Formal Features as a Consequence of Doubling Effects[*]

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1. Introduction

A central topic in the study to the syntax-semantics interface concerns the question what exactly constitutes the set of functional projections, or more precisely, what constitutes the set of formal features that are able to project. Since Pollock's (1989) work on the split-IP hypothesis many analyses have assumed a rich functional structure, consisting of a UG-based set of functional heads that are present in each clausal domain (Rizzi (1997) for the CP domain or Cinque (1999) for the IP domain). This approach has become known as the *cartographic* approach (cf. Cinque (2002), Rizzi (2004), Belletti (2004) for an overview of recent papers). Under this approach the set of functional projections is not taken to result from other grammatical properties, but is rather taken as a starting point for grammatical analyses. An alternative view on grammar, standardly referred to as *building block grammars* (cf. Bobaljik & Thrainsson (1998), Koeneman (2000)), takes syntactic trees to be as small as possible. Obviously, in many cases there is empirical evidence for the presence of a functional projection in a particular clause, e.g. due to the presence of an overt functional head. The main difference between the building block grammar approach and the cartographic approach (in its most radical sense) is that in the first approach the presence of a particular functional projection in a particular sentence in a particular language does not imply its presence in all clauses, or all languages, whereas this is the basic line of reasoning behind the latter approach. However the question what exactly determines the amount and distribution of functional projections remains open.

In the following section I provide some theoretical backgrounds and present my proposal, the Flexible Formal Feature Hypothesis (FFFH), arguing that a particular feature [F] can only be analysed as a formal feature able to create a functional projection FP if and only if there are (substantial) instances of doubling effects with respect to F present in language input during first language acquisition. After that, in section 3, I

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illustrate how the FFFH works by discussing a case-study: negation and Negative Concord. In this section I demonstrate that negation is a syntactically flexible functional category: in Negative Concord languages negation is realised as a formal feature, in Double Negation languages it is not. This calls for an explanation of Negative Concord in terms of syntactic agreement. In section 4, a consequence of the application of the FFFH to negation is discussed: the syntax of (negative) markers. Here I show that the FFFH makes correct predictions, thus providing empirical evidence for it. Section 5 concludes.

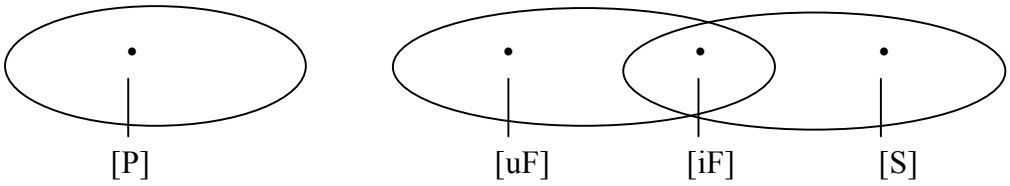
2. Formal Features Result from Doubling Effects

In the Minimalist Program (Chomsky 1995, Chomsky 2000, Chomsky 2001) Lexical Items (LIs) are assumed to be bundles of three kinds of features: phonological features, semantic features and formal features. In this paper the distinction between formal features and semantic features is of particular interest. First, I focus on the question as to what exactly are the differences between formal and semantic features. Second, the question rises how these differences can be acquired during L1 acquisition.

2.1 Formal Features

As LIs consist of three different kinds of features, three different sets of features can be distinguished: the set of phonological features, the set of formal features and the set of semantic features. Following standard minimalist assumptions on the architecture of grammar, the set of formal features and the set of semantic features intersect, whereas the set of phonological features does not. This is illustrated in (1).

(1) Phonological features Formal features Semantic features



In the figure, the relations between the sets are illustrated. As the sets of formal and semantic features intersect, it follows that only some formal features carry semantic content. Therefore formal features have a value ±interpretable: interpretable formal features can be interpreted at LF, the interface between grammar and the (semantic) Conceptual-Intentional system; uninterpretable features do not carry any semantic content and should therefore be deleted in the derivation before reaching LF in order not to violate the Principle of Full Interpretation (Chomsky 1995). Uninterpretable features ([uF]'s) can be deleted by means of establishing a checking relation with a corresponding interpretable feature [iF]. A good example of a formal feature is the person feature (a so-called φ-feature). It is interpretable on pronouns, but uninterpretable on verbs. This is the reason why finite verbs enter a relation with a subject, so that the uninterpretable person feature on the verb is checked against the interpretable feature on the subject and is deleted. A proper example of a semantic feature is genus (as opposed to gender), which

does not trigger any syntactic operation. No feature has to be deleted, as genus can always be interpreted. The difference between formal features and semantic features thus reduces to their ability to participate in syntactic operations.
Now the following question arises: how can one know whether a particular feature is an interpretable formal feature [iF] or a semantic feature [F]? The final observation enables us to distinguish the two. From a semantic perspective the two are undistinguishable, as they have identical semantic content:

(2) $||X_{[iF]}|| = ||X_{[F]}||$

However, if one detects the presence of an uninterpretable formal feature [uF] in a sentence, there must be present an element carrying an interpretable formal feature [iF]. Hence an element Y carries an interpretable feature [iF] if (in the same local domain) an element carries an uninterpretable feature [uF] without yielding ungrammaticality (with Y being the only possible candidate to delete [uF]). In those cases Y must carry [iF] instead of [F], otherwise feature checking cannot have taken place. This question is of course not only relevant for the curious linguist, but plays also a major role in first language acquisition, as the language learner needs to find out of which features a particular LI consists of.

2.2 Uninterpretable Features and Doubling Effects

So, the question how to determine whether an LI carries a formal feature [iF] or a semantic feature [F] reduces to the question how to determine whether an LI carries a feature [uF]. If in a grammatical sentence an LI X carries a feature [uF] there must be an LI Y carrying [iF]. Hence, the question arises how uninterpretable features can be detected. This question is much easier to address: LIs carrying [uF]'s exhibit (at least) two properties that can easily be recognised (which already have been mentioned above) and are repeated in (3).

(3) a. A feature [uF] is semantically vacuous.
b. A feature [uF] triggers syntactic operations Move and Agree in order to be deleted.

So, at first sight three properties form a test to recognise a feature [uF]: its semantic uninterpretability, the triggering of an operation Move and the triggering of an operation Agree. Below I argue that all of these three properties reduce to one single property: doubling.

First, although a feature [uF] is meaningless, it must establish a syntactic relationship with an element that carries [iF] and that therefore must have semantic content. This is illustrated in the following example with the person feature [i/u2SG]:

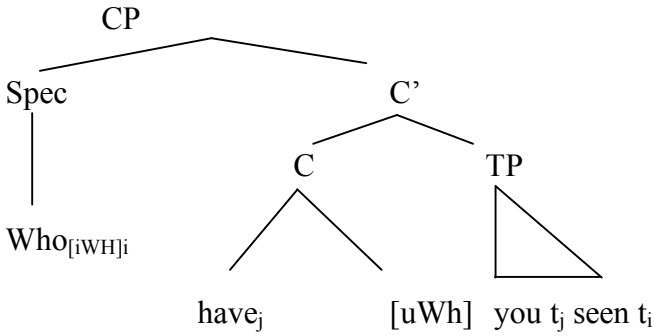
(4) a. Du komm-st German
You come.2SG
b. $[_{TP}\ Du_{[i2SG]}\ kommst_{[u2SG]}\ ]$

In (4) it is shown that the information that the subject is a 2nd person singular pronoun is encoded twice in the morphosyntax: first by the choice of the subject *Du*, second by the person marker *–st* on the verbal stem.

The example in (4) is already an example of the syntactic operation Agree as at some point in the derivation the verb's [u2SG] feature is checked against a corresponding [i2SG] feature. Without an Agree relation between *Du* and *kommst*, the sentence would be ungrammatical; if *kommst* did not have any uninterpretable person features at all, there could not have been triggered an Agree relation in the first place. Hence, if an Agree is a result of a doubling effect. [1]

Now, let us have a look at the operation Move. Checking requirements of uninterpretable features always trigger movement. It follows immediately that Move should follow from doubling properties, since Move is a superfunction of Agree (Move = Agree + Pied-piping + Merge). I illustrate this with an example taken from Robert & Roussou (2003). It has been argued that *Wh* fronting is triggered by an uninterpretable Wh feature [uWH] on C. By moving the Wh word, which carries an [iWH] feature, to Spec,CP, C's [uWH] feature can be checked against this [iWH]. This is illustrated in (5).

(5)



In (5) the question feature is present three times in total in the structure: as [iWH] on the Wh word, as [uWH] on C and as a deleted [iWH] on the trace. Given that the *Wh* term had to be fronted, it can be determined that C must contain an uninterpretable feature [uWH]. In other words, Move unfolds the presence of an uninterpretable feature [uWH] although this feature has not been spelled-out. Hence Move too results from a double manifestation of the Wh feature in the sentence. Note that the presence of the [uWH] feature is visible as a consequence of the fact that movement of the *Wh* term is required. Hence, all visible properties of [uF]'s result from detectable doubling properties. Moreover, as we saw, it also works the other way round. Doubling is defined as an instance of multiple manifestations of a single semantic operator. As only one element may be the realisation of this semantic operation ([iF]) al other manifestations must carry [uF]. Thus, whenever there is doubling with respect to F, there is a [uF] present, and whenever a [uF] feature is present in a syntactic structure, there is doubling with respect to F.

[1] Such a relation is not restricted to two elements (one [iF], one [uF]), also multiple [uF]'s can establish a relation with a single [iF]. Ura (1996) and Hiraiwa (2005) refer to this phenomenon as *multiple Agree*.

Now we can reformulate the answer to the question asked above. How can an [iF] be distinguished from [F]? The answer is that whenever there is doubling with respect to F, there are (only) formal features ([iF]/[uF]). Following this line of reasoning, if there is no doubling with respect to F, there is no reason to assume that F is a formal feature. In those cases, every instance of F always corresponds to a semantic feature [F]. As mentioned before, the possibility to distinguish between formal and semantic features is crucial for L1 acquisition, as every L1 learner needs to find out of which features a particular LI consists. On the basis of the things said above, I put forward the following hypothesis:

(6) *Flexible Formal Feature Hypothesis (FFFH)*
   a. Every feature [F] is first analysed as a semantic feature ([F]).
   b. Only if there are doubling effects with respect to F in the language input, [F] has to be reanalysed as a formal feature [i/uF].

This hypothesis, if correct, has consequences for the architecture of grammar. It rejects the idea that the set of formal features is fixed by UG, and states that every semantic operator[2] in principle can be part of the syntactic vocabulary (i.e. the set of formal features) or remains within the realm of semantics. In this sense this hypothesis treats the formation of the set of formal features on a par with grammaticalisation. Before continuing the proposal and its consequences in abstract terms, I first provide a case-study which proves that this hypothesis makes in fact correct predictions.

3 Case study: Negation and Negative Concord

The case study to test the FFFH presented above concerns negation. Doubling with respect to negation is clearly detectable, since two semantic negations always cancel out each other. If two negative elements do not cancel out each other, but yield one semantic negation, at least one of the two negative elements must be uninterpretable. This phenomenon is well described and known as Negative Concord (NC).

One can distinguish three different types of languages with respect to multiple negation: (i) Double Negation (DN) languages, in which two negative elements always cancel out each other; (ii) Strict NC languages, in which every clause-internal negative element (both negative markers and n-words[3]) yields only one semantic negation; and (iii) Non-strict NC languages, where either a preverbal n-word or a preverbal negative marker establishes an NC relation with a preverbal n-word. However, a negative marker in this type of languages may not follow preverbal n-words. An example of a DN language is Dutch, an example of a Strict NC language is Czech and an example of a Non-strict NC language is Italian, as is illustrated in (7)-(9) below.

[2] For a discussion about what exactly constitutes the class of semantic operators the reader is referred to von Fintel (1995), Keenan & Stabler (2003) and Roberts & Roussou (2003: ch. 5).

[3] The term *n-word* is due to Laka (1990) and defined in Giannakidou (2002) as elements that seem to exhibit semantically negative behaviour in some contexts, but semantically non-negative behaviour in other contexts.

(7) a. Jan ziet *niemand* — Dutch
Jan sees n-body
'Jan doesn't see anybody'
b. *Niemand* zegt *niets*
N-body says n-thing
'Nobody says nothing'

(8) a. Milan *(*ne*-)vidi *nikoho* — Czech
Milan NEG.saw n-body
'Milan didn't see anybody'

b. Dnes *(*ne*-)volá *nikdo*
Today NEG.calls n-body
'Today nobody calls'
c. Dnes *nikdo* *(*ne*-)volá
Today n-body NEG.calls
'Today nobody calls'

(9) a. Gianni *(*non*) ha telefonato a *nessuno* — Italian
Gianni NEG has called to n-body
'Gianni didn't call anybody'
b. Ieri *(*non*) ha telefonato *nessuno*
Yesterday NEG has called n-body
'Yesterday nobody called'
c. Ieri *nessuno* (**non*) ha telefonato (a *nessuno*)
Yesterday n-body NEG has called to n-body
'Yesterday nobody called (anybody)'

In Dutch, two negations cancel each other out, and thus every negative sentence contains only one negative element. This is either the negative marker *niet* or a negative quantifier, as illustrated below. Note that the locus of the negative operator at LF does not coincide with its relative position at surface structure, but this is due to quantifier raising (independent from negation) in (10) or V2 in (12). Hence there are no doubling effects with respect to negation. As a result from the FFFH it follows that negation in Dutch is not formalised (or grammaticalised): the only negative feature [NEG] in Dutch is a semantic feature.

(10) Jan doet *niets* — ¬∃x.[**thing'**(x) & **do'**(**j**, x)]
[NEG]
Jan does n-thing

(11) *Niemand* komt — ¬∃x.[**person'**(x) & **come'**(x)]
[NEG]
N-body comes

(12) Jan loopt *niet* — ¬**walk'**(**j**)
[NEG]
Jan walks NEG

Things are different, however, in NC languages. Let us start by discussing the Non-strict NC language Italian. In Italian postverbal n-words obligatorily need to be accompanied by the negative marker *non* or a preverbal n-word. This means that a large part of negative sentences in the L1 input consists of sentences such as (13).

(13) Gianni *non* ha visto *nessuno* ¬∃x.[**person'**(x) & **see'**(**g**, x)][4]
[iNEG] [uNEG]
Gianni NEG has seen n-body

Since (13) contains more than one negative element, but only one negation in its semantics, only one of the negative elements can be semantically negative and the other one must be semantically non-negative. The latter element must therefore carry an uninterpretable formal negative feature [uNEG], and negation being formalised in this language the negative operator carries [iNEG] and not [NEG]. Negation must take scope from the position occupied by *non*. *Non* thus carries [iNEG] and *nessuno* carries [uNEG]. This distribution cannot be reversed, since otherwise a sentence such as (14) is expected to be grammatical, contra fact.

(14) *Gianni ha visto *nessuno*
Gianni has seen n-body
'Gianni hasn't seen anybody'

Non's [iNEG] feature also enables it to express sentential negation. This is shown in (15) where *non* functions as the negative operator.

(15) *Non* ha telefonato Gianni ¬**call'**(**g**)
[iNEG]

The fact that *non* is the carrier of [iNEG] and n-words carry [uNEG] seems to be problematic in one respect, namely that Italian also allows sentences such as (16). Here *non* is absent (and must not even be included). Hence all overt negative elements carry [uNEG].

(16) *Nessuno* ha telefonato a *nessuno* ¬∃x∃y[**person'**(x) & **person'**(y)
[uNEG] [uNEG] & **call'**(x, y)]

However, given the grammaticality and the semantics of the sentence, one element must have [iNEG]. Basically, there are two ways out. Either one analyses n-words as being lexically ambiguous between negative quantifiers and non-negative indefinites (cf. Herburger (2001)), but this would render (14) grammatical. The other way out is to assume that negation is induced by a (phonologically) abstract negative operator ($Op_{\neg}$), whose presence is marked by the overt n-words. Then (16) would be analysed as follows:

(17) $Op_{\neg}$ *nessuno* ha telefonato a *nessuno*
[iNEG] [uNEG] [uNEG]

This analysis is supported by the fact that if the subject n-word is focussed and the negative marker *non* is included, the sentences achieves a DN reading. Hence, apart from the presence of *non*, a second negative operator must be at work.

[4] For reasons of clarity tense is neglected in all these readings

(18) *Op¬* *NESSUNO* non ha telefonato a *nessuno*
[iNEG] [uNEG] [iNEG] [uNEG]

Hence, given the fact that in Italian not every instance of negation is semantically negative, negation is formalised and every negative element carries a formal negative feature: n-words carry [uNEG] and the negative marker *non* and *Op¬* carry [iNEG].

In Czech, the application of the FFFH leads to slightly different results. First, since Czech is an NC language, negation must be formalised and n-words are attributed a feature [uNEG]. However the (default) assumption that the negative marker carries [iNEG] cannot be drawn on this basis yet. The negative operator could also be left abstract. Hence, for the moment the value of the formal feature of the negative marker in (19) is left open.

(19) Milan *ne*-vidi *nikoho* ¬∃x.[**person**'(x) & **see'**(**m**, x)]
[?NEG] [uNEG]

In Italian we saw that *non* must be the negative operator, since negation takes scope from the position that it occupies. Consequently, no n-word is allowed to surface left from this marker (with the exception of constructions like (16)). However, in Czech n-words are allowed to occur both to the left and to the right of the negative marker. This means that negation cannot take scope from the surface position of *ne*. The only way to analyse *ne* then, is as a negative marker that carries [uNEG] and which establishes a feature checking relation (along with the n-words) with a higher abstract negative operator:

(20) *Op¬* *Nikdo* *ne*volá ¬∃x.[**person'**(x) & **call'**(x)]
[iNEG] [uNEG] [uNEG]

As a final consequence, single occurrences of *ne*, cannot be taken to be realisations of the negative operator, but markings of such an operator. In (20) the negative marker indicates the presence of *Op¬*, which on its turn is responsible for the negative semantics of the sentence.

(21) Milan *Op¬* *ne*-volá ¬**call'**(**m**)
[iNEG][uNEG]

Hence, in Czech even the negative marker is semantically non-negative. Czech and Italian thus differ with respect to the formalisation of negation to the extent that the negative marker in Italian carries [iNEG], whereas the negative marker in Czech carries [uNEG]. Note that this corresponds to the phonological status of the two markers: in Czech the negative marker exhibits prefixal behaviour, thus suggesting that it should be treated on a par with tense/agreement morphology. Italian *non* is a (phono-logically stronger) particle, that can be semantically active by itself.

The application of the FFFH calls for an analysis of NC as a form of syntactic agreement. Such an approach has been initiated by Ladusaw (1992) and adopted by Brown (1996) and Zeijlstra (2004). It should be noted however that these are not the only accounts for NC. Other accounts treat NC as a form of polyadic quantification (Zanutttini (1991), Haegeman & Zanuttini (1996), De Swart & Sag (2002)) or treat n-words as

Negative Polarity Items (cf. Laka (1990), Giannakidou (1997, 2000)). Space limits prevent me from doing justices to these theories by evaluating them and argue why they do not solve several off the problems that can be solved under the syntactic agreement approach. The reader is referred to Zeijlstra (2004) for an evaluation of different theories of NC.

4 Consequences

Now let us look at the relation between the formal status of negative features and the syntactic status of negative markers. Negative markers come about in different forms. In some languages (Turkish) the negative marker is part of the verbal inflectional morphology; in other examples the negative marker is a bit stronger. Italian *non* is a strong particle, and the Czech particle *ne* is weak. German *nicht* on the other hand is even too strong to be a particle and is standardly analysed as an adverb. Examples are in (22)-(24).[5]

(22) John elmalari ser-*me*-di[6] — Turkish
John apples like.NEG.PAST.3SG — (affixal)
'John doesn't like apples'

(23) a. Milan *ne*-volá — Czech
Milan NEG.calls — (weak particle)
'Milan doesn't call'

b. Gianni *non* ha telefonato — Italian
Gianni NEG has called — (strong particle)
'Gianni didn't call'

(24) Hans kommt *nicht* — German
Hans comes NEG — (adverbial)
'Hans doesn't come'

I adopt the standard analysis that negative affixes and weak and strong negative particles should be assigned syntactic head (X°) status, whereas negative adverbials are specifiers/adjuncts, thus exhibiting XP status (cf. Zanuttini (1997a,b), Rowlett 1998, Merchant 2001, Zeijlstra 2004).

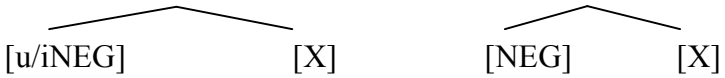
The difference between X° and XP markers has influence on functional structure. X° negative markers must (by definition) be able to project themselves, yielding a clausal position Neg°. On the other hand, XP negative markers may occupy the specifier position of a projection that is projected by a (possibly abstract) negative head Neg°, Spec,NegP (as is the standard analysis for most adverbial negative markers), but this is not necessarily the case. It could also be an adverbial negative marker that occupies an adjunct/specifier position of another projection, for instance a *v*P adjunct position. In that

[5] It is not excluded that languages have more than one negative marker. Standard French for instance exhibits both a negative head particle/clitic *ne* and an adverb *pas*.
[6] Example from Ouhalla (1991), also cited in Zanuttini (2001)

case it is not necessary that there is a special functional projection NegP present in the clausal structure (it is not excluded either).

Now the question follows: when is a negative feature able to project? Giorgi & Pianesi (1997) have addressed this question in terms of their feature scattering principle, arguing that 'each feature can project a head.' However, given the modular view on grammar in which features are divided in different classes, the question emerges which kind of features can head a projection. One would not argue that every lexical semantic feature or every phonological feature might have its own projection. Feature projection is a syntactic operation, and should thus only apply to material that is visible to syntax. Hence, the most straightforward hypothesis is that only formal features can project. This means that a feature can only head a projection if [F] has been reanalysed as a formal feature [i/uF]. Consequently, it follows immediately that the availability of a negative projection NegP in a particular language then depends on the question whether negation has been reanalysed as a formal feature [i/uNEG] in this language. This makes the following prediction: only languages that exhibit doubling effects with respect to negation (i.e. only in NC languages) NegP may be available. This claim can easily be tested as it has been argued above, that X° negative markers occupy a Neg° position, whereas adverbial negative markers do not have to occupy a Spec,NegP position. The prediction following from this is that only in the set of NC languages one can find negative markers X° (see (25)).

(25) a. NC: [u/iNEG]/[X] b. Non-NC: [X]



In Zeijlstra (2004) this prediction has been tested for a threefold empirical domain (a sample of 267 Dutch dialectal varieties, a sample of 25 historical texts, and a set of 25 other languages from different families) and been proven correct.[7] This provides empirical evidence for the FFFH.

5 Conclusions

In this paper I first I argued on theoretical ground that the set of formal features, i.e. the set of features that can head a functional projection, is not provided by UG, but is a result of L1 acquisition. Only those semantic features that exhibit (overt) doubling effects are formalised (or grammaticalised). This has been formulated in the FFFH. Consequently, as only formal features can project, the number of functional projections FP that a particular grammar has at its disposal is limited by the FFFH. Each grammar, based on the language input during L1 acquisition, makes a particular choice of semantic operators that can be

[7] Two kinds of exceptions have been found. First, Standard English, being a non-NC language allows for the negative marker *n't* ,which behaves like a negative head. Possibly this is related to the fact English is on its way of transforming itself into an NC language (cf. Zeijlstra (2004)). Alternatively, English negation can be said to exhibits doubling effects, as it may trigger movement (negative inversion). Second, a number of Southeast Asian languages lack n-words. In those languages however, it can be shown that negative markers trigger Move, thus exhibiting a doubling effect as well.

realised as FP's. Thus clausal structure is subject to cross-linguistic variation and not a UG-based template.

In the second part of this paper I applied the FFFH to the domain of negation. Negation is a semantic operator that differs cross-linguistically in the way it surfaces in morphosyntax. Languages differ with respect to whether they exhibit doubling effects (known as NC) and thus the result of this application is that only in NC languages, negation is formalised. In DN languages negation is not realised as a formal feature. The claims about the flexible formal status of negation are empirically testable. Not only requires it an analysis of NC in terms of syntactic agreement (cf. Zeijlstra (2004) who shows that such an analysis solves many problems that other analyses have been facing). It also makes correct predictions about the syntactic status of negative markers: it is shown that only NC languages may exhibit a negative marker Neg°.

Of course, the FFFH is still programmatic in nature. It seems to make correct predictions for negation, but it should be evaluated for a number of other functional categories in order to determine its full strength. However, I think that the evidence provided in this paper sheds more light on exactly how semantics dictates the syntactic vocabulary.

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