Conclusion

Natural language grammars are highly complex and multi-faceted, and the theorist faces a great many decision points in constructing a theory, and many decisions in using a framework for linguistic description. On some of those decisions we see

²⁸An example of such a constraint given in prose is the Locality Principle of Pollard and Sag (1987, p. 143–144).

²⁹Our discussion also included work from LFG, TAG, and Neo-Constructivist approaches, but we did not attempt to compare simplicity.

³⁰See also Sarkar, 2000 for a discussion of factors that play a role in parsing TAGs. Sarkar showed that syntactic lexical ambiguity, that is, the number of trees that are selected by the words in a sentence is much more important than the sentence length, which is usually regarded the most important in worst-case computations related to complexity classes.

a great deal of common ground with the respondents. Many views advocated in the commentaries are orthogonal to the claims made in our target article. The representation of argument optionality, the amount of detail that lexical items should include, the probabilistic component of grammar, gradability in grammar rules and features, and other questions allow for the same range of answers whether one embraces the lexical approach to argument structure or not. We are struck by how often we find ourselves in agreement with our critics on these matters.

We maintain our claim that the grammars of natural languages include lexical rules operating on lexical valence structures, and that valence alternations and cognate relations involve the application of such rules. The dialog with our respondents has forced us to refine our thinking and to dig deeper to understand exactly what is at stake.

References

- Abeillé, Anne and Schabes, Yves. 1989. Parsing Idioms in Lexicalized TAG. In H. Somers and M. M. Wood (eds.), *Proceedings of the Fourth Conference of the European Chapter of the Association for Computational Linguistics*, pages 1–9, Manchester, England: Association for Computational Linguistics.
- Alishahi, Afra. 2014. Lifecycle of a Probabilistic Construction. *Theoretical Linguistics* 40(1–2), To appear.
- Alishahi, Afra and Stevenson, Suzanne. 2012. A Computational Model of Learning Semantic Roles from Child-Directed Language. *Language and Cognitive Processes* 25(1), 50–93.
- Anderson, Stephen R. 1977. Comments on the paper by Wasow. *Formal syntax* 361, 378.
- Asudeh, Ash and Toivonen, Ida. 2014. *With Lexical Integrity*. *Theoretical Linguistics* 40(1–2), In Print.
- Bergen, Benjamin K. and Chang, Nancy. 2005. Embodied Construction Grammar in Simulation-Based Language Understanding. In J.-O. Östman and M. Fried (eds.), *Construction Grammars: Cognitive Grounding and Theoretical Extensions*, pages 147–190, Amsterdam/Philadelphia: John Benjamins Publishing Co.
- Berwick, Robert C. and Weinberg, Amy S. 1984. *The Grammatical Basis of Linguistic Performance: Language Use and Acquisition*. Cambridge, MA: MIT Press.
- Bierwisch, Manfred. 1987. A Structural Paradox in Lexical Knowledge. In E. van der Meer and J. Hoffmann (eds.), *Knowledge Aided Information Processing*, pages 141–172, Amsterdam: Elsevier Science Publisher B.V. (North-Holland).
- Boas, Hans C. 2011. Zum Abstraktionsgrad von Resultativkonstruktionen. In

- S. Engelberg, A. Holler and K. Proost (eds.), *Sprachliches Wissen zwischen Lexikon und Grammatik*, Institut für Deutsche Sprache, Jahrbuch 2010, pages 37–70, Berlin/New York, NY: de Gruyter.
- Boas, Hans C. 2014. Lexical Approaches to Argument Structure: Two Sides of the Same Coin. *Theoretical Linguistics* 40(1–2), To appear.
- Boas, Hans C. and Sag, Ivan A. (eds.). 2012. *Sign-based Construction Grammar*. CSLI Lecture Notes, No. 193, Stanford, CA: CSLI Publications.
- Boas, Hans Christian. 2003. *A Constructional Approach to Resultatives*. Stanford Monographs in Linguistics, Stanford, CA: CSLI Publications.
- Booij, Geert E. 2014. Word Formation in Construction Grammar. In P. O. Müller, I. Ohnheiser, S. Olsen and F. Rainer (eds.), *An international handbook of the languages of Europe*, Berlin: de Gruyter, To appear.
- Borer, Hagit. 2003. Exo-Skeletal vs. Endo-Skeletal Explanations: Syntactic Projections and the Lexicon. In J. Moore and M. Polinsky (eds.), *The Nature of Explanation in Linguistic Theory*, pages 31–67, Stanford, CA: CSLI Publications.
- Bresnan, Joan. 2001. *Lexical-Functional Syntax*. Oxford, UK/Cambridge, USA: Blackwell.
- Briscoe, Ted J. and Copestake, Ann. 1999. Lexical Rules in Constraint-Based Grammar. *Computational Linguistics* 25(4), 487–526. <http://acl.ldc.upenn.edu/J/J99/J99-4002.pdf>, 06.04.2004.
- Chomsky, Noam. 1957. *Syntactic Structures*. Janua Linguarum / Series Minor, No. 4, The Hague/Paris: Mouton.
- Chomsky, Noam. 1959. On Certain Formal Properties of Grammars. *Information and Control* 2(2), 137–167.
- Chomsky, Noam. 1990. On formalization and formal linguistics. *Natural Language and Linguistic Theory* 8(1), 143–147.
- Chomsky, Noam. 2008. On Phases. In R. Freidin, C. P. Otero and M. L. Zubizarreta (eds.), *Foundational Issues in Linguistic Theory. Essays in Honour of Jean-Roger Vergnaud*, pages 133–166, Cambridge, MA: MIT Press.
- Copestake, Ann. 1992. The Representation of Lexical Semantic Information. *Cognitive Science Research Papers* 280, University of Sussex.
- Copestake, Ann, Flickinger, Daniel P., Pollard, Carl J. and Sag, Ivan A. 2005. Minimal Recursion Semantics: an Introduction. *Research on Language and Computation* 4(3), 281–332. <http://lingo.stanford.edu/sag/papers/copestake.pdf>, 11.10.2006.
- Croft, William. 2003. Lexical Rules vs. Constructions: A False Dichotomy. In H. Cuyckens, T. Berg, R. Dirven and K.-U. Panther (eds.), *Motivation in Language: Studies in Honour of Günter Radden*, pages 49–68, Amsterdam/Philadelphia: John Benjamins Publishing Co.
- Culicover, Peter W. and Jackendoff, Ray S. 2005. *Simpler Syntax*. Oxford: Oxford

- University Press.
- Davis, Anthony R. 2001. *Linking by Types in the Hierarchical Lexicon*. Stanford, CA: CSLI Publications.
- Fisher, Cynthia. 1996. Structural limits on verb mapping: The role of analogy in children's interpretations of sentences. *Cognitive psychology* 31(1), 41–81.
- Flickinger, Daniel P. 1987. *Lexical Rules in the Hierarchical Lexicon*. Ph. D.thesis, Stanford University.
- Fodor, Jerry A., Bever, Thomas G. and Garrett, Merrill F. 1974. *The Psychology of Language. An Introduction to Psycholinguistics and Generative Grammar*. New York: McGraw-Hill Book Co.
- Gawron, Jean Mark. 1986. Situations and Prepositions. *Linguistics and Philosophy* 9(4), 427–476, goldberg95a:237 caused-motion über LR.
- Goldberg, Adele E. 1995. *Constructions. A Construction Grammar Approach to Argument Structure*. Cognitive Theory of Language and Culture, Chicago/London: The University of Chicago Press.
- Goldberg, Adele E. 2003. Words by Default: the Persian Complex Predicate Construction. In E. J. Francis and L. A. Michaelis (eds.), *Mismatch: Form-function Incongruity and the Architecture of Grammar*, CSLI Lecture Notes, No. 163, pages 117–146, Stanford, CA: CSLI Publications.
- Goldberg, Adele E. 2014a. *Tuning in to the Verb-Particle Construction in English*. In L. Nash and P. Samvelian (eds.), *Syntax and Semantics: Complex Predicates*, submitted.
- Goldberg, Adele E. 2014b. Fitting a Slim Dime between the Verb Template and Argument Structure Construction Approaches. *Theoretical Linguistics* 40(1–2), To appear.
- Goldberg, Adele E. and Jackendoff, Ray S. 2004. The English Resultative as a Family of Constructions. *Language* 80(3), 532–568.
- Haider, Hubert. 1986. Fehlende Argumente: vom Passiv zu kohärenten Infinitiven. *Linguistische Berichte* 101, 3–33.
- Heinz, Wolfgang and Matiasek, Johannes. 1994. Argument Structure and Case Assignment in German. In J. Nerbonne, K. Netter and C. J. Pollard (eds.), *German in Head-Driven Phrase Structure Grammar*, CSLI Lecture Notes, No. 46, pages 199–236, Stanford, CA: CSLI Publications.
- Jackendoff, Ray S. 2011. What is the human language faculty? Two views. *Language* 87(3), 586–624.
- Kálmán, László. 2014. What can constructions do? *Theoretical Linguistics* 40(1–2), To appear.
- Kay, Paul. 2005. Argument Structure Constructions and the Argument-Adjunct Distinction. In M. Fried and H. C. Boas (eds.), *Grammatical Constructions: Back to the Roots*, Constructional Approaches to Language, No. 4, pages 71–98, Amsterdam/Philadelphia: John Benjamins Publishing Co. <http://www.icsi>.

- berkeley.edu/~kay/ASCs.pdf, 07.11.2006.
- Kay, Paul. 2014. Unary Phrase Structure Rules and the Cognitive Linguistics Lexical Linking Theory. *Theoretical Linguistics* 40(1–2), To appear.
- Kay, Paul and Sag, Ivan A. 2014. A Lexical Theory of Phrasal Idioms. Ms. Stanford University.
- Keyser, Samuel Jay and Roeper, Thomas. 1992. Re: The Abstract Clitic Hypothesis. *Linguistic Inquiry* 23(1), 89–126.
- Kobele, Greg. 2006. *Generating copies: An investigation into structural identity in language and grammar*. Phd thesis, UCLA.
- Kobele, Gregory M. 2014. Meeting the Boojum. *Theoretical Linguistics* 40(1–2), In Print.
- Levin, Beth and Rappaport, Malka. 1986. The Formation of Adjectival Passives. *Linguistic Inquiry* 17(4), 623–661.
- Manning, Christopher D. 2003. Probabilistic syntax. In R. Bod, J. Hay and S. Jannedy (eds.), *Probabilistic linguistics*, pages 289–341, MIT Press.
- Meurers, Walt Detmar. 2001. On Expressing Lexical Generalizations in HPSG. *Nordic Journal of Linguistics* 24(2), 161–217. <http://www.sfs.uni-tuebingen.de/~dm/papers/lexical-generalizations.html>, 30.11.2006.
- Michaelis, Laura A. 2012. Making the Case for Construction Grammar. In Boas and Sag (2012), pages 31–67.
- Michaelis, Laura A. 2013. Sign-based Construction Grammar. In Trousdale and Hoffmann (2013), pages 133–152.
- Müller, Stefan. 2002. *Complex Predicates: Verbal Complexes, Resultative Constructions, and Particle Verbs in German*. Studies in Constraint-Based Lexicalism, No. 13, Stanford, CA: CSLI Publications. <http://hpsg.fu-berlin.de/~stefan/Pub/complex.html>, 23.06.2014.
- Müller, Stefan. 2003a. Mehrfache Vorfeldbesetzung. *Deutsche Sprache* 31(1), 29–62. <http://hpsg.fu-berlin.de/~stefan/Pub/mehr-vf-ds.html>, 23.06.2014.
- Müller, Stefan. 2003b. Solving the Bracketing Paradox: an Analysis of the Morphology of German Particle Verbs. *Journal of Linguistics* 39(2), 275–325. <http://hpsg.fu-berlin.de/~stefan/Pub/paradox.html>, 23.06.2014.
- Müller, Stefan. 2004. Continuous or Discontinuous Constituents? A Comparison between Syntactic Analyses for Constituent Order and Their Processing Systems. *Research on Language and Computation, Special Issue on Linguistic Theory and Grammar Implementation* 2(2), 209–257. <http://hpsg.fu-berlin.de/~stefan/Pub/discont.html>, 23.06.2014.
- Müller, Stefan. 2005. Resultative Constructions: Syntax, World Knowledge, and Collocational Restrictions. Review of Hans C. Boas: A Constructional Approach to Resultatives. *Studies in Language* 29(3), 651–681. <http://hpsg.fu-berlin.de/~stefan/Pub/boas2003.html>, 23.06.2014.
- Müller, Stefan. 2006. Phrasal or Lexical Constructions? *Language* 82(4), 850–

883. <http://hpsg.fu-berlin.de/~stefan/Pub/phrasal.html>, 23.06.2014.
- Müller, Stefan. 2007. *Head-Driven Phrase Structure Grammar: Eine Einführung*. Stauffenburg Einführungen, No. 17, Tübingen: Stauffenburg Verlag, first edition. <http://hpsg.fu-berlin.de/~stefan/Pub/hpsg-lehrbuch.html>, 23.06.2014.
- Müller, Stefan. 2010a. *Grammatiktheorie*. Stauffenburg Einführungen, No. 20, Tübingen: Stauffenburg Verlag. <http://hpsg.fu-berlin.de/~stefan/Pub/grammatiktheorie.html>, 23.06.2014.
- Müller, Stefan. 2010b. Persian Complex Predicates and the Limits of Inheritance-Based Analyses. *Journal of Linguistics* 46(3), 601–655. <http://hpsg.fu-berlin.de/~stefan/Pub/persian-cp.html>, 23.06.2014.
- Müller, Stefan. 2013a. The CoreGram Project: Theoretical Linguistics, Theory Development and Verification. Ms. Freie Universität Berlin. <http://hpsg.fu-berlin.de/~stefan/Pub/coregram.html>, 23.06.2014.
- Müller, Stefan. 2013b. *Grammatiktheorie*. Stauffenburg Einführungen, No. 20, Tübingen: Stauffenburg Verlag, second edition. <http://hpsg.fu-berlin.de/~stefan/Pub/grammatiktheorie.html>, 23.06.2014.
- Müller, Stefan. 2013c. Unifying Everything: Some Remarks on Simpler Syntax, Construction Grammar, Minimalism and HPSG. *Language* 89(4), 920–950. <http://hpsg.fu-berlin.de/~stefan/Pub/unifying-everything.html>, 23.06.2014.
- Müller, Stefan and Wechsler, Stephen Mark. 2014. Lexical Approaches to Argument Structure. *Theoretical Linguistics* 40(1–2), 1–76, In Print. <http://hpsg.fu-berlin.de/~stefan/Pub/arg-st.html>, 23.06.2014.
- Nunberg, Geoffrey, Sag, Ivan A. and Wasow, Thomas. 1994. Idioms. *Language* 70(3), 491–538.
- Platzack, Christer. 2005. The Object of Verbs Like *help* and an Apparent Violation of UTAH. In H. Broekhuis, N. Corver, R. Huybregts, U. Kleinhenz and J. Koster (eds.), *Organizing Grammar: Linguistic Studies in Honor of Henk van Riemsdijk*, Studies in Generative Grammar, No. 86, pages 483–494, Berlin: Mouton de Gruyter.
- Pollard, Carl J. 1996. The Nature of Constraint-Based Grammar. <http://lingo.stanford.edu/sag/L221a/pollard-96.txt>, 28.06.2008.
- Pollard, Carl J. and Sag, Ivan A. 1987. *Information-Based Syntax and Semantics*. CSLI Lecture Notes, No. 13, Stanford, CA: CSLI Publications.
- Pollard, Carl J. and Sag, Ivan A. 1994. *Head-Driven Phrase Structure Grammar*. Studies in Contemporary Linguistics, Chicago, IL/London: The University of Chicago Press.
- Pullum, Geoffrey K. 1985. Assuming Some Version of X-bar Theory. In *Papers from the 21st Annual Meeting of the Chicago Linguistic Society*, pages 323–353.
- Pullum, Geoffrey K. 1989. Formal Linguistics Meets the Boojum. *Natural Language and Linguistic Theory* 7(1), 137–143. <http://dx.doi.org/10.1007/>

- BF00141350, 31.01.2009.
- Pullum, Geoffrey K. 1991. *The Great Eskimo Vocabulary Hoax and Other Irreverent Essays on the Study of Language*. Chicago, IL: The University of Chicago Press.
- Pullum, Geoffrey K. and Scholz, Barbara C. 2001. On the Distinction between Generative-Enumerative and Model-Theoretic Syntactic Frameworks. In P. de Groote, G. Morrill and C. Retor (eds.), *Logical Aspects of Computational Linguistics: 4th International Conference*, Lecture Notes in Computer Science, No. 2099, pages 17–43, Berlin/Heidelberg/New York, NY: Springer Verlag.
- Pulvermüller, Friedemann, Cappelle, Bert and Shtyrov, Yury. 2013. Brain Basis of Meaning, Words, Constructions, and Grammar. In Trousdale and Hoffmann (2013).
- Richter, Frank. 2004. *A Mathematical Formalism for Linguistic Theories with an Application in Head-Driven Phrase Structure Grammar*. Phil. Dissertation (2000), Eberhard-Karls-Universität Tübingen. <http://w210.ub.uni-tuebingen.de/dbt/volltexte/2004/1203/>, 04.06.2010.
- Richter, Frank and Sailer, Manfred. 2009. Phraseological Clauses as Constructions in HPSG. In S. Müller (ed.), *Proceedings of the 16th International Conference on Head-Driven Phrase Structure Grammar, University of Göttingen, Germany*, pages 297–317, Stanford, CA: CSLI Publications.
- Riehemann, Susanne. 1993. *Word Formation in Lexical Type Hierarchies: A Case Study of bar-Adjectives in German*. Masters Thesis, Eberhard-Karls-Universität Tübingen, also published as SfS-Report-02-93, Seminar für Sprachwissenschaft, University of Tübingen.
- Riehemann, Susanne Z. 1998. Type-Based Derivational Morphology. *Journal of Comparative Germanic Linguistics* 2(1), 49–77. <http://doors.stanford.edu/~sr/morphology.ps>, 05.04.2009.
- Sag, Ivan A. 2007. Remarks on Locality. In S. Müller (ed.), *Proceedings of the 14th International Conference on Head-Driven Phrase Structure Grammar*, pages 394–414, Stanford, CA: CSLI Publications. <http://csli-publications.stanford.edu/HPSG/2007/>, 29.07.2007.
- Sag, Ivan A. 2012. Sign-Based Construction Grammar: An Informal Synopsis. In Boas and Sag (2012), pages 69–202. <http://lingo.stanford.edu/sag/papers/theo-syno.pdf>, 23.10.2007.
- Sag, Ivan A., Boas, Hans C. and Kay, Paul. 2012. Introducing Sign-Based Construction Grammar. In Boas and Sag (2012), pages 1–29.
- Sag, Ivan A., Wasow, Thomas and Bender, Emily M. 2003. *Syntactic Theory: A Formal Introduction*. CSLI Lecture Notes, No. 152, Stanford, CA: CSLI Publications, second edition.
- Sailer, Manfred. 2000. *Combinatorial Semantics and Idiomatic Expressions in Head-Driven Phrase Structure Grammar*. Dissertation, Eberhard-Karls-

- Universität Tübingen. <http://w210.ub.uni-tuebingen.de/dbt/volltexte/2003/916/>, 18.11.2004.
- Sarkar, Anoop. 2000. Practical Experiments in Parsing Using Tree Adjoining Grammars. In *Proceedings of the Fifth Workshop on Tree-Adjoining Grammars and Related Frameworks (TAG+5)*.
- Soehn, Jan-Philipp and Sailer, Manfred. 2008. At First Blush on Tenterhooks. About Selectional Restrictions Imposed by Nonheads. In G. Jäger, P. Monachesi, G. Penn and S. Wintner (eds.), *Proceedings of Formal Grammar 2003, Vienna, Austria*, pages 149–161, Stanford, CA: CSLI Publications. <http://csli-publications.stanford.edu/FG/2003/soehn.pdf>, 04.06.2010.
- Stabler, Edward P. 2001. Minimalist Grammars and Recognition. In C. Rohrer, A. Rossdeutscher and H. Kamp (eds.), *Linguistic Form and its Computation*, Studies in Computational Linguistics, No. 1, pages 327–352, Stanford, CA: CSLI Publications.
- Stabler, Edward P. 2009. Computational Models of Language Universals: Expressiveness, Learnability, and Consequences. In M. H. Christiansen, C. Collins and S. Edelman (eds.), *Language Universals*, pages 200–223, Oxford: Oxford University Press.
- Stabler, Edward P. 2010. After Government and Binding Theory. In J. F. A. K. van Benthem and G. B. A. ter Meulen (eds.), *Handbook of Logic and Language*, pages 395–414, Cambridge, MA: MIT Press, second edition. <http://www.linguistics.ucla.edu/people/stabler/afterGB.pdf>, 02.04.2010.
- Steels, Luc (ed.). 2011. *Design Patterns in Fluid Construction Grammar*. Constructional Approaches to Language, No. 11, Amsterdam/Philadelphia: John Benjamins Publishing Co.
- Stiebels, Barbara and Wunderlich, Dieter. 1994. Morphology Feeds Syntax: the Case of Particle Verbs. *Linguistics* 32(6), 913–968.
- Stump, Gregory T. 1991. A Paradigm-Based Theory of Morphosemantic Mismatches. *Language* 67(4), 675–725.
- Trousdale, Graeme and Hoffmann, Thomas (eds.). 2013. *The Oxford Handbook of Construction Grammar*. Oxford: Oxford University Press.
- van Trijp, Remi. 2011. A Design Pattern for Argument Structure Constructions. In Steels (2011), pages 115–145.
- Wasow, Thomas, Nunberg, Geoffrey and Sag, Ivan A. 1982. Idioms: An Interim Report. In H. Shiro and I. Kazuko (eds.), *Proceedings of the XIIIth International Congress of Linguistics*, Tokio.
- Wechsler, Stephen Mark. 1990. Accomplishments and the Prefix *re-*. In J. Carter and R.-M. Dechaine (eds.), *Proceedings of the North Eastern Linguistic Society XIX*, pages 419–434, Amherst: Graduate Linguistic Student Association, Dept. of Linguistics, University of Massachusetts.
- Wechsler, Stephen Mark. 1995a. Preposition selection outside the lexicon. In S. P.

- Raul Aranovich, William Byrne and M. Senturia (eds.), *Proceedings of WCCFL XIII*, pages 416–431.
- Wechsler, Stephen Mark. 1995b. *The Semantic Basis of Argument Structure*. Dissertations in Linguistics, Stanford, CA: CSLI Publications.
- Wechsler, Stephen Mark. 1997a. Prepositional phrases from the twilight zone. *Nordic Journal of Linguistics* 20(02), 127–153.
- Wechsler, Stephen Mark. 1997b. Resultative Predicates and Control. In R. C. Blight and M. J. Moosally (eds.), *Texas Linguistic Forum 38: The Syntax and Semantics of Predication. Proceedings of the 1997 Texas Linguistics Society Conference*, pages 307–321, Austin, Texas: University of Texas Department of Linguistics.
- Wechsler, Stephen Mark. 2001. An Analysis of English Resultatives Under the Event-Argument Homomorphism Model of Telicity. In *Proceedings of the 3rd Workshop on Text Structure, University of Texas, Austin, Oct. 13–15, 2000*.
- Wechsler, Stephen Mark. 2005a. Resultatives under the Event-Argument Homomorphism Model of Telicity. In N. Erteschik-Shir and T. Rapoport (eds.), *The Syntax of Aspect—Deriving Thematic and Aspectual Interpretation*, pages 255–273, Oxford University Press.
- Wechsler, Stephen Mark. 2005b. Weighing in on scales: A reply to Goldberg and Jackendoff. *Language* 81(2), 465–493.
- Wechsler, Stephen Mark. 2012. Resultatives and the Problem of Exceptions. In I.-H. L. et al (ed.), *Issues in English Linguistics*, Seoul, South Korea: Hankookmunhwasa.