1 Introduction

Recent years have seen growing interest in the old idea that constructions are primitives of grammatical descriptions. The aim of much of the constructionalist literature is to demonstrate that grammars are composed fundamentally of constructions, which are correspondences between grammatical form and meaning. This view stands in contrast to the mainstream approach initiated by Chomsky (1970) that takes constructions to be incidental byproducts of the interaction between primitive grammatical operations, abstract grammatical principles and parameter settings in particular grammars.

While the literature on constructions is substantial, there has been lim-

*We are deeply grateful to Ray Jackendoff, Carmelo Bazaco and Lorena Sainz-Maza Lecanda for many critical questions, comments and suggestions that have helped immeasurably in improving the work reported on here. The remaining errors are our responsibility.
ited focus in the literature on the question of how constructions are to be properly stated, and what, if any, constraints apply to the formulation of constructional grammars. Many if not all approaches assume that a construction is (minimally) a correspondence between phonological, syntactic and semantic representations, but beyond this they are less than fully explicit about what these representations consist of.

While the general case for characterizing grammatical phenomena in constructional terms has some empirical support, it is far less clear what specific representations, properties and features may or may not be invoked in defining constructions. Many formulations invoke detailed properties or features both of form and of meaning as necessary in order to characterize the correspondences, a strategy that raises the obvious question of whether and how constructions can be constrained. Furthermore, some constructionists argue that constructions should incorporate not only truth conditional meaning, but knowledge that speakers have about the use of linguistic expressions in context. Such knowledge may include aspects of register, social identity, frequency, and so on.

On the assumption that a central goal of linguistic theory is to characterize the notion of ‘possible language’, the absence of a principled characterization of what can be a construction poses a potential problem for the constructionist approach. Culicover (2013, 2014) proposes to constrain constructions by assuming a narrow definition of what constitutes a construction. The broader questions of what sorts of information can enter into

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1 A notable exception is Sag (2012).

2 See, for example, Bybee and Eddington (2006); Traugott (2008); Traugott and Tros-dale (2013) and Goldberg (2013) for a review.
defining constructions and how that information can best be represented remain open.

This paper thus has two main goals. One is to come to a preliminary understanding on principled grounds of what properties should play a role in defining constructions, and what should not. We address this goal by considering alternative constructional analyses of a specific phenomenon, English subjectless tagged questions, as in (1).

(1)  
  a. Fooled us, didn’t they.  
  b. Wouldn’t have done it, would she?  
  c. Dumb, isn’t he?  
  d. Resting peacefully now, are they?

First, we consider Kay’s (2002) analysis. Kay’s analysis makes crucial use of the notion of ‘main clause’, or the root, in order to state the subjectless property of such sentences. We argue in section 2 that allowing explicit reference to the root undermines the proper understanding of the subjectless property (in English) as belonging not to grammar but to the pragmatics of conversation. We propose a constraint on the formulation of constructions that allows only reference to concrete features of form, structure and meaning. This proposal leads to the specification of an architecture for describing constructions in section 3 which we illustrate by applying it to the description of tag questions. The result is a constructional analysis of subjectless tagged questions based on analyses of independently motivated tag and interrogative constructions and general semantic and pragmatic principles.

The second goal is to characterize what it means for an expression of the
language to be well-formed with respect to a set of constructions – that is, what it means for something to be grammatical in this framework. This is the problem of ‘licensing’.

A typical case is that a sentence satisfies the conditions of two or more independent constructions – for example, a passive resultative like *The pub was drunk dry* simultaneously satisfies the conditions for passive and for the resultative. An inheritance mechanism is typically invoked in construction grammar in order to create a composite construction that combines conditions from the two or more general constructions (Sag 1997; Goldberg 2003). But Müller (2006) shows convincingly that accounting in this way for the combined licensing of more than one construction leads at best to an explosion of individual constructions in the grammar and a loss of generality and explanatory power; at worst, it may not be computationally feasible. Section 4 reviews this problem and shows how the framework argued for in section 3 can be incorporated into a general approach to constructional licensing.

Section 5 proposes a formalization of the framework and offers a precise characterization of what it means for a complex expression to be licensed by a set of constructions. Section 6 summarizes and draws some conclusions about what a grammatical description in terms of constructions is a description of.
2 Subjectless tags

2.1 Kay’s constructional analysis

Kay’s (2002) analysis of subjectless tagged questions treats subjectless sentences such as those in (1) as a construction that may be combined with a tag. Such an analysis raises rather than resolves many questions. For example, if there is a construction in English that allows the subject to be null, why isn’t there another construction that allows the object to be null? Why is the null subject construction restricted to root clauses (*Sandy said that ∅ would call later)*? More generally, what is the grammatical difference between dropping the subject under conditions where it is contextually supplied, and pro-drop languages, where pronominal subjects are systematically null?

It is of course possible to provide descriptive answers to these questions. For the English case, for example, we can stipulate that the subject may be null only in a main clause. Kay uses the notation in (2) to express this condition on the subjectless tag construction.

(2) [ROLE main-clause]

But we should be cautious about the use of such a feature. Crucially, it sidesteps the question of why the subject in English (and possibly the auxiliary verb) can be omitted in a main clause, but not in a subordinate clause. A construction that restricted null subjects to embedded clauses rather than to main clauses would be superficially no different from the case under consideration – it would use the feature [ROLE subordinate-clause]
instead of (2) – but languages with such a construction are not attested as far as we know.

In contrast, in languages with a grammatical null subject construction, either the null subject is licensed by overt morphological agreement, or null pronouns are generally licensed (Jaeggli and Safir 1989). In neither case is licensing of the null subject sensitive to the grammatical distinction of main vs. embedded clause. These facts suggest prima facie that in English the phenomenon is not strictly a matter of grammar.

With this in mind, let us consider the phenomenon of null subjects in English in more detail. A central feature of Kay’s analysis is that the subjectless sentences in English require tags, so that the identity of the subject can be supplied by the tag. He cites the examples in (3) as evidence that English does not have pro-drop, and that in order to have a subjectless clause one must also have a tag.

(3)  
   a. *Ate the pizza.
   b. *Has told the boss about it.

However, it is straightforward to construct subjectless examples with the simple present or past where the interpretation of the missing subject is acquired from context.

(4)  
   a. Blew it! [said of oneself, of a companion or of someone we are observing who has just made an error]
   b. Leaves a lot to be desired. [said of a dessert billed as “the Kitchen Sink” but actually consisting of one small scoop of ice cream]
c. Looks like a raccoon eating a whale. [said of a work of abstract art]

d. Had some pizza already? [asked of the addressee]

e. Trying to outsmart me? [asked of the addressee]

What characterizes utterances such as these is that they have an immediacy of reference – it is possible for the interlocutors to infer the missing subject from the event just experienced or the object in their shared visual field. Rather than instances of a specific construction, the examples in (4) seem to be instances of a general phenomenon described by Stainton (1995, 2005, 2006). Stainton characterizes such examples as “people ... using plain old words and phrases ... to perform speech acts” (2006, 94). In the examples in (4), the phrases are tensed VPs; in other cases that Stainton cites they can be VPs (feel anything yet?, NPs (nice try; whiskey?), APs (nice!; stupid!) and PPs (to the station). Stainton makes a convincing case that the force of these utterances as assertions, questions, etc. can and must be inferred by hearers given the context (see also Culicover and Jackendoff 2012 and work cited there).

An additional observation suggesting that the mechanism by which tags and subjectless sentences combine is general rather than construction-specific

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3 Thanks to Ray Jackendoff for examples d and e.

4 This being said, it is true that there may be something special about examples like (3b). For one thing, it is not clear that a modal or inflected auxiliary verb heads a phrase; the structure may be tripartite (i.e. [Subject AUX VP]); so it may not be possible to specify the form of a fragmentary sentence in terms of a single constituent. For another, it is very difficult to construct acceptable examples of this form, even when contextual conditions appear to be satisfied – compare, for example, blew it! vs. *has blown it! But this does not mean that we should abandon an inferential account of subjectless sentences, just that we do not fully understand how the inferences work and what goes on in the interpretation of the English present perfect; cf. the acceptable Shoulda tried harder.
comes from Kay himself. Kay makes the point that the tags attach to these subjectless sentences in exactly the same way, and with exactly the same consequences, as they do to full sentences. So we have *blew it, didn’t you?* with the same interpretation as the corresponding *you blew it, didn’t you?*. This means that whatever the force of the tag is, it is combined with the force of the host regardless of the syntactic structure of the host. With respect to the acceptability of the tag, nothing special has to be said about the particular combination of subjectless sentence and tag, as Kay notes.

The evidence presented here suggests that a more general approach to tag questions is needed. Virtually all of the facts that motivate Kay’s analysis are true not just of subjectless tag questions but of subjectless sentences and tag questions more broadly. We have suggested that subjectless sentences are independently accounted for by the constraints governing English phrase structure and language use. But what about tag questions? Must an adequate analysis of tag questions make use of a main clause feature?

In fact, tag questions are in fact not strictly root phenomena. They attach only to syntactic constituents that express propositions about which the speaker has a particular attitude, which may be embedded clauses, as noted originally by Lakoff (1969); see also Hooper and Thompson (1973). This is the case in (5a), but not (5b).

$$5 \begin{align*} 5 \text{a.} & \text{ I don’t suppose that you’re going to let me borrow your car,} \\ & \begin{cases} \text{are you} \\ \text{*aren’t you} \end{cases}? \\ 5 \text{b.} & \text{*The police would never suppose that he still has the money,} \end{align*}$$
Importantly, in root level examples, the proposition to which the tag attaches is one that the speaker has some level of commitment to or belief in (Romero and Han 2004). In contrast, in (5a), the the embedded clause does not express a proposition that the speaker believes or has evidence for, but rather one that she doubts. The negated attitude predicate in the matrix clause makes this clear. Below, drawing on Romero and Han’s (2004) analysis of polar questions, we will argue that it is the speaker’s negative epistemic orientation toward the proposition expressed, not the fact of embedding, that makes the positive statement acceptable. (5b) demonstrates that embedding alone is not sufficient.

The data examined thus far demonstrate that the main clause feature is unnecessary for the analysis of subjectless tag questions, and makes incorrect predictions for the analysis of tag questions more generally. What remains is the special form and function of English interrogative tags, which we take up in section 3.2 when we present an alternative analysis.

2.2 A constraint

We conclude on the basis of the foregoing that it is unnecessary to posit the feature [ROLE main-clause] in the formulation of an English subjectless tag construction. This leads to a more general question: Could there be another construction that includes this feature as a licensing condition, or is the use of this feature ruled out in principle?
On the face of it it would seem that it is necessary to refer to [ROLE
main-clause] in order to characterize main clause phenomena. However,
as with tag questions, other putative root phenomena in English, such as
inversion, in fact occur in embedded clauses. Inversion occurs in embedded
questions in non-standard English, and in embedded sentences in the case
of negative and so-inversion.

(6) a. She asked me what was I doing after I closed up.

b. I suggest that only then will people such as Mr. Becker realize
that there really is no free lunch.

c. To emphasize this we have only to bear in mind that so quickly
did the public appreciate the “Empire Express” that the New
York Central is justified in running this train daily between
New York and Buffalo.

Another type of purportedly root phenomenon, V2 in German, appears
to be possible in embedded clauses with main clause force (Gärtner 2000,
2002). Moreover, it is well-established that there is complementarity be-
tween German V2 and the appearance of an overt complementizer (Evers
1975). This complementarity suggests an alternative analysis. Here, root
phenomena can be formulated in terms of structures that lack complemen-
tizers and subordinate phenomena can be formulated in terms of structures
that contain complementizers. Selection of subordinate clauses that permit
root phenomena will then be implemented as selection of the category in

5 If I Had Only Known, By David Mooney, p. 94.
6 To the Point: A Dictionary of Concise Writing, By Robert Hartwell Fiske, p. 263.
which the complementizer does not appear.

This brings us to the question of how we privilege a constructional account that rules out reference to a main clause feature. The simplest solution would be to make it impossible to refer explicitly to main vs. embedded clause.

While this would be satisfactory for these particular data, we propose a more general approach. Suppose we require that constructional conditions make reference only to the syntactic and morphosyntactic properties of the constituents. As a hypothesis, let us adopt the strongest (i.e. most ‘minimalist’) position, as follows.

**Constructional Constraint on Attributes and Values (CCAV):**

Reference only to syntactic structures composed of primitive syntactic and morpho-syntactic properties is allowed in the formulation of constructions.

On the CCAV hypothesis, with respect to the syntactic aspects of constructions, the only things that we can refer to in a construction are the syntactic categories, such as noun and verb, their morphologically distinguished subcategories, such as gender and tense, their organization into hierarchical structures, and the grammatical functions Subject and Object. Under CCAV, null arguments and elliptical constructions are possible, but their distribution cannot be restricted to certain types of clauses, only to certain grammatical functions. The CCAV will prevent reference to the level of a clause in a structure, as well as similar properties of other categories, e.g. “the most deeply embedded VP”.

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Under the CCAV, the absence of a subject in sentences of a language such as English that does not have null subjects is not constructional in the sense we are using the term here, but must be a matter of inference in discourse, as must be the absence of any lexically selected obligatory argument or adjunct. Fragmentary utterances must be explained by appealing to a general theory of language use that has the capacity to account for the interpretation of expressions that are not complete sentences and for the interpretive differences between main and subordinate clauses.

In the remainder of this paper we assume the CCAV as a working hypothesis about what can be referred to in the statement of a construction.

3 A framework for constructions

Before presenting our alternative analysis of subjectless tagged sentences, we turn to the development of a minimal framework for describing constructions that conform to the CCAV. The problem is how to license an arbitrary construct, that is, a correspondence representing a token of the language, in terms of the constructions that comprise the grammar. We take a construct to be a representation that includes information about phonological form, syntactic structure and interpretation. In the interests of both accessibility and precision, we first motivate the components of the framework informally. We provide a more rigorous formal characterization in section 5.
3.1 Correspondences in the Parallel Architecture

Following the Parallel Architecture of Jackendoff (2002), we assume that there is a component of the grammar that generates all of the well-formed phonological strings, called PHON, another component of the grammar that generates all of the well-formed syntactic structures, called SYN, and a component of the grammar that generates all of the well-formed meanings (conceptual structures), called CS. These components are called ‘tiers’ in the Parallel Architecture. Essentially the same architecture is assumed by all constructional approaches, and by many non-constructional approaches outside of the mainstream.

For each tier, the grammar of a language contains well-formedness conditions on the possible expressions that may appear on that tier. For concreteness we represent SYN using a context-free phrase structure grammar, PHON using a set of symbols to be discussed informally in this section and defined in Section 5, and CS using a higher order logic augmented with information about thematic roles. See Section 5 for more precise characterizations of the representations of each tier.

A constructional grammar of a language is used to generate the acceptable constructs of that language. A construct is the representation of a single expression of the language, a particular utterance. A construction

Footnote:

8Simpler Syntax assumes another syntactic level of grammatical functions (GF). We do not incorporate GFs into our descriptions here, in order to keep the exposition as simple as possible. See footnote 19 for further discussion and an example involving the GF tier. Similarly, it is possible that morphology constitutes a distinct tier. We also leave open the question of precisely how to incorporate correspondences between linguistic form on the one hand and information structure and discourse representation on the other into the grammar. These may well constitute distinct tiers as well.
is a generalization over constructs. Constructions include generalizations about correspondences between phonological strings, syntactic structures and interpretations. From the perspective in this paper, everything that constrains some aspect of the structure of a linguistic expression is a construction. A construct is licensed by the constructions of a language if each element on each tier of the construct conforms to a generalization expressed in some construction.

An example of a construction is the one that licenses VP in English. The construction says that a VP may consist of a V followed by other, possibly null, material; it has the form in (7). 1 in PHON is the phonological string corresponding to V₁ and so on. The PHON tier of (7) says that any daughter X in VP follows V[^9]. The correspondence between X in SYN and 2 in PHON is indicated by 2 being identical to the subscript on X. Since for each VP the interpretation is determined by the semantics of the verb, we do not incorporate a CS tier into the formulation of this construction.

(7) Construction: V-INITIAL VP

\[
\begin{bmatrix}
\text{PHON} & 1 > 2 \\
\text{SYN} & [\text{VP } V_1, X_2]
\end{bmatrix}
\]

We say that a token that satisfies the conditions of this construction instantiates the construction. Such a token must have a phonological string correctly corresponding to a verb, it may have a phonological string correctly corresponding to other constituents of the VP, and the phonological strings must be in the order given. The token may have other properties that

[^9]: A more comprehensive account would reflect the fact that this condition may be violated by preverbal adverbs, as in *Sandy will completely fail the test.*
instantiate other constructions. If all of the properties of the token instantiate some construction or other, we say that these constructions license the token. In generative grammar terms, they generate it.

Crucially, (7) alone does not fully license an arbitrary actual VP with non-null X. X itself must be licensed by other constructions that constrain expressions of the relevant categories, e.g., NP, S, AP, PP, VP, and so on.

Individual words are also constructions. Each word specifies a correspondence between a string of sounds, syntactic properties, and a meaning. For example, the lexical entry of the verb kick is as in (8). (We use the spelling of the word in place of the phonological representation in PHON.)

(8) Construction: kick

\[
\begin{array}{c}
\text{PHON} \quad \text{kick}_1 \\
\text{SYN} \quad V_1 \\
\text{CS} \quad \lambda y.\lambda x.\text{kick}_1'(\text{AGENT} : x, \text{THEME} : y)
\end{array}
\]

There are two parts to the correspondence for kick that we consider, the PHON-SYN correspondence and the SYN-CS correspondence. Starting with the first, it can be seen that the entry in (8) is approximate, because it does not take into account the fact that kick may take different forms depending on its inflection: kick, kicks, kicked, kicking. For irregular verbs, the set of forms is larger, e.g. go, goes, went, going, gone.

In fact, what must be included somehow in the lexical representation is its paradigm, the set of alternative forms for the word that are compatible with various syntactic and semantic contexts. It is far from trivial to incorporate paradigmatic information into a constructional approach, for several
reasons. The form in PHON in a particular construct must be appropriate to the morphological properties of the corresponding word. Furthermore, the representation of the paradigm should allow us to capture generalizations about regular and irregular forms. Words such as kick and go have their paradigmatic forms regardless of whether they are used literally, or in an idiom (e.g. kicked the bucket, went nuts).

Moreover, a nonce word that satisfies the phonotactics of the language, e.g. *flurge is defined just by its phonological representation. If we stipulate its syntactic category, e.g. V, we can say what its paradigm forms are even though it has no meaning: flurge, flurges, flurged, flurging. The problem is further complicated by the fact that while the paradigm is a set of forms, a regular morphology is a function, and neither of them is a phonological representation of the type that appears in PHON.

In order to move the overall exposition forward and develop the main intuitions of our approach to constructions, we adopt the fiction that PHON is the word itself, e.g. ‘kick’ for the word kick, and leave the formal analysis of inflection and paradigms aside.

Overt coindexing is not strictly necessary in a representation such as [8], where each tier contains only one element. However, overt coindexing is needed when something unpredictable needs to be said about the relationship between elements on one tier and those on another tier that does not follow from the fact that they appear in the same correspondence. One such case is the stipulation of linear order. For example, in English the verb appears at the left edge of the VP. That is, its phonological form precedes the forms of all other constituents of VP. Hence construction [7] must be
able to refer to the PHON of the V and its ordering with respect to the PHON of the rest of the VP.

Another case of unpredictability is a complex correspondence between SYN and CS. For example, in the resultative construction exemplified by *drink the pub dry*, it must be specified that dry' is predicated of the pub (symbolized as p) and that the event denoted by the verb is the cause, as in the construct in (9). In (9) e and e' are variables over events, and CAUSE denotes a relation on events that holds just in case one event causes the other.

(9) Partial construct: *drink the pub dry*

\[
\begin{align*}
&\text{PHON} & \text{drink}, \, [\text{the}, \, \text{pub}]_1, \, \text{dry}_2 \\
&\text{SYN} & [\text{VP}\, \text{NP}_1, \, \text{AP}_2, \, \text{V}_3]_4 \\
&\text{CS} & \lambda x \lambda e \exists e' [\text{drink}_3'(e, \text{AGENT} : x) \land \text{CAUSE}(e, e') \land \\
& & \text{dry}_2'(e', \text{THEME} : p_1)]_4
\end{align*}
\]

Note that the linear ordering is not specified by the construction that licenses this construct. That is the responsibility of (7) and the construction that positions the direct object adjacent to the verb. The lack of ordering is indicated by the use of commas in PHON. The fact that the ordering contributions of these constructions is not included is part of why (9) is labeled as a “partial construct”.

The general resultative construction is given in (10).

(10) Resultative
The CS representation of the verb supplies the causing event predicate $Q$, and the AP supplies the result predicate $P$. The theme corresponds to the direct object of the verb, which is independently licensed in the VP.$^{10}$

Consider next an idiom such as kick the bucket. We should not have to say that kick precedes the bucket, because this is a perfectly normal VP in English. The only thing that is necessary is the identification of the words – the phon. The linear ordering in a given construct will be licensed by the appropriate ordering constructions for the syntactic category. So we can represent kick the bucket in the lexicon as follows:

(11) Construction: kick the bucket

\[
\begin{align*}
\text{PHON} & \quad \text{kick}_1, \, \text{the}_2, \, \text{bucket}_3 \\
\text{SYN} & \quad [\text{VP} \, \text{V}_1, \, [\text{NP} \, \text{ART}_2, \, \text{N}_3]]_4 \\
\text{CS} & \quad \lambda x. \text{die'}_4(\text{EXPERIENCER}:x)
\end{align*}
\]

Finally, we need to be able to formulate constructions that are complex but completely rigid, such as idioms like by and large, and those that are a composite of fixed forms, inflected forms and variables, like sell NP down the river. The respective constructions are given in (12) and (13). For by and large it is not necessary to give the syntactic categories of the individual

\[\text{If the verb is transitive, then the direct object satisfies both the theme argument of the resultative and the theme argument of the verb, as in hammer the metal flat. We leave the details aside.}\]
words, but their ordering is critical and must be specified in the construction; cf. *large and by.

(12) Construction: by and large

\[
\begin{array}{c}
\text{PHON} & \text{by–and–large} \\
\text{SYN} & \text{ADV} \\
\text{CS} & \text{mostly}\'
\end{array}
\]

For sell down the river, the ordering of the words need not be specified in the construction, for reasons given above in connection with kick the bucket.\footnote{In fact, it is not possible to specify the ordering exactly – the position of the direct object position in the linear order is determined by the ordering rules for the English VP. For example, a heavy NP may appear VP finally, and a pronoun must be adjacent to the verb, as shown in (i).}

(13) Construction: sell NP down the river

\[
\begin{array}{c}
\text{PHON} & \text{sell}_1, 2, [\text{down, the, river}]_3 \\
\text{SYN} & [\text{VP } V_1, \text{NP}_2, \text{PP}_3]_4 \\
\text{CS} & \lambda y x. \text{betray}_4(\text{AGENT}:x, \text{THEME}:y'_2)
\end{array}
\]

In (13), PP\(_3\) abbreviates [PP \(_P\), [NP \(_{\text{Det, N}}\)] \(_3\)] and [down, the, river] \(_3\) abbreviates [down, [the, river]] \(_3\). It is incumbent on the construction to specify the hierarchical structure within its SYN and PHON tiers, but not the order of elements. Other constructions, such as the NP and PP constructions,
determine the order of elements.

The preceding examples illustrate two key aspects of licensing. (1) Each element of each tier must satisfy some condition of some construction, and (2) all aspects of the construct must be licensed in some way. For instance, in the construct *Alan kicked Fido*, the PHON tier must represent the appropriate forms for each of the words in the appropriate order, and the meaning must be one in which the relation kick′ holds of the entities $a$, the translation of *Alan*, and $f$, the translation of *Fido*. Similarly, *John kicked the bucket* is licensed by the idiom construction and the more general constructions if die′ is predicated of $j$, and if the proper linear ordering is observed. While the idea is intuitively simple, the implementation of a definition of licensing that satisfies this description is non-trivial, as our discussion in section 5 shows.

### 3.2 A constructional analysis of tag questions

In this section we sketch out an illustrative constructional analysis of tag questions using the approach described in section 3.1 and the CCAV.

The tag question construction has two realizations (Culicover 1973). In one realization, exemplified by (14), the auxiliary in the tag is negated, and the main clause is not negated.\(^{13}\)

\(^{12}\)There is a possibility that the ability of an idiom to appear in various structures, e.g. passive, correlates with the transparency of the correspondence between SYN and CS, as suggested by Nunberg et al. (1994); see also Sag (2012). The representational notation may be particularly well-suited to identifying such correlations. However, because of the complexity of the issue we are unable to pursue it here.

\(^{13}\)In addition to tag questions, there are also non-interrogative tag constructions in English (Culicover 1973). Here, we focus on just tag questions.
(14) Otto will take out the recycling, \{ *will \ \{ \text{won't} \} \} he?

The force of a sentence like (14) is to indicate that the speaker has reason to believe the proposition expressed by the main clause, call it \( p \), and to ask the addressee for confirmation of \( p \). This tag question construction has a force similar to that of a polar question with preposed negation, as in (15) (Romero and Han, 2004).

(15) Won’t Otto take out the recycling?

The second realization of the tag question construction is exemplified by (16). In this case, the main clause is negated, but the tag is not.

(16) Otto won’t take out the recycling, \{ \text{will} \ \{ *\text{won’t} \} \} he?

This sentence also expresses the speaker’s commitment to the proposition expressed by the main clause, call it \( \neg p \), and also asks the addressee for confirmation. It has a force similar to that of a positive polar question with focus prosody (indicated using all caps) on the auxiliary, as in (17).

(17) A: Otto will take out the recycling.

\quad B: WILL Otto take out the recycling?

The classical view is that the condition that licenses the positive tag is simply that the AUX of the main clause is negated. However, as observed by Culicover (1971), what licenses the positive tag is sentential negation. Sentential negation can be marked in a number of ways, including by a
negative quantifier on the subject, as illustrated in (18a), or by negative inversion, as illustrated in (18b).

(18) a. Not many members of the committee actually were at the meeting, were(*n’t) they?

b. In not many years will Christmas fall on a Tuesday, \[ \begin{cases} \text{will} \\ *\text{won’t} \end{cases} \] it?

From this brief examination of the data, several generalizations emerge (see Culicover 1973 and Kay 2002 for additional discussion). First, the form of the tag is that of an elliptical question. Second, the polarity of the tag must be the opposite of the polarity of the main clause. And third, tag questions have meanings that are very similar to the meanings of polar questions exemplified in (15) and (17).

The construction for polar questions thus requires a (possibly elliptical) VP in SYN, requires the phonological material corresponding to that VP in PHON, and requires the interpretation of that VP to appear in a particular place in CS; see (19). \( Q \) is a question operator returning a Hamblin-style denotation for questions, i.e. a set of alternatives.

(19) Construction: POLAR QUESTION

\[
\begin{bmatrix}
\text{PHON} & 3>1>2 \\
\text{SYN} & [\text{AUX}_1, \text{NP}_1, \text{VP}_2] \\
\text{CS} & Q(P_2(x_1))
\end{bmatrix}
\]

We adopt a modified version of Romero and Han’s analysis of polar ques-
tions with preposed negation, verum focus, and the adverb really. They argue that in all three cases, the observed interpretations arise due to the presence of a verum operator. The verum operator takes a proposition as its argument and returns a kind of modal comment on the proposition, namely that it is for sure that the proposition should be added to the common ground according to some conversational participant, $x$.

Because the force of a polar question with verum is to ask whether the addressee is sure that $p$ should be added to the common ground, the use of such a question gives rise to an implicature that the speaker has doubts about adding $p$. In other words, it conversationally implicates that the speaker has prior belief in or evidence for $\neg p$. Romero and Han call this the epistemic implicature of the polar question. For details about how the implicature arises and why it has the polarity it has in each case, see Romero and Han 2004.

Assuming Romero and Han’s analysis makes it possible to account for the polarity generalization above without saying anything special about polarity in the tag construction. The crucial observation is that in each case the main clause of the tag question is the overt realization of the content of the epistemic implicature. Importantly, this is only the case when the polarities of the main clause and tag differ. The tag question with preposed negation gives rise to the implicature that the speaker has evidence for $p$. Similarly, the positive tag question gives rise to the implicature that the speaker has evidence for $\neg p$.

\[\text{14}\text{For a purely pragmatic analysis, see Rooy and Safarova 2003. For analyses in terms of speech acts, see Asher and Reese (2005) and Krifka (2012). Krifka also provides a helpful overview of previous accounts.}\]
The tag question construction is presented in (20).

(20) Construction: TAG QUESTION

\[
\begin{align*}
\text{PHON} & : 6 > [4 > 5]_9 \\
\text{SYN} & : [S|S \text{ NP}_1, [\text{AUX}_2, X_3]_8, [\text{AUX}_4, \text{ PN}_5]_9)_7 \\
\text{CS} & : p_6 \land Q(\text{VERUM}_a ((P_8(x_{1,5}))_9)_7)
\end{align*}
\]

The PHON tier of (20) arranges the elements of the construction in the correct linear order. The negative realization of an AUX such as *will* as *won’t* or *will not* is accounted for by lexical correspondences. Similarly, an AUX that consists only of Tense corresponds to *do/don’t/did/didn’t* etc. in PHON. The PHON tier does not need to specify order inside the main clause, represented by 6, because other constructions such as V-initial VP determine that order. The SYN tier shows that the entire construction consists of two constituents, each with constituents of its own. The first, which is of category S, is the main clause. The second is the tag.

The CS consists of two conjuncts. The first says that the speaker proposes to add the proposition \( p \) expressed by 6 to the common ground. The second asks whether the addressee will confirm that \( p \) should for sure be added to the common ground. That is the effect of making \( P_8(x_{1,5}) \) the argument of \( \text{VERUM}_a \) and then of \( Q \), where \( a \) indicates that \( \text{VERUM} \) is evaluated relative to the addressee.

To create an acceptable construct licensed by (20), it is necessary to add sentential negation to one of the conjuncts in (20). Examples without sentential negation are ruled out because they propose contradictory updates to the common ground. A partial representation of the construction is given
in (21).

(21) Partial Construction: SENTENTIAL NEGATION

\[
\begin{align*}
\text{PHON} & \quad \ldots \\
\text{SYN} & \quad [\text{NEG}_1, X_2] \\
\text{CS} & \quad \neg_1 p_2
\end{align*}
\]

When sentential negation is combined with the tag question construction, the result is an utterance without contradiction between the meaning of the main clause and the epistemic implicature. With (21), we can now represent two tag question constructs in (22) and (23).

(22) Construct: John didn’t run, did he?

\[
\begin{align*}
\text{PHON} & \quad [\text{John}_{1-\text{did}_{2-n’t_{10-\text{run}_3}_{0-\text{[did}_4-\text{he}_5}_{9}}}
\\
\text{SYN} & \quad [S, \text{NEG}_{10}, [S, \text{NP}_1, [\text{AUX}_2, X_3]_6, [\text{AUX}_4, \text{NP}_5]_9]_7 \\
\text{CS} & \quad \neg_{10} p_6 \land [Q(\text{VERUM}_a(\neg_{10} \text{run}_5((j_{1,5})_{9})))]_7
\end{align*}
\]

(23) Construct: John ran, didn’t he?

\[
\begin{align*}
\text{PHON} & \quad [\text{John}_{1-\text{ran}_{3,2}_{0-\text{[did}_4-n’t_{10-\text{he}_5}_{9}}}
\\
\text{SYN} & \quad [S, [S, \text{NP}_1, [\text{AUX}_2, X_3]_6, \text{NEG}_{10}, [\text{AUX}_4, \text{NP}_5]_9]_7 \\
\text{CS} & \quad p_6 \land [Q(\text{VERUM}_a(\neg_{10} \text{run}_5((j_{1,5})_{9})))]_7
\end{align*}
\]

Both of these examples are acceptable because the polarity of the first conjunct differs from the polarity of the second, matching the data described above. The composition of the negation operator and its argument is determined by the construction for sentential negation.

The analysis of polar questions proposed here demonstrates both the utility of a constructional account and the importance of CCAV. The con-
structural framework provides a mechanism for stating the correspondence between form and meaning that allows the tag construction to introduce the *verum* operator. Following the CCAV hypothesis results in an analysis of tag questions that involves only independently motivated elements. The tag construction simply puts these elements together in a special way. The analysis also illustrates the use of multiple constructions in licensing a single construct. The centrality of this feature of the framework is discussed in Sections 4 and 5.

4 Müllner’s problem

With the basic representational framework in place, we turn to a critical problem in the formulation of constructions raised by Stefan Müllner (2010), which we refer to as Müllner’s Problem. Müllner’s Problem stems from the fact that constructions stated in terms of more or less complete syntactic structures, as for example in Goldberg (1995), may combine with one another. Assuming that constructions are signs, that is, form-meaning correspondences, it is impossible to license sentences that exemplify more than one construction at the same time without formulating constructions that are the composites or variants of other constructions. We propose here that it is possible to solve Müllner’s Problem by decomposing constructions along the lines of sections 3 and 5: a construct is licensed if there is a set of constructions such that each component of each tier is properly licensed by some construction.

Müllner discusses a number of cases where it appears that one construction
feeds another construction. An example is the resultative, given as \text{(10)} in section 3 and exemplified in German by \textit{Er fischt den Teich leer} (‘He fishes the pond empty’). Müller points that that if the resultative is formulated in terms of the direct object and a secondary predicate, there needs to be another construction to accommodate the passive variant of this construction. Hence there needs to be a ResultativePassive as well as a Resultative and a Passive construction in the grammar. The Resultative construction says that the denotation \( p \) of the direct object \textit{the pond} is the argument of the secondary predicate \textit{empty}'\(^\prime\), and the state \textit{empty}'\(^\prime\)(\text{theme}:p) is the result of the action \textit{fish}'\(^\prime\). In contrast, the ResultativePassive construction would say that the subject is the argument of the secondary predicate, and so on.

Müller demonstrates that the resultative may take many various forms as it interacts with other constructions. E.g.,

1. Arguments can be reordered through scrambling and topicalization
2. The finite verb can appear in both initial and final position, if the clause is a question or a subordinate clause, respectively.
3. Adjuncts may appear anywhere between arguments, and there may be multiple adjuncts.
4. Arguments and adjuncts belonging to resultative constructions and predicates that embed the resultative construction may be permuted and interleaved.
5. The resultative may be nominalized.
6. Arguments of the resultative may be questioned or relativized.
The point is that if a construction expresses an unpredictable correspondence between phonological form, syntactic structure and meaning, there must be many constructions to account for each of the combinations of different syntactic configurations with the resultative.

Given the interactions of syntactic phenomena, Müller shows that the number of such composite constructions can be very large, perhaps unbounded in principle. At best this leads to the failure to capture significant generalizations in the grammar, he argues. Müller’s Problem is, then, how to account for the fact that a construction may appear in many different syntactic configurations and yet remains the same, at least in terms of its constructional meaning?

We illustrate this point with Müller’s examples of relatives. It is possible to relativize either the subject or the object of the resultative, as shown in (24).

(24) a. der den Teich leer fisht who the pond empty fishes ‘who fishes the pond empty’

   b. den der Fritz leer fisht which the Fritz empty fishes ‘which Fritz empty fishes’

Müller argues that there has to be one composite construction for each of these configurations.

Intuitively, what we want is for the order of elements not to matter in licensing the resultative construction, as long as the critical components of the construction are present. Similarly, it should not matter whether the
clause is a resultative or something else, in order to license the relative clause construction. For example, in (24) there should be one construction that is responsible for interpreting a VP consisting of an object, a predicate and a verb as a resultative, and another that is responsible for licensing the positioning of the relative pronoun in initial position in the clause. (These constructions are essentially the same for German and English.)

A partial construction for the relative pronoun is given in (25). It says that the relative proform is clause-initial. The construction is partial because it does not include cs information linking the relative pronoun to its antecedent or the interpretation of the clause.

(25) Partial construction: relative pronoun

\[
\begin{array}{l}
\text{PHON} \ 1 > 2 \\
\text{SYN} \ [S \ PN_1, X_2] \\
\text{CS} \ \ldots
\end{array}
\]

There are a number of additional constructions that are required for a full account of relative clauses. One is the construction that says that a head noun precedes all phrasal complements and adjuncts in the NP (26). Again, cs information is omitted.

(26) Partial construction: relative clause

\[
\begin{array}{l}
\text{PHON} \ 1 > 2 \\
\text{SYN} \ [N \ N_1, XP_2] \\
\text{CS} \ \ldots
\end{array}
\]

Another construction specifies the interpretation of the relative clause in the configuration of SYN in (26). The relative clause is interpreted as a property,
and its argument is a variable bound by the head noun. We refer the reader to Culicover (2011, 2013) for the details.

The resultative construction (10) is repeated here.

(10) Construction: Resultative

\[
\begin{align*}
\text{SYN} & \quad [\text{VP AP}_1, \text{V}_2] \\
\text{CS} & \quad \lambda y_x \lambda x_e \lambda e_x \exists e' Q_2(e, \text{AGENT : } x) \wedge \\
& \quad \text{CAUSE}_4(e, e') \wedge P_1(e', \text{THEME : } y)
\end{align*}
\]

A partial representation of the relative clause der den Teich leer fischt in (24) in terms of the construction in (10) is given in (27). For readability we index the syntactic elements with their lexical content. Der is a relative pronoun and is licensed in clause-initial position, following (25) above. It corresponds to the agent role in CS. The agent variable in CS is still \(\lambda\)-bound because the denotation of a relative clause is a function. Ultimately, the values of \(P\) and \(x\) will be determined by the antecedent of the relative clause. Because (25) and (10) are instantiated by (27) independently, there is no need to assume a composite construction that combines (25) and (10).

(27) Partial Construct: der den Teich leer fischt ‘who fishes the pond empty’

\[
\begin{align*}
\text{SYN} & \quad [s [\text{PN der}]_1, [\text{NP den Teich}]_2, [\text{AP leer}]_3, [\text{V fisht}]_4]_5 \\
\text{CS} & \quad \lambda y_x \exists e \exists e'. \text{fish}_4'(e, \text{AGENT : } x_1) \wedge \text{CAUSE}_5(e, e') \wedge \\
& \quad \text{empty}_3'(e', \text{THEME : p}_2)
\end{align*}
\]

A similar type of analysis can be applied to any case where more than one construction is exemplified.
This brief discussion illustrates the licensing of complex constructs that instantiate several constructions simultaneously. The key is that a construction need not specify all three of PHON, SYN and CS. Moreover, it is not necessary to specify all of the constituents of a phrase in the statement of the construction, just those that define the construction as such.

5 Licensing

In this section, we provide a more precise description of how a given construct may be licensed by a set of constructions working together.

5.1 Well-formedness rules

The first step toward defining explicit licensing rules is to develop representations for constructs and constructions. In both cases, it is crucial to represent the information in each tier and the connections between tiers. Following Jackendoff (2002), we assume that each tier has its own well-formedness rules. The representations of the three tiers are specified in the next three sections. Connections between tiers are discussed in Section 5.1.4.

5.1.1 PHON-well-formedness

The PHON tier represents the sound of a construct. Since we are concerned here with articulating the essential aspects of constructional correspondences, we set issues having to do with inflectional paradigms aside, as discussed in Section 3 and focus on the representation of word order in PHON.
We represent well-formedness rules of the PHON tier using a higher order logic. In this we follow extensive work in the categorial grammar tradition, starting with Curry (1963) and continued by Oehrle (1994); De Groote (2001); Muskens (2003) and more recently by Pollard and his associates (Smith 2011; Mihalicek 2012; Pollard and Smith 2013; Pollard 2013; Martin 2013; Worth 2014). Our logic is defined in (28)-(31) and discussed below.

(28) Basic types:
   a. \( s \), strings: \([s] =_{def} S\), where S is the set of strings of sound of the language.
   b. \( t \), truth values: \([t] =_{def} \{\top, \bot\}\)

(29) Type constructors:
   a. \( \langle, \rangle \) is the functional type constructor.
   b. If \( \alpha \) and \( \beta \) are types, then \( \langle \alpha, \beta \rangle \) is a type.
   c. If \( \alpha \) and \( \beta \) are types, then \( [[\langle \alpha, \beta \rangle]] =_{def} \) the set of functions from \( \alpha \) to \( \beta \).
   d. Nothing else is a type.

(30) Constants and variables:
   a. Individual constants of type \( s \) correspond to phonemes. They are represented by IPA characters where phonological detail is critical and by English letters otherwise.
   b. Variables over strings of sound are used in specifying constructions. They are represented using Arabic numerals.

(31) Relations:
The notation for the current system has the potential to become cumbersome quickly. For example, the PHON tier for the word *kick* looks like this: [k-i-k]. Since we are concerned here entirely with word order, we simplify
in two ways. First, we use English letters rather than IPA characters, and second we do not include the concatenation symbol inside individual words. This makes the representation of the PHON tier of the construction kick just “kick”. It is understood that “kick” stands for [k-r-k].

One important feature of the logic defined in (28)-(31) is the inclusion of truth values as a type in PHON. Including truth values as a type in PHON may seem counterintuitive. They are included because a construction expresses generalizations that are true of the constructs that instantiate it. For example, consider all of the English constructs with a determiner and a noun that instantiate the NP construction. A generalization that holds true over all of these constructs is that the determiner precedes the noun. That generalization is expressed in the PHON tier of the NP construction by $1 >_3 2$, where 1 corresponds to the string associated with the determiner, 2 corresponds to the noun, and 3 ranges over the strings making up the entire PHON tier of the construct. Assuming that the output of $>$ is a truth value makes it possible to test a given construct against the construction. If $1 >_3 2$ is true of that construct, then the construct instantiates the NP construction, at least in the PHON tier.

The concatenation and precedence relations defined in (31) have obvious applications to defining word order. Inclusion is used when a construction requires all of the constructs that instantiate it to include certain strings

\[15\text{In many cases, when } > \text{ and } - \text{ appear in a construction, the subscripted variable corresponds to the entire PHON tier of any construct instantiating the construction. In such cases, we simply write } > \text{ and } -. \text{ Although this makes the symbol for immediate temporal precedence identical to the symbol for concatenation, it is generally obvious which relation is intended. In addition, immediate temporal precedence is a generalization over instances of concatenation, so the two notions are closely related.}\]
but does not say anything about how those strings must be ordered.

In this logic, it is fairly straightforward to represent a crucial difference between constructs and construction. Constructs, because they represent utterances, contain only strings and the concatenation function. They contain no other elements of the logic. It is not possible to pronounce a variable or a truth value. As a result, the type of the PHON tier of a construct is necessarily $s$, the type of strings. We codify this difference in the pronounceability rule for constructs in (32).

(32) **Pronounceability:** For all constructs $c$, the PHON tier of $c$ must be of type $s$.

### 5.1.2 SYN-well-formedness

Because word order is represented by PHON, we represent SYN using a representation that does not impose order. We represent the SYN tier using set theory, including multisets. Multisets, notated $[ , ]$, are just like sets in that the order of elements does not matter. For instance, the multisets $[a, b]$ and $[b, a]$ are equivalent. Multisets differ from sets in that the duplication/repetition of elements does matter. For example, the sets $\{a, a, b, b\}$ and $\{a, b\}$ are equivalent, but the multisets $[a, a, b, b]$ and $[a, b]$ are not.

We assume syntactic categories as primitives. Each syntactic category is represented as a multiset. Some categories are given below in (33) and abbreviated with capital letters.$^{17}$

---

$^{16}$Our use of the multiset is analogous in this respect to the numeration in Chomsky (1995).

$^{17}$The complete list of categories is longer, but we limit the list here for ease of exposition.
Many lexical items have syntactic categories. These items are represented as elements of the multiset representing the category. In addition, some members of a given syntactic category may consist of combinations of elements of (possibly) other categories. Which categories combine in which ways is determined by the constructions of each language.

Syntactic categories per se do not appear in the representations of constructs or constructions. Instead, their members do. For example, the SYN tier of the lexical entry for kick indicates that every construct that instantiates kick includes a particular member of the category V. We could represent this by writing “[kick] ∈ V” in the SYN tier of the construction. This representation would indicate both that [kick] is a multiset (the square brackets) and that it is an element of category V. However, in addition to being unsightly, writing things in this way obscures generalizations. Furthermore, in every case, recovering exactly which member of V is involved in a construct can easily be done by examining the PHON and CS tiers. We could also write “[V kick]” as an abbreviation of “[kick] ∈ V”, but this too would reproduce
much of the material in PHON and CS. Therefore, in the representations, we use upper case category labels to indicate a specific member of a category rather than the entire category. Which member will be assumed to be recoverable from information in the PHON and SYN tiers.

For example, consider the construction for the lexical item *kick* in (8), repeated for convenience.

(8) Construction: *kick*

\[
\begin{array}{c}
\text{PHON} & \text{kick}_1 \\
\text{SYN} & \text{V}_1 \\
\text{CS} & \lambda y.\lambda x.\text{kick}'_1(\text{AGENT}:x, \text{THEME}:y)
\end{array}
\]

The construction in (8) says that *kick* is a particular member of the category V. Importantly, (8) does not say that the SYN tier of *kick* consists of a variable over members of V. There is only one member of the category that is associated with the PHON tier *kick* and the CS tier \(\lambda x,\lambda y.\text{kick}'(\text{AGENT}:y, \text{THEME}:x)\).

In (8), V stands for that member.

(34) shows how the SYN tier works for a construct with two lexical items.

(34) Construct: *kick Fido*

\[
\begin{array}{c}
\text{PHON} & [\text{kick}_2, \text{fido}_1]_3 \\
\text{SYN} & [\text{VP V}_2, \text{NP}_1]_3 \\
\text{CS} & \lambda y,\lambda x.\text{kick}'_2(\text{AGENT}:y, \text{THEME}:f_1)]_3
\end{array}
\]

Focusing on the SYN tier and ignoring the other tiers for now, (34) shows that the construct consists of a multi-set which is a member of the category VP and which has two elements. The first element, indicated by V, is an
element of the category V. Specifically, it is the element [kick]. The second
is an element of the category NP.

Although variables over members of syntactic categories do not figure
in (8) and (34), we do need such variables. For example, the V-initial VP
construction discussed in Section 3 applies to constructs regardless of the
particular verb and complements involved. To account for this, variables
over members of a given syntactic category are indicated using the sans-
serif version of the category label. Thus $V$ is a variable over members of the
category V Assuming that $X$ stands for variables over singleton subsets of
multiple categories, the representation of the syn tier of V-initial VP is $[VP
V, X]$.

5.1.3 CS-well-formedness

We represent the cs tier using a higher order logic with at least the basic
types $e$ for individuals and $t$ for truth values and with the subtype of individ-
uals $e$ for Davidsonian events. We assume the functional type constructor
$\langle, \rangle$. Because semantic frameworks of this sort are widespread, we do not
define the logic here.

The only modification we make is a non-standard representation of the-
monic roles. Following Dowty (1989, 1991), thematic roles can be understood
as properties of predicates indexed by argument position or as relations be-
tween events and individuals. On the second approach, in e.g. John runs
the predicate run introduces an event, call it $e$. AGENT is then a relation
between events and individuals. In this case, AGENT($e, j$) is true of the
running event. Given suitable assumptions about how thematic roles are
defined, for any eventuality-introducing predicate \( P \) and individual \( x \), if \( x \) is an argument of \( P \), then in principle it is possible to specify \( x \)'s thematic role in the event introduced by \( P \). For such a translation, we could write \( P(e) \land \text{ROLE}(e, x) \). However, instead, we write \( P(\text{ROLE}: x) \) to mean the same thing. Thus, for the translation of \( \text{John runs} \), \( \exists e. \text{run}'(e) \land \text{AGENT}(e, j) \) and \( \text{run}'(\text{AGENT}: j) \) are notational variants.

### 5.1.4 Connections between tiers

Although not strictly about the well-formedness of any one tier, correspondences between elements on different tiers must be discussed before licensing can be defined. Correspondences between tiers are represented using subscripts. For example, consider again the lexical entry for \( \text{kick} \):

```
(8) Construction: \( \text{kick} \)
    \[
    \begin{align*}
    \text{PHON} & \quad \text{kick}_1 \\
    \text{SYN} & \quad V_1 \\
    \text{CS} & \quad \lambda x_e \lambda y_e. \text{kick}_1'(\text{AGENT}: y, \text{THEME}: x)
    \end{align*}
    \]
```

The subscripts in (8) indicate that particular elements of particular tiers are connected. Here for example, the \text{PHON} material \( \text{kick}_1 \) and the \text{SYN} material \( V_1 \) characterize the same grammatical element.

One question that the representation in (8) raises is what part of \( \text{CS} \) is indicated by the subscript on \( \text{kick}' \). We use subscripts on predicates to cover both the predicate itself, here \( \text{kick}' \), and its argument structure, here the remainder of the \text{CS} tier.
5.2 Licensing via instantiation

With the well-formedness rules of each tier in place, it is now possible to say how constructions license constructs. To solve Müller’s problem, a given construct must be licensed by multiple constructions simultaneously. This keeps the number of constructions manageable rather than unbounded without limiting the set of possible constructs.

We refer to two relations that hold between constructs and constructions. The first is term instantiation. Here ‘term’ is used to refer to expressions in constructs and constructions across all tiers and types: variables, functions, sets, etc. Term instantiation holds between a construct and a construction if some term in the construct is an instance of a term in the construct. Two types of term instantiation are defined in (35).

(35) Term Instantiation: A term $t$ in a construct instantiates a term $T$ in a construction iff

a. $t$ is identical to $T$ (instantiation by identity) or,

b. $t$ is a value of type $\alpha$, and $T$ is a $\lambda$-bound or free variable of type $\alpha$ (instantiation by substitution).

Both types of instantiation defined in (35) are exemplified immediately below. However, instantiation by substitution, defined in (35b), requires some comment first. Instantiation by substitution is defined only over $\lambda$-bound or free variables. This restriction prevents an individual constant from instantiating a quantificationally bound variable. For example, assume that every has the cs $\lambda P \lambda Q \forall x.P(x) \rightarrow Q(x)$. If (35b) were defined over all variables, then we could substitute $j$, the interpretation of John, for $x$. 

40
This would result in vacuous quantification, and make incorrect predictions about the interpretation of utterances with *every*. For this reason, among bound variables, only λ-bound variables can be instantiated by substitution. Free variables are included in (35b) to deal with contextually supplied implicit arguments, such as the implicit location argument needed for the interpretation of *local* [Partee 1989].

We illustrate (35b) by considering how the construction for *kick* (i.e. the lexical entry for *kick*) is instantiated in the construct *Alan kicked Fido*, which is given in (36), ignoring tense.

(36) Construct: *Alan kicked Fido.*

\[
\begin{array}{l}
\text{PHON} \quad \text{Alan}^{-1}\text{-[kick}^{-2}\text{-fido}^{-3}]_{4} \\
\text{SYN} \quad [S \ NP_{1}, [VP \ V_{2}, NP_{3}]_{4}] \\
\text{CS} \quad \text{kick}'_{2}(\text{AGENT};a_{1}, \text{THEME};f_{3})
\end{array}
\]

In the PHON tier, the phonological material [kick] in the construct is identical to the phonological material [kick] in the construction. Similarly, in the SYN tier V is identical to V. Note that this identity comes not from the fact that both are represented with “V”. Due to the notational conventions discussed in Section 5.1.2 all verbs will have the symbol V as their SYN tier. Rather, the two are identical because in both cases V represents a specific member of the category V, i.e. [kick].

These descriptions apply, ceteris paribus, to the instantiation of the PHON, SYN, and CS tiers of the constructions for *Alan* and *Fido*. Therefore, only the construction for *Fido* is provided.
The instantiation of kick in the cs tier of (36) involves both identity and substitution. First, the meaning and argument structure of kick are instantiated by identity. In both the construct in (36) and the kick construction in (8), the meaning of kick is kick’ and its argument structure involves an agent and a theme. In contrast, the variables in the cs tier of kick, x and y, are instantiated by the values f and a, respectively. This is instantiation by substitution. It is acceptable because x and y are variables of type e, and f and a are constants of type e.

The instantiation of the cs tiers of kick and fido in (36) illustrate an important point. A given term in a construct may instantiate terms in multiple constructions simultaneously. In (36), f simultaneously instantiates f in the construction Fido by identity and the bound variable x in the construction kick by substitution.

Instantiation by substitution is further illustrated by the way in which (36) instantiates the V-initial VP construction, repeated below.

(7) V-INITIAL VP

\[
\begin{array}{l}
\text{PHON} & 1 > 2 \\
\text{SYN} & \left[\text{VP} V_1, X_2\right]
\end{array}
\]

The string [kick] in (36) instantiates the variable over strings 1 in (7) by substitution. Similarly, [Fido] instantiates 2. In the syn tier, the variables
V and X are instantiated by V and NP, respectively.

An additional kind of term instantiation is illustrated by the relation between elements of the construct in (36) and elements of the V-initial VP construction. This is **instantiation by satisfaction**. Instantiation by satisfaction is possible when a relation between terms encoded in a construction holds between terms in a construct. In this case, the linear precedence relation between the variables 1 and 2 encoded in (7) holds between the terms kick and Fido which instantiate 1 and 2.

Instantiation by satisfaction is defined in (38). It is limited to the **phon** tier, because allowing it to apply to the **cs** tier could result in the **cs** tier of a construct instantiating the **cs** tier of any construction that it entails.

(38) **Instantiation by satisfaction:** Given construct c with terms t and t′ in the **phon** tier and construction C with terms T and T′ in the **phon** tier and relation R such that \( R(T, T') \), c instantiates R iff

a. t instantiates T and
b. t′ instantiates T′ and
c. \( R(t, t') \).

Instantiation by satisfaction is needed primarily to address the mismatch between the kinds of relations available for the **phon** tier of constructions and those available for the **phon** tier of constructs. As mentioned in Section 5.1.1, the **phon** tier of a construct can only involve strings and concatenation. However, the **phon** tier of a construction can express generalizations over constructs using other relations, such as the linear precedence relation. Instantiation by satisfaction specifies how such relations are satisfied.
in particular constructs.

Thus far, we have defined only the instantiation of terms. Next it is necessary to say what it means for a construct to instantiate a construction. This is done in (39).

(39) **Construction instantiation:** A construct, \( c \), instantiates a construction, \( C \), iff

a. for all terms \( T \) in \( C \), there is some term \( t \) in \( c \) such that \( t \) instantiates \( T \) (term exhaustion) and

b. for all relations \( R \) in the PHON tier of \( C \), if \( R \) is not instantiated by a term in \( c \), then \( c \) instantiates \( R \) by satisfaction (relation exhaustion) and

c. all correspondences between tiers that hold in \( C \) also hold in \( c \) (consistent co-indexing).

The first two conditions in (39) say that for a construct to instantiate a construction, it must instantiate every term and relation in that construction. The final condition requires that every correspondence between tiers in the construction must be replicated in the construct.

With construction instantiation defined, we are in position to define licensing in (40).

(40) **Construct licensing:** A construct \( c \) is a licensed construct iff

(40) for every term \( t \) in \( c \), \( t \) instantiates a term \( T \) in some construction \( C \) and

(41) for every such \( C \), \( c \) fully instantiates \( C \).
presents two conditions for a construct to be licensed, or grammatical, in the current framework. The first condition is that every element of the construct must instantiate some element of some construction. This means, in essence, that nothing in the construct can be outside the grammar of the language. The second condition is that any construction involved in licensing a construct must be fully instantiated in the construct. In other words, constructs cannot pick and choose parts of constructions to instantiate. Either they instantiate the entire construction, or they do not instantiate it at all. This definition of licensing, combined with the constructions posited above plus a suitable construction for a sentence, correctly predicts the Alan kicked Fido construct in (36) to be grammatical.

The definitions of instantiation and licensing developed here provide a mechanism by which a set of constructions licenses a construct without inheritance hierarchies or complex constructions built recursively out of more

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19The reader may have noticed that the rules of the system do not differentiate between the correct representation of the construct Alan kicked Fido in (36) and a minimally different representation in which the order of arguments is switched in the CS tier: kick₂₂(agent: f₃, theme: a₁). They predict both versions to be acceptable, even though the minimally different CS does not correspond to an acceptable interpretation of Alan kicked Fido. To rule this out, it is necessary to add additional complexity to the system. Following Culicover and Jackendoff (2005), we assume an additional Grammatical Function (GF) tier. This tier connects CS and SYN using primitives such as subject and object. We also assume the constructions for DIRECT OBJECT in (i) and ACTIVE VOICE in (ii). Together, these constructions ensure that the mapping between CS and SYN is appropriate.

(i) Construction: DIRECT OBJECT

\[
\text{SYN} \begin{bmatrix} \text{VP} V_1, \text{NP}_2 \end{bmatrix} \\
\text{GF} \begin{bmatrix} \text{OBJECT: 2} \end{bmatrix}
\]

(ii) Construction: ACTIVE VOICE

\[
\text{GF} \begin{bmatrix} \text{OBJECT: 2} \end{bmatrix} \\
\text{CS} \begin{bmatrix} \lambda R_{e, e(t)} \lambda x_e \lambda y_e. R(\text{AGENT: } x_1, \text{THEME: } y_2) \end{bmatrix}
\]
primitive constructions. As a result, the system avoids Müller’s problem, which centered on the unbounded proliferation of constructions.

6 Summary and general perspective: What is a grammar for?

We began this paper with a review of Kay’s constructional analysis of subjectless tag questions in English. We argued for the CCAV: that constructions should only be able to make reference to primitive syntactic and morphosyntactic properties of representations. Using this constraint as guidance, we described an architecture for stating constructions based closely on Jackendoff’s Parallel Architecture, and applied it to the description of English tag questions.

We then considered the general question of how to define the licensing of individual expressions of a language in terms of grammars composed of such constructions. We reviewed Müller’s demonstration that the solution cannot consist of forming composite constructions from individual constructions. Our formalization of the proposed architecture explicitly assumes CCAV as a constraint on representations, and solves Müller’s problem by defining licensing in terms of the simultaneous satisfaction of constructional conditions.

We recognize that our proposal to disallow reference in constructions to non-grammatical properties runs counter to much of the literature in constructional approaches. Culicover (2013) argues that the descriptive apparatus of a grammar should be powerful enough to describe any conceivable
form/meaning correspondence, but that it should be formulated in a way that makes it possible to measure and compare the complexity of diverse phenomena. But there is an important assumption made there, and made here, which is that there are certain aspects of language use (understood broadly to include frequency, social facts, and so on) that are not properly part of a grammatical description. Such aspects are impossible to include in constructions that follow the CCAV.

What is at issue is what kinds of phenomena are properly part of grammar, or more broadly, what a grammar is for. Traditionally, the term ‘grammar’ has been used in (at least) two ways:

- The grammar_{Speaker} is what is in the head of the speaker that accounts for the use of language, e.g. in production and comprehension.
- The grammar_{Linguist} is the linguist’s description of the speaker’s linguistic knowledge.

Grammar_{Speaker} appears to be what Bybee (2006, 711) has in mind when she writes “certain facets of linguistic experience, such as the frequency of use of particular instances of constructions, have an impact on representation ... The result is a cognitive representation that can be called a grammar.” Her argument is that grammar_{Linguist} should reflect as exactly as possible grammar_{Speaker}, understood broadly as including all facets of linguistic experience.

The issue here is more than a terminological one. It has to do with the goal of linguistic description. There is no question that each speaker of a
language has acquired a mental representation of a language that underlies his or her linguistic capacity on the basis of experience. It is plausible that any aspect of the environment whatsoever that correlates systematically with some aspect of the form and/or meaning of the language could be represented somewhere in the speaker’s mind as knowledge that is activated along with the form and meaning. It would be quixotic to attempt to describe everything in the head of each speaker, since each speaker has different experiences and so arrives at a different mental representation of language in this broader sense.

If we want to understand something about the nature of the relationship between linguistic form and meaning there has to be idealization, as Chomsky famously proposed in *Aspects of the Theory of Syntax* (Chomsky 1965). One dimension of idealization would be to abstract away from individual experience, and understand the variability of linguistic behavior across populations as a function of the variability of experience. This means that we will consciously ignore individual differences in the interest of getting at the more fundamental question of what it is that explains what a grammar $\text{Speaker}$ might be, and how it gets into the speaker’s head.

But beyond this, it seems to be impossible to construct a coherent account of variability without further idealization: what varies is speakers’ use of form/meaning correspondences in context, as a product of their experience. Isolating, describing and accounting for the form/meaning correspondences themselves appears in fact to be a prerequisite for such a broader investigation of variation. Crucially, it is possible to describe the correspondences that constitute knowledge of the language and in fact track their fre-
quency and context of use without conflating knowledge and use (Newmeyer 2003).

In fact, Bybee has to rely on such idealization in order to be able to make coherent proposals regarding speakers’ representation of frequency information. For example, in [Bybee (2006) 720] she cites the English *be-going-to* construction as (42) –

\[(42) \quad \text{[subject + be going + to + VP]}_{\text{INTENTION, FUTURE}}\]

This is a construction that gradually emerged over time from the literal *be going to* (Garrett 2012). Such an account of course relies on such grammatical categories as ‘subject’ and ‘VP’. These are just the sorts of properties allowed by the CCAV.

The further idealization that isolates the description of form/meaning correspondences such as (42) stems from our recognition of the impossibility of incorporating all of a person’s experience without differentiation into a useful description of knowledge of language. This idealization is at the heart of the competence/performance distinction. The linguist carves out what promises to be a useful and reasonably principled subset of the speaker’s knowledge of language and tries to describe and explain it. This is how we, and many if not all generative grammarians, understand grammar, or simply ‘grammar’.

As discussed in this paper, grammar in this restricted sense is concerned with the description of the knowledge that certain forms have certain meanings, where ‘meaning’ is understood as having to do with truth conditional representations of the world; consideration of a broader inventory of con-
struction types will lead us to include representations of such discourse-related phenomena as topic, focus and information structure. Even accounting for this much poses formidable descriptive and explanatory challenges for linguistic theory. We believe that it would not be possible to take on these challenges if we also had to account, for example, for the fact that a particular form with a particular meaning is used with a certain frequency in certain social contexts, perhaps to represent social identity, and with a different frequency in other social contexts. And perhaps equally importantly, it would not be possible to arrive at a satisfactory account of how knowledge of such a form/meaning correspondence is used without having a prior account of what that knowledge is and why it has the properties that it has.

On the other hand, we suggest that grammar_{Speaker}, what is in the speaker’s head, should be understood as underlying linguistic performance. This is an extended sense of the term, compared with Chomsky’s original use of it. Performance has many parts, including the computation of meaning given form and the computation of form given meaning, that is, comprehension and production, which is the domain of psycholinguistics, and the management of contextual frequency, social meaning and social identity, which is the domain of sociolinguistics.

We believe that aspects of this latter subtype of performance are what Bybee and many constructionists are trying to account for. All of this knowledge is in the speaker’s head, and is eminently worthy of study. But the fact that it exists does not bear directly on our description of the forms and their meanings, and certainly doesn’t entail that form/meaning correspon-
dences, that is, constructions, cannot be usefully identified and studied on their own.
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