Chapter 1

Not for Love or Money: Collocations![1]

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ABSTRACT.

We will discuss the distribution of the German verbs *fackeln* (*hesitate*; *dither*, in the sense of acting nervously or indecisively) and *wahrhaben* (literally *have true*; *admit to oneself*). Both are Negative Polarity Items which must fall in the scope of more semantic operators than just negation: a durational modifier in the case of *fackeln* and a modal operator for *wahrhaben*. We will argue that a collocation module is needed to account for the obligatory presence of the additional operators. The collocational requirements must be expressed with reference to the logical form of the operators. We, then, can show that the negation sensitivity can be accounted for by the same collocational mechanism, referring to the logical form of the licensing context rather than to its entailment properties. We will present an analysis within the framework of Head-Driven Phrase Structure Grammar (HPSG).

1.1 Introduction

Formal lexicalist grammars emphasize a division of labor in the architecture of grammars. A small set of general principles of grammar controls the realization of lexical elements in well-formed linguistic structures. The lexical elements themselves have idiosyncratic properties, such as their phonology, meaning and syntactic category, which are not predictable from general principles but have to be specified in the lexicon. Among the idiosyncratic properties we find the selectional requirements of syntactic or semantic functors. When we consider large corpora, however, we observe that current implementations of this architecture leave a set of phenomena unaccounted for that have been described as the *collocational restrictions* of lexical items. As we will see, these restrictions can go beyond mere statistical tendencies and should thus be regarded as belonging to the linguistic knowledge of speakers. Given that they concern properties of linguistic structures that are outside the domain of selectional restrictions, we will argue for their integration in formal grammars by an extension of the ontology of lexical signs that will permit their inclusion in lexical specifications. Supplementing the lexical extension, a collocation module of grammar enforces their realization in linguistic structures by a general principle.

[1]We are grateful to the FG-Trento reviewers for comments and to Carmella Payne for help with English.

Proceedings of Formal Grammar 2002
G. Jäger, P. Monachesi, G. Penn & S. Wintner (editors).

1.2 Data

The German verb *fackeln* has two meanings: (i), *to burn* occurring mainly with particles such as *ab-* (*flare off*); (ii), *to dither, to shilly-shally*. We will focus on this second meaning. In the COSMAS-I corpus (`www.ids-mannheim.de/~cosmas`), there are 280 occurrences of this use. 241 (86%) are in the combination *nicht lang(e) fackeln*, illustrated in (1).

(1) Der neue Geschäftsführer fackelte nicht lange.
the new manager dithered not long
'The new manager didn't dither very long.'

The remaining 39 (14%) occurrences contain: 22 (7.9%) with *lang(e)* and other negative markers (as *ohne* (*without*), *nie* (*never*), see (2a)), 3 (1.1%) with a durational modifier and a negative element both different from *lange* and *nicht*, see (2b). In 2 (0.7%) cases *lange* occurs, but no negative element (2c). There are 12 (4.3%) instances of a negation, but no durational modifier (2d).

(2) a. Ohne lange zu fackeln, rannte der Helfer in die Wohnung.
without long to dither ran the helper into the apartment
'The helper ran into the apartment without dithering very long.'

b. Es gebe zwei Punkte, in denen die Politesse keine Minute fackle,
there are two points at which a traffic warden no minute dithers
'There were two points at which a traffic warden wouldn't dither a minute.'

c. Harsche SVP-Kritik erntete die Regierung dafür, dass sie so lange fackle
harsh SVP criticism reaped the government that for that it so long dithered
'The government reaped harsh SVP criticism for dithering so long.'

d. Ohne zu fackeln, zückte einer von ihnen ein Messer.
without to dither drew one of them a knife
'One of them drew a knife without dithering.'

We can add introspective and further corpus data to these observations. As a result, we find that the verb *fackeln* may occur with a wide range of durational modifiers and in many contexts that license NPIs. The defalcation of one of these requirements decreases grammaticality significantly.

(3) a. Keiner hat einen Moment gefackelt, bevor er gesprungen ist.
nobody has a moment dithered before he jumped has
'Nobody dithered a moment before jumping.'

b. ? Keiner hat gefackelt, bevor er gesprungen ist.
Nobody has dithered before … 'Nobody dithered before … '

c. *? Peter hat einen Moment gefackelt, bevor …
Peter has a moment dithered before …
'Peter dithered a moment before … '

d. * Peter hat gefackelt, bevor …
Peter has dithered before … 'Peter dithered before … '

We conclude that for its linguistic contexts of occurrence, the verb *fackeln* requires: (i) to be in the scope of a durational modifier and (ii) that the verb and the modifier be in the scope of an NPI licensing operator. While this generalization covers the introspective and most of the corpus data (95%), examples such as (2c–d) suggest that further research is needed to amend the generalizations to include the remaining data.

The verb *fackeln* is a particularly good example for multiple co-occurrence conditions. Another interesting element is the verb *wahrhaben* (literally *have true*), used in the sense of *admit (to oneself)* or *accept*. The COSMAS-I corpus contains 100 occurrences of this verb. In 99 cases, the verb occurs in polarity contexts and in 96, embedded under the modal verb *wollen* (*want*):

(4) Man wolle die mögliche Diagnose Herzinfarkt nicht wahrhaben, sagte S.
one wants the possible diagnosis heart attack not true.have said S.
'One didn't want to accept the possible diagnosis of heart attack, said S.'

The remaining 4 cases contain 2 occurrences of the verb *möchten*, a polite synonym of *wollen*; 1 occurrence of the verb *können* (*can*) and 1 occurrence with the verb *müssen* (*must*). The last occurrence, repeated in (5) is also the only one with no NPI trigger and is considered ungrammatical by our informants.

(5) (*) (er) muß wahrhaben, daß er sich mit seiner Schwägerin … nicht
(he) must true.have that he himself with his sister-in-law not
nur in Sachen Finanzen gut versteht.
only in matters of finances well gets along
'he must admit that he gets along well with his sister-in-law, not only in financial matters.'

To describe the grammatical cases, we observe that the verb *wahrhaben* must be a dependent of the verb *wollen* and in the scope of an NPI trigger. The NPI trigger must have scope over the obligatory modal verb, as evidenced by the occurrence of *wahrhaben* in comparatives.

(6) Der Wald stirbt schneller als die regierungsamtlichen Zahlen es
the forest dies faster than the government official numbers it
wahrhaben wollen.
true.have want

'The forest is dying faster than the government official figures indicate.'

Even though, in all the corpus data, the verb *wahrhaben* occurs in the infinitive, other non-finite forms are possible as well, but are usually semantically awkward, as evidenced by the translation. In (7a) it occurs as an active past participle, in (b) as passive. Embedded under the noun *Wille* (*will*), even a *zu*-infinitive is possible.

(7) a. Auf einmal will Peter das nicht mehr wahrgehabt haben.
suddenly wants Peter that no longer true.had have
'Suddenly, Peter doesn't want to have had ever admitted it.'

b. Diese Tatsache will von niemandem wahrgehabt werden.
this fact wants by nobody true.had be
'This fact would not be admitted by anybody.'
'Nobody wants to admit this fact'

c. Er hat nicht den Willen, das Fiasko wahrzuhaben.
he has not the will the fiasco true.to.have
'He doesn't have the will to admit the fiasco.'

We conclude that *wahrhaben* has to be in the scope of a semantic operator of volition, as introduced by certain uses of *wollen*, *möchten* or *Wille*, which, in turn, must fall under the scope of an NPI licensing operator.

Considering crosslinguistic data, Hoeksema (2001) shows that many NPIs in English and Dutch are subject to additional occurrence restrictions. He calls them *secondary restrictions*. For example the expression *for love or money* is an NPI that requires a modal or irrealis contexts. In a negative episodic statement, it can only be interpreted literally (Hoeksema 2001).

(8) a. I wouldn't talk to him for love or money.

b. John did not date her for love or money, but at the behest of his father.

Hoeksema shows that, just as with polarity restrictions, his secondary restrictions historically develop from stylistic preferences to grammaticalized occurrence restrictions that cannot be violated.

1.3 A Collocation Module for Formal Grammars

The traditional grammatical mechanism to account for the obligatory co-occurrence of two elements is *selection*. The theory of selection incorporated in HPSG assumes that a head selects its complements, and an adjunct selects the head. We will show that for the verbs *fackeln* and *wahrhaben*, the obligatory presence of the DM or of *wollen* cannot be enforced by selection.

The verb *wahrhaben* is the easier case of the two. Here, the verb *wollen* clearly takes *wahrhaben* as a complement. Inflection, word order and semantics all support this direction of embedding. Under the usual assumptions about selection, a complement does not select the head. Thus, *wahrhaben* cannot select for the modal.

Analogously, we can show that *fackeln* does not select the DM. *Fackeln* is a synonym of *zögern* (*hesitate*). Though *zögern* is atelic, therefore compatible with DMs, neither introspective nor corpus data suggest that a DM is obligatory. Substituting *zögern* for *fackeln* does not change the meaning or the structure of the sentences. Thus, there is no semantic or syntactic evidence for a complementhood of the DM. Instead the synonymy of the two verbs strongly suggests that the DM be treated as an adjunct in both cases.

This is especially clear if we compare *fackeln* with *dauern* (*take (time)*) for which a durational adverbial is also present in almost all corpus examples.[2]

(9) Die Vorstellung dauerte drei Stunden.
the presentation lasted/took three hours

For *dauern*, the status of the DM is open to debate. The logical structure of the verb *dauern* differs from that of *fackeln*: in the first case, the DM determines the duration of the subject, whereas in the second it specifies the duration of the dithering. The special interpretation of the durational adverbial with *dauern* motivates a treatment as a semantic argument and, consequently, as a syntactic complement. However, such motivation is absent for *fackeln*.

Alternatively, Steinitz (1988) assumes that the DM that accompanies *dauern* is an adjunct, instead of a complement. It is obligatory because the verb *dauern* is semantically very weak. Therefore, without a further specification of the duration time, a sentence containing *dauern* is odd. The verb *fackeln* on the other hand is not semantically weak, or otherwise, so would be its synonym *zögern* for which the DM is fully optional. Thus, the explanation for *dauern* does not apply to *fackeln*.

If we accept on the basis of the available empirical evidence that the DM is an adjunct rather than a complement in the case of *fackeln*, *fackeln* cannot be said to select the DM. Furthermore, there is no independent semantic mechanism or pragmatic constraint to which the obligatory presence of the DM could be reduced. Therefore, the verb cannot enforce the presence of the DM.

Selection is certainly not the right term for the kind of co-occurrence patterns under discussion; it seems more fitting to characterize the phenomenon with the notion *collocation*. Under its most neutral definition, the term collocation refers to any statistically remarkable co-occurrence of elements in a corpus. The importance of collocations has been asserted most prominently in the London School (Firth 1957, pp. 190–215) and its descendants (Butler 1985; Sinclair 1991). There, a lexical element is defined and particularized by its collocational restrictions:

[2]Exceptions are occurrences of *dauern* in modal contexts:

(i) So ein Verfahren kann dauern.
such a procedure can take (a while)

> "The defining feature of a lexical item, by which such an item is recognized, is its pattern of co-occurrence with other items, that is its *collocational* behavior. A lexical item is recognized as different from other lexical items because its total pattern of collocation is unique." (Butler 1985, p. 130)

In the present paper, we want to ignore co-occurrence patterns that can be reduced to effects of thematic coherence (*milk—cow*) or to syntactic and semantic selection (*read—book*). Instead, we will focus on patterns that seem unpredictable from discourse structure or grammatical properties of the elements that make up a text. The collocation patterns of *fackeln* and *wahrhaben* are of this kind. They also go beyond mere statistical preferences, and can even be accessed by introspective data. Therefore, within the framework of theoretical assumptions of current formal theories of grammar, the collocational behavior of these words should follow from a speaker's linguistic knowledge. Nonetheless, the collocational behavior of lexical elements has been largely ignored in formal linguistics: In HPSG — and similarly in GPSG, GB, LFG, Categorial Grammar, and even Construction Grammar — collocations have not yet been integrated into the architecture of grammar.

Faced with the obligatory presence of the durational modifier for *fackeln* we acknowledged the necessity of a collocation module. For its integration into the architecture of signs we will now introduce the attribute COLL at the level of *signs*. The value of COLL is a list. It is empty for non-lexical signs. A lexical sign has exactly one element in its COLL value: the root sign of the utterance in which it occurs. This is enforced by a principle, the COLL PRINCIPLE:[3]

(10) The COLL PRINCIPLE:
If a sign a dominates a sign b which has a non-empty COLL value, then the element in b's COLL value is a sign c such that c dominates a.

Having introduced the prerequisites of a collocation module, we can specify the requirements that the verb *fackeln* imposes on its occurrences as part of its lexical entry.

(11) Sketch of the lexical entry of *fackeln* (preliminary version):

$$\begin{bmatrix} \textit{word} \\ \text{PHON}\ \langle \textit{fackeln} \rangle \\ \text{S L} \begin{bmatrix} \text{CAT HEAD } \boxed{2}\ \textit{verb} \\ \text{CONTENT } \ \mathsf{hesitate}'(e,x) \end{bmatrix} \\ \text{COLL}\ \langle \boxed{1} \rangle \end{bmatrix} \quad \textbf{and} \quad \texttt{dominates}(\boxed{1},\boxed{3}) \quad \textbf{and} \quad \boxed{3}\begin{bmatrix}\text{S L}\begin{bmatrix}\text{CAT HEAD MOD}\,[\text{LOC CAT HEAD }\boxed{2}] \\ \text{CONTENT} \ldots \mathbf{dur}'(e)\ldots\end{bmatrix}\end{bmatrix}$$

In (11) we specify that the sign in the COLL list must dominate a modifier which (i) modifies the verb *fackeln* and (ii) has a durational semantics. The first requirement is directly stated by tag $\boxed{2}$. For the second, we assume that we can

[3]See Sailer (2000) and Richter and Sailer (2002) for a formalization of this principle in RSRL, the underlying description language of HPSG (Richter et al. 1999, Richter 2000).

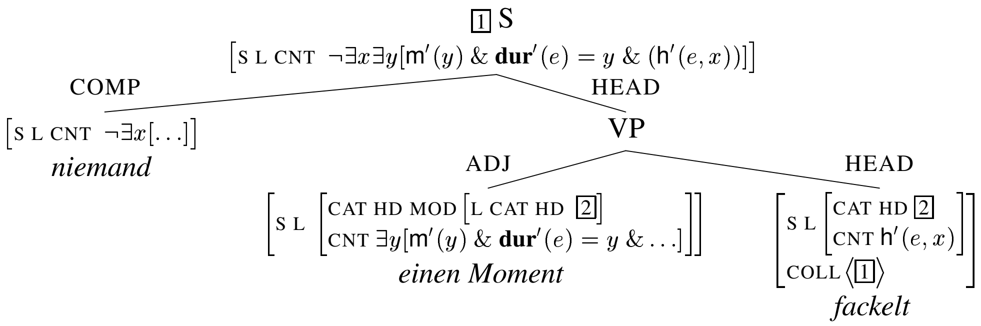

Figure 1.1: The analysis of *(dass) niemand einen Moment fackelt* (*(that) nobody dithers a moment*)

identify the class of durational modifiers by their CONTENT values, i.e., their *logical form*. Following Kamp and Reyle (1993), we posit a semantic constant **dur′** whose interpretation is the duration of an event and which occurs in the logical form of all durational modifiers.

Consider Figure 1.1.[4] We postulate terms of a higher-order language as the values of the CONTENT attribute, but remain agnostic to the mechanism of combinatorial semantics. Our proposal is compatible with an approach that relies on lambda conversion in combination with a flexible type shifting system à la Hendriks (1993) (explored for HPSG in Sailer 2000), or with a more specialized semantic combinatorics such as *Lexical Resource Semantics* (Richter and Sailer 2001a,b).

The figure shows that COLL is not a selection attribute: The DM is introduced into the sentence by the traditional head-adjunct-schema of Pollard and Sag (1994) and, therefore, the verb does not select its modifier. The COLL list of a word contains the highest node in the structure, which is enforced by the COLL PRINCIPLE. By this assumption, a lexical element can impose idiosyncratic restrictions on the sentences in which it may occur, i.e., the COLL specification can be seen as a global filter rather than as a selection requirement.

In the case of *wahrhaben* the collocation requirement states that in every utterance containing *wahrhaben*, there must be a word that (i), contributes a semantic constant of volition, and (ii), has (a projection of) *wahrhaben* on its valence lists. Under the standard argument raising analysis of German coherent constructions (Hinrichs and Nakazawa, 1989), this also accounts for the infinitival data in (7).

Our collocation module is powerful enough that in principle, any property of an utterance can be taken as a collocational requirement of a word in that utterance. For an analysis of *fackeln* and *wahrhaben*, we need (i), the selectional relation between the verbs and its collocate, the DM or the modal respectively, and (ii), the logical form of the collocate. We do not need its phonology. For other phenomena, like the *a*/*an* alternation in English, phonological information plays a crucial role (see Asudeh and Klein 2002). We leave it to further investigation to determine how a theory of collocations can be made more constrained.

[4]The semantic constants $\mathsf{hesitate}'$ and moment' are abbreviated with h' and m'.

1.4 A Representational Theory of PI Licensing

The most successful theories of PI licensing rely on the entailment properties of the context in which a PI may or may not occur. Such entailment-based theories (EBT) have been proposed in Fauconnier (1975), Ladusaw (1980) and refined in Zwarts (1981, 1986, 1997). Downward entailing (DE) environments are those which allow inferences from sets to subsets. For example the sentence *Nobody likes vegetables* implies *Nobody likes carrots*, whereas *Everybody likes vegetables* does not imply *Everybody likes carrots*. The EBT advances the insight that NPIs can only occur in DE contexts. The use of entailment notions allows the grouping of contexts created by *not*, *nobody*, *few*, *seldom* for which a purely syntactic characterization is not plausible. Not withstanding its merits, the EBT encounters severe problems with PI licensing in embedded sentences, in conditionals and in questions (see van der Wouden 1997 for discussion).

In the EBT, the class of DE operators is divided into several subclasses: *ultra strong* negation, as introduced by negative particles like *nicht* (*not*) is called *antimorphic* and shows further entailment properties. These additional properties can be broken down in two entailment properties which correspond to the de Morgan laws of negation. These properties are called *anti-additivity* and *antimultiplicativity*. For an anti-additive operator f (such as *niemand* (*nobody*)) the following holds: $f(X \cup Y) = f(X) \cap f(Y)$. Analogously, an antimultiplicative operator (like *nicht jeder* (*not everyone*)) observes the following equation: $f(X \cap Y) = f(X) \cup f(Y)$ (see Kas 1993 for details). Zwarts (1997) shows that for some NPIs, a simple DE context is enough, whereas others require contexts that are at least anti-additive (but not antimultiplicative), some even require antimorphic contexts. As pointed out in van der Wouden (1997, pp. 134–141) there are no NPIs attested that can occur in an antimultiplicative context but not in an anti-additive context. This observation is unanticipated — and so far unexplained — within the EBT.

If we consider the logical form of the licensing operators instead of their entailment properties, there is a natural account of the antimultiplicativity problem. A PI is in the scope of an antimorphic negation if in the logical form of a sentence, there is no other semantic operator intervening between the negation and the semantic contribution of the PI. The PI is in an anti-additive context, if there is only an indefinite intervening between the negation and the PI. Finally, if there are other operators intervening, in particular "real" quantifiers the PI is in a weakly negative, i.e., simply downward-entailing context. Such contexts are created by words as *wenige* (*few*) or *kaum* (*hardly*).

To characterize all DE operators as introducing negation ("$\neg$") to the logical form of the sentence, we allow some semantic decomposition at the level of logical form, as is done in Stechow (1993, 1996) and Przepiórkowski and Kupść (1999). For example, the logical form of the DE quantifier *wenige* (*few*) is taken to be $\neg\mathsf{many}'[\ldots]$. Thus, it meets our characterization of what constitutes a simply DE context. The table in (12) indicates the logical form of some NPI-licensers of different licensing strength.[5]

(12)

entailment classification	example	lf representation
antimorphic	*nicht* (*not*)	$\neg[\ldots\phi\ldots]$
anti-additive	*niemand* (*nobody*)	$\neg\exists[\ldots\phi\ldots]$
downward entailing	*wenige* (*few*)	$\neg\mathsf{many}'[\ldots\phi\ldots]$

The representational reformulation of the hierarchy of negations fixes the antimultiplicativity problem: All antimultiplicative natural language operators are of the form "*not every–*". In the representational approach, these operators receive a logical form which contains a negation and a universal quantifier ("$\neg\forall$"). This representational characterization leads us to expect that these operators create contexts which form a natural class with those of simple DE-operators, i.e., contexts in which a quantifier intervenes between the negation and an NPI which is to be licensed. This observation suggests that the representational approach to NPI licensing can explain the lack of a class of NPIs which would be systematically predicted under the EBT.

An EBT-based account of PI licensing was linked to collocations by van der Wouden (1997). With the collocation module of Section 1.3, we can integrate van der Wouden's proposal of considering entailment requirements as collocational restrictions into our grammar. The complications with missing information of entailment properties in the structure of signs that would arise with directly adopting van der Wouden's EBT-based approach can easily be avoided by reformulating his entailment notions in representational terms. Our collocation module of Section 1.3 can then refer to the logical form of licensers. For *fackeln* that is the logical form of a durational modifier. We would expect that reference to other operators, like negation and quantifiers, is also being made in the collocational requirements of lexical items. Thus, our collocation module provides the necessary means to express polarity requirements.

Given the representational recoding of the entailment definitions, we can integrate the polarity requirements of the verb *fackeln* into its lexical entry.

(13) Sketch of the lexical entry of *fackeln* (final version):

$$\begin{bmatrix} \textit{word} \\ \text{PHON}\ \langle \textit{fackeln} \rangle \\ \text{S L} \begin{bmatrix} \text{CAT HEAD}\ \boxed{2}\ \textit{verb} \\ \text{CONTENT}\ \ \mathsf{hesitate}'(e,x) \end{bmatrix} \\ \text{COLL} \left\langle \boxed{1} \left[\text{S L CONT}\ \ldots \neg[\ldots \mathsf{h}'(e,x)\ldots]\ldots\right] \right\rangle \end{bmatrix} \ \textbf{and}\ \ \texttt{dominates}(\boxed{1},\boxed{3}) \ \textbf{and}\ \ \boxed{3}\left[\text{S L}\begin{bmatrix}\text{CAT HEAD MOD}\ [\text{L CAT HEAD}\ \boxed{2}] \\ \text{CONTENT}\ \ldots \mathbf{dur}'(e)\ldots\end{bmatrix}\right]$$

With this lexical entry, we can analyze a typical sentence containing *fackeln* in Figure 1.1. The collocational requirements of the verb are met: (i), the CONTENT

[5]For simplicity, we encode negative indefinites as existential quantifiers. The contrast between existential and universal quantification has been amply noted (e.g., Partee 1987, Zimmermann 1993).

value of sign $\boxed{1}$ contains a negation operator with scope over the constant contributed by the verb, and (ii), the sign in its COLL list, $\boxed{1}$, dominates the DM which modifies the verb.

In light of a collocation mechanism like ours, it is only natural that a lexical element restricts the logical form of the sentences in which it occurs in various respects. In the case of *wahrhaben*, the relevant item is required to be in the scope of a negation and a modal operator in the logical form of the sentence. A similar restriction applies for *for love or money*, mentioned in (8). Further examples in Hoeksema (2001) suggest that other elements of the logical form of a sentence, such as the presence of quantifiers, can be crucial as well.

Our approach captures multiple co-occurrence requirements in a unified way. Hoeksema's "secondary" restrictions are treated on pair with the polarity requirements of NPIs. We achieve this by adopting a representational theory of NPI licensing rather than introducing a different machinery, as would be needed for an EBT. Furthermore, we can express the required degree of negativity by referring to constants that are needed independently in the logical form of a sentence to express the right readings. This is a clear advantage over theories which encode NPI requirements by the percolation of diacritic markings (Dowty 1993).

1.5 Conclusion

We argued that a collocation module is needed to account for the distribution of lexical elements as the verbs *fackeln* and *wahrhaben*. The requirement of a durational modifier or of a particular matrix verb are classical collocational properties. Once a collocation module is introduced, it can also comprise the second distributional restriction of the two verbs, namely their limitation to negative contexts. Reformulating the hierarchy of licensing strength for PIs of Zwarts (1997) in terms of the logical form of the licensers, we have seen that a representational theory is capable of making the same distinctions as the EBT without being confronted with the antimultiplicativity problem. Finally, studies like Hoeksema (2001) have revealed that many PIs show additional collocational restrictions. Our approach is the first to capture this observation collectively.

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