Some consequences of Categorial Deficiency for the Theory of Grammar

ABSTRACT: This paper capitalises on Categorial Deficiency, the idea that functional elements are specified for uninterpretable categorial features, to derive a number of little-studied characteristics of phrase structure. Hence, it reduces the inability of functional heads to appear without a complement and the non-occurrence of lexical heads in the middle of a projection (unless there is a second lexical head at the bottom thereof) to the feature-checking requirement of such uninterpretable categorial features. Furthermore, it proposes that the most common type of Head Movement can be construed as a subcase of the Agree relation holding between interpretable categorial features of lexical heads and the uninterpretable ones of functional heads, while the consequences of the above for the theory of Agree are examined. Finally, it employs Categorial Deficiency in order to propose an endocentric, Bare Phrase Structure compatible analysis of mixed projections, where nominal and verbal projections co-exist, as the result of a 'switch' head mediating between the verbal and the nominal part.

1   Introduction

This paper will venture into explaining a number of seemingly unrelated properties of Universal Grammar, with the emphasis on phrase structure. In order to achieve this, it will employ and extend a single theoretical concept, that of *Categorial Deficiency* of functional elements (Panagiotidis, 2004). Hence, the purpose of the discussion here is for the answers provided to stem from the said principle without any stipulated mechanisms or further assumptions about the nature of syntax or about the requirements of LF, especially since comparatively little is known about the latter.

Discussion will proceed by addressing the following questions:

(1) Under exactly which circumstances can lexical categories appear sandwiched between functional heads in their projection line? Why are such 'sandwiches' generally banned? (i.e. what is wrong with a sequence like *C…*V*…T…Asp?)

(2) What is the LF trigger of Head Movement?

(3) How can the behaviour of mixed categories (like gerunds) be accounted for in Bare Phrase Structure terms?

Before examining the following, we need to look into background assumptions, what Categorial Deficiency is and how it is motivated.

2　The category of functional categories

2.1　Functional heads and their complements

In a passage often cited or alluded to, Abney (1987: 64-5) lists some criteria to distinguish lexical from functional elements. One of them is that the latter are usually inseparable from their complements. This observation, when seen in unison with one in Abney (1987: 285), motivates Categorial Deficiency. More precisely, Abney claims that Determiners are special as they arguably

> … differ from other functional elements [as] determiners sometimes appear without a complement […] [T]he appearance of functional elements as "intransitives," in a pronominal usage, constitutes a systematic exception to the otherwise general requirement that they take an obligatory complement.

So, a functional element is inseparable from its complement, in fact it can never stand without a complement – unless this element is a Determiner in a pronominal usage. Using primarily empirical arguments, Panagiotidis (2002) – like Felix (1990) and Corver & Delfitto (1999) before him – attacks an analysis of pronouns as intransitive Determiner heads, i.e. Determiners without nominal complements. This ultimately results in Abney's observations obtaining an exceptionless character, qualifying as a candidate for (an upshot of) a Universal Grammar principle:

(4) A functional element can never stand without a complement.

Panagiotidis (2002; 2004) attempts to capture (4) by limiting the problem of complement-less functional heads to a checking requirement of theirs. Accordingly, it is in principle possible for the computational system to pick *two* functional heads from the numeration and merge them, in the absence of any lexical material; nevertheless, this derivation would crash because of unchecked features on them.

These unchecked features are no other than *unintepretable categorial features* of functional heads. In other words, Panagiotidis (2002; 2004) argues that there exist no categorial features for functional categories such as [T] (for Tense), [C] (for Complementiser) or Chomsky's (1995) [D] (for Determiner) and that these, like all functional categories, bear unintepretable categorial features.

Before examining the nitty-gritty of this proposal in detail, we need to backtrack a bit and briefly review the literature on the categorial specification of functional elements.

2.2   (Functional) features for grammatical category

There are four possible lines of inquiry into the grammatical category of functional elements like Tense, Complementiser, Determiner and the like:

I. There is one distinctive categorial feature for each (functional) category. Tense is marked for / by a categorial [T] feature, Complementiser for / by a [C] one, Determiner for / by a [D] one, and so on. In this point of view, categorial features are (tacitly) perceived as purely taxonomical and are as many as the categories themselves.

II. There are no categorial features for functional elements (Anna Roussou, p.c.). So, for instance, when LF encounters interpretable referential features on a feature bundle, this bundle is a Determiner. Although this is a conceptually attractive thesis, it would require considerable scrutinising into the actual mechanisms enabling identification of different categories, as well as spelling out its consequences.

III. Lexical heads are category-neutral roots (Marantz 1997; 2000; Alexiadou 2001; Borer 2003; 2004): the whole projection is categorially defined by the functional structure it contains. So, if a lexical root, say √*dog*, is selected by a functional superstructure containing a Determiner, the root will be interpreted as a noun; if, on the other hand, it is selected by a functional superstructure containing a Tense head, the root will be interpreted as a verb. This way of analysing category has yielded a number of interesting results.

IV. Finally, and as will be argued here, a lexical head categorially defines its functional superstructure: nouns force Determiners in their projection line, verbs force Tense heads, and so on. The category of a functional element depends, in a fashion to be clarified, on a lexical one.

I believe there are good reasons to embark upon a programme aiming to unify the last two approaches, III and IV, on the basis of the latter. This would require a deeper level of analysis, which goes beyond the goals of this paper. Hence, the last approach (IV) will be followed here, with the reasons for this decision summarised below.

A first reason is that there is a lot of variation in the functional domain cross-linguistically, maybe this is the only domain of cross-linguistic syntactic variation (Borer 1984; Wexler & Manzini 1987; Ouhalla 1991; Chomsky 1995 – and elsewhere). Languages seem to differ

from each other in the membership of the subset of features available to them by UG and in the number of functional heads (i.e. bundles of features) in which they express this subset, see Thráinsson (1996), Bobaljik & Thráinsson (1998) and Harley & Ritter (2002), among others. At the same time, as Baker (2003) has shown, *all* languages seem to possess the following lexical categories and only these: nouns, verbs and adjectives (although the results are less conclusive for the latter). If functional structure, the locus of variation, categorially defined the whole projection, including lexical verbs and nouns, we would expect more types of lexical categories, as well as some of them lacking in some languages. Nevertheless, lexical categories exhibit considerable consistency across grammatical systems, unlike functional ones. This most probably suggests that it is lexical elements that should be given a privileged categorial status.

The idea implicit in some versions of the thesis that functional structure categorially defines the whole projection is that this is done as follows: a given sequence of functional heads *in unison* defines the lexical root it dominates. For instance, D…Num…*n* makes the root a noun (and the whole projection a nominal one), whereas C…T…Asp…*v* makes the root a verb (and the whole projection a verbal one). This is not elegant, not least because, unless one subscribes to a Cinque-style (1999) view of syntax, not all functional heads have to be there. Marantz (2000) on the one hand and Alexiadou (2001) and Borer (2004) on the other have addressed this problem by taking either the *lowest* or the *highest* functional head in a projection to define its category, respectively. The former is systematically attacked on conceptual grounds by Baker (2003: 267-275), and no more will be added here. As for the latter, we will review a way to dispense with such a requirement in section 5.

Finally, arguing for lexical heads as those that impose their category to functional items, and not vice versa, works satisfactorily with at least two observations about grammar:

The first one is no other than the plausible intuition that lexical categories, rather than functional ones, somehow reflect conceptual categories, cf. Uriagereka (2002) and Baker (2003); see also Langacker (1987), Croft (1991), Givón (1984) for insights departing from different assumptions. This of course must be related to the fact that it is lexical elements that typically denote concepts.

A second observation is what Felix (1990) calls *biuniqueness*: (some) functional categories can appear in the projection line of only one lexical head. Thus, Tns combines with V, and only dubiously with N (cf. Tonhauser 2005, contra Nordlinger & Sadler 2004), Det does not combine with inflected verbs, Num cannot feature in a verbal projection line. This is the

motivation behind Grimshaw's (1991) Extended Projection and van Riemsdijk's (1998) M-Projection.

2.3   Previous accounts

The point of view adopted here, namely that the category of functional elements depends on that of a lexical one, has been especially fruitful. Van Riemsdijk's (1990) *Categorial Identity Thesis*, Ouhalla (1991) and Grimshaw (1991) all converge a hypothesis presented as (5) below:

(5) Functional categories bear the categorial specification of the *lexical* head in their projection line.

Hence, if verbs bear a [V] feature, Asp and Tns will all also bear a [V] feature; Num and D must bear an [N] feature, just like nouns – and so on. Some form of feature matching guarantees that D (an [N] category) will never select V, T (a [V] category) will never select N, and so on. Thus, biuniqueness can be captured without extra assumptions or the need to appeal to little-understood LF restrictions. More interestingly, perhaps, a consequence of (5) is that, no matter how many functional categories are hypothesised, motivated and discovered, no proliferation of the number of parts of speech is necessary. In other words, categorial features for functional categories, such as [T], [C] or [D] are unnecessary and done away with.

Still, this approach is not without problems. One that is of special concern here is how we distinguish functional from lexical categories, if categorial features of the latter, say [N] and [V] are the only ones that exist. More practically, our problem is that we do not, for instance, want to say that Tns^0 or Asp^0 are verbs by virtue of their [V] feature, despite the fact that (5) could lead us to think so. A way forward is to argue, as is a common background assumption, that functional heads bear no descriptive, concept-denoting features (therefore / or they cannot assign θ-roles). Exactly this could distinguish between, say, two bundles of features containing [V]: the one bearing concept-denoting features, such as RUN or EAT, will be the verb, the other one a verbal functional head. This is an idea that has been around for some time and is, again, presented in Abney (1987: 64-65). Still, this cannot be the characteristic distinguishing lexical from functional items, as more recent research has suggested. More specifically, *semi-lexical* heads appear to exist: lexical nouns, like *one*, and lexical verbs, like the first member of serial verbs (Hagemeijer 2001), which are virtually devoid of concept-denoting features: Emonds (1985), van Riemsdijk (1998), the contributions in Corver & van Riemsdijk (2001), Panagiotidis (2003). In other words, the existence of members of lexical

categories that do not denote concepts, semi-lexical heads, refutes the possibility that lexical and functional differ between them (only) by virtue of their encoding concept-denoting features or not.

An additional issue that arises with (5) is how LF interprets the categorial features on each head, now that each head (=bundle of features) in a projection has one. It is doubtful that they are all needed at LF. To clarify, consider the following schematic projection line,[1] consisting of three functional heads and a lexical one:

    (6) C…Tns…Asp…V

According to (5) above, (6) would contain *four* [V] features. As mentioned before, it is not clear how all these are interpreted at LF. At the same time, and according to Full Interpretation and Inclusiveness (Chomsky 1995), they cannot just be *taxonomic-classificatory* features that give heads and projections an identity and then somehow disappear. Note that, again in an implicit way, this is how categorial features are perceived, an assumption orthogonal to a (minimalist) perception of features as *interface*-interpretable atoms / instructions of some sort (see also Baker 2003: Ch. 1).

2.4 Categorial Deficiency

On our way to addressing the open issues above, we need first to backtrack a bit and decide what categorial features are. From Baker (2003), let us adopt the following two proposals, the one in (7) axiomatically, while that in (8) as a working hypothesis, which will facilitate discussion of matters in what follows.[2]

    (7) *Categorial features are LF-interpretable.*

    (8) There are *two* categorial features: [V] (predication) and [N] (sortality). Adjectives are unmarked for categorial features.

The above have the following consequences. First, according to (7), categorial features are not peculiar, taxonomic-classificatory features, but interface interpretable – LF-interpretable, more specifically – grammatical features, of the better-known kind. Having said that, we are

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[1] Informal definition of projection line, for descriptive purposes and with no claims of theoretical significance:

    (i) X^0 and Y^0 are in the same projection line iff X^0 c-commands the projection containing (a copy of) Y^0.

The term 'projection line' will be used as a substitute for Grimshaw's (1991 / 2001) 'Extended Projection' and Riemsdijk's (1998) M-Projection, as these are not adopted here.

[2] Alternatives such as [V] encoding 'event' and eventuality, as in Schütze (2001: 157) and his discussion of Rothstein (1999), or the possibility that no 'deep' distinction can be made between adjectives and nouns (Richard Larson, p.c.) are more than just worth investigating.

still left with *four* [V] features in (6). Taking (8) to be correct, this means that predication is redundantly marked four times in the projection sketched in (6). This leaves us with three [V] features too many, as only the [V] of V genuinely expresses predication.

This is why, at this point, we invoke Panagiotidis' (2004) notion of Categorial Deficiency:

> (9) **Categorial Deficiency**: functional elements bear the uninterpretable version of the categorial feature of the lexical head at the bottom of their projection line.

Let us look at the consequences of (9) with respect to the proliferation of identical categorial features in (6) above. If verbs bear a [V] feature, Asp, Tns etc. will all also bear a verbal categorial feature, albeit an *uninterpretable* one, [uV]. Identical facts hold for the nominal functional heads Num and D: they must also bear an uninterpretable [uN] feature. Hence, not *all* categorial features are interpretable. More precisely, those on functional heads are not. Consequently, LF reads only one (set) of categorial features per projection line.[3]

2.5 Repercussions of Categorial Deficiency at a conceptual level

A first consequence of Categorial Deficiency is that *Extended Projections* can now be derived without features dedicated to signalling 'lexical' from 'functional'. Clarifying this first issue, recall that according to Grimshaw (1991), an Extended Projection is informally the set of projections of a lexical category plus its con-categorial functional projections (e.g., DP is an Extended Projection of N and TP of V). Addressing the problem of how to distinguish between lexical and functional heads within an Extended Projection, if they all bear the same categorial specification, Grimshaw argues for a feature *F* with values from 0 to n. F_0 on a head signifies 'lexical', whereas F_n signifies 'functional'. If, by definition, functional elements bear uninteptretable categorial features, then F is not necessary and can be done away with. Actually, it is quite possible that the notion of 'Extended Projection' itself can be wholly derived from Categorial Deficiency, without extra assumptions. Some pointers towards this appear in the rest of this paper.

Furthermore, the lexical-functional distinction – an important one in the psycholinguistic and neurolinguistic literature, given that, for instance, in Specific Language Impairment and agrammatism functional elements can be selectively impaired, with lexical ones being spared (Friedmann & Grodzinsky 1997; Tsimpli & Stavrakaki, 1999; Platzack 2001; Borer & Rohrbacher 2002 – among many others) – is now capturable in grammar-internal terms,

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[3] Essentially, (9) is in the spirit of Chomsky (1995), but it takes his discussion of categorial feature strength as driving movement and categorial "affixal features" (1995: 269) on functional heads further afield.

without reference to concepts. This is readily achieved using Categorial Deficiency, by which the lexical-functional divide boils down to the two classes being categorially apart. This particular way of drawing the line between the lexical and the functional becomes even more attractive in the light of acquisition studies. Well-known acquisition facts such as that functional categories are acquired later in L1 (Radford 1990, Tsimpli 1996) and harder in L2 can now be reduced to the difficulty (or impossibility) to acquire uninterpretable features (Hawkins & Chan 1997; Tsimpli 2003): now the elements bearing uninterpretable *categorial* features, the functional ones, are exactly those that are harder to acquire.

Turning to semi-lexical items, Categorial Deficiency entails that lexical status is the result of the presence of an interpretable categorial feature in a bundle of features and that it is dissociated from the presence of concept-denoting features therein. This accommodates semi-lexical items in the cross-categorisation presented in the following table, where [X] notates a categorial feature or a set thereof and [FF] concept-denoting features:

(10)   Cross-categorisation of categorial and concept-denoting features

	[X]	**[*u*X]**
[FF]	*LEXICAL* (*run, cat…*)	
∅	*SEMI-LEXICAL* (*one*, *be…*)	*FUNCTIONAL* (Det, Tns, Asp…)

Consequently, there is no need for a special categorial status of semi-lexical elements to be hypothesised: these are underspecified / semantically impoverished nouns, verbs and adjectives (Emonds 1985, Schütze 2001). Another generalisation embodied in (10) is that functional heads do not typically denote concepts – although this is not their defining property. Lexical heads, on the contrary, can (easier) support descriptive content as they can readily characterise it as sortal (nouns) or a predicate / eventuality (verbs), by virtue of their own [V] and [N] features.[4]

Finally, if Categorial Deficiency is valid, then there is room for cross-linguistic variation with respect to how many and which functional categories a grammar contains. If Thráinsson

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[4] What about the empty cell, i.e. the combination of [*u*X] and [FF]? I believe that there are two options: one is that the cell *must* remain empty, because LF cannot characterise the denotation of an [*u*X][FF] element as sortal or predicative – or whatever categorial features signify at LF. Alternatively, the combination is possible but very limited for LF reasons: there are no functional elements meaning *run* or *dog* or what have you. One can freely speculate on the issue, but what is needed is systematic research thereon.

(1996) and Bobaljik & Thráinsson (1998) – among many others – are correct in that UG provides features to be assembled in bundles in particular grammars, then what makes these bundles 'functional categories' is their uninterpretable categorial feature(s) ([*u*X]). Such a model relieves us from the necessity of a difficult to explain 'skeletal' approach to functional categories, where they are rigidly arranged in a universal and typically populous schema, as in Borer (2004) and, especially, Cinque (1999).

It is easy to see that each of the points touched upon above merit more consideration and elaborating on. Before moving on to present some *empirical* results of Categorial Deficiency, the rest of this section will briefly present how this principle can capture the inexistence of projection lines ending in a complement-less functional head, as already discussed in Panagiotidis (2002), exemplifying on determiners, as he does.

So, let *d* be a functional head of the category Det without a complement. According to (9), *d* contains a [*u*N] feature, like all determiners do. Whichever position *d* is merged in (argument, adjunct, hanging topic), no local checker for the [*u*N] feature of *d* is available, as it has no complement. The situation will be identical even if *d* takes a Num complement, as Num is, by definition, also a (nominal) functional head, hence specified for a [*u*N] feature. In both cases the derivation crashes. Generalising, no functional head can be without a complement.

3   Why there are no lexical sandwiches.

Let us now turn to matters of a more empirical nature, namely the implications of Categorial Deficiency for phrase structure. The first one, to be looked into in this section in some detail, is the absence of ('extended') projections with their lexical heads *merged* in positions sandwiched by functional material.

3.1   Lexical heads must be projection-final…

To begin with, LF probably interprets configurations (=sets, according to Chomsky 2000; 2005), not linear orders. That much is more or less uncontroversial and corroborated by the following fact: one way or another, lexical heads may appear in the middle or at the top of their own projection line when interpreted. Consider the well-known examples of French V-to-T movement (11) or Germanic V2 (12):

(11) $[_{CP} C [_{TP} [_T V Tns] [_{AspP} Asp V]]]$

(12) $[_{CP} [_C V C] [_{TP} Tns [_{AspP} Asp V]]]$

In other words, LF seems to have no *a priori* difficulties interpreting lexical heads high in their own projection line. Here is where Question (1) poses itself, of which a version Baker

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(2003:269) has also considered. To put it plainly, why is it the case that we cannot merge a functional projection FP with a lexical head L to form an LP and then merge LP with a higher functional head? In concrete terms, why is something like (13) invariably out?

(13)   *[CP C [VP V [TP Tns Asp]]]

Thus, why can't we merge Tns with Asp, the resulting TP with V and the VP formed with C? Note that this would still give us all the right ingredients of a Complete Functional Complex. Supposing that (13) *somehow* offends LF or the Conceptual-Intentional systems beyond it for reasons of scope, although observe that the nature of such offence is at best unclear, movement of *functional* elements (say, Tns or Asp) could eventually mend them. Nevertheless, this kind of 'mending' movement is either not at all or sparsely (Laka 1990) attested.[5] Leaving then aside LF scope problems and their elusive nature, let us attempt to capture the ungrammaticality of (13) in terms of Categorial Deficiency. First of all, comparing this example with (11), we note one crucial difference between them. Whereas in (11) there is a *copy* of the lexical head V at the bottom of the CP projection to check off all the uninterpretable categorial features, namely those of C, Tns and Asp, this is not what happens in the case of (13). In this latter example, Tns and Asp are merged lower than V. what this entails is that neither the $[u\text{V}]$ feature on Tns nor that on Asp in (13) c-command the $[\text{V}]$ feature of V.[6] They hence remain unchecked and the derivation crashes. The descriptive generalisation follows:

(14)   No functional heads merged below a lexical one in the latter's projection line (i.e. no sandwiches).

3.2   … but this does not preclude a second [X] head

The above generalisation seems to be valid and without any exceptions. Having said that, as Patricia Cabredo (personal communication) noticed, (14) belies the actual situation, which is slightly more intricate (and interesting): excluding lexical heads in non-final positions within a projection does not exclude *two* lexical heads in a projection, one of them – obviously – in a non-final position. So, configurations like the one in (15) are out, but what about something like (16) below? (*F* = 'functional head'; *L* = 'lexical head')

(15)   * F…F…F…L…F
(16)   F…L…F…F…L

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[5] Note, on top of everything, that Laka's Tns raising has nothing got to do with mid-projection lexical heads.

[6] More on the actual checking process in section 4.4.

Unlike the lowest one in (15), all functional heads – and their uninterpretable categorial features [uX] – c-command (at least) one interpretable categorial feature [X] in (16). Categorial Deficiency cannot prevent the existence of a *second* lexical head in mid-projection, once there *is* a lexical head at the bottom of the projection line to check the uninterpretable categorial features in it. Is this desirable? To use concrete examples, are the ruled-in configurations such as the ones below grammatical and attested?

(17)   C… Tns…V_1… Asp…V_2

(18)   D…Num…N_1…Num…N_2

The answer is positive. Actually, (17) looks a lot like the correct representation for genuine cases of *clause union*. This is precisely what Cardinaletti & Giusti (2001: 373) claim regarding monoclausal constructions with a higher motion verb (V_1) in the Sicilian dialect of Marsalese, as in example (19). Hagemeijer (2001: 416) gives a similar analysis of Serial Verbs in São-Tomense, as illustrated in (20).

(19) a. Vaju   a   pigghiu   u   pani   *Marsalese*

          go.1SG   to   fetch. 1SG   the   bread

       b. I'll go fetch the bread.   *English*

(20) Bisu   vwa   subli   *São-Tomense*

      bird   fly   go.up

      'The bird flew upwards'.

The works cited provide detailed argumentation against biclausal analyses for clause union and serial verbs.[7] Turning to (18), it is very close to the phrase marker van Riemsdijk (1998: 11-19) gives for *direct partitive constructions*, such as in the Dutch examples below.

(21) a. drie   liter   melk

              three   litre   milk

       'three litres milk'

          b.   een   kudde olifanten

                a   herd   elephants

       'a herd of elephants'

In each case N_1 (*liter* and *kudde*) is a semi-lexical noun, in the same projection line as N_2 (*melk* and *olifanten*).[8]

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[7] A useful overview of the properties of serial verbs as well as an interesting account can be found in Cormack & Smith (1996).

[8] The above are also compatible with Koizumi's (1995) extended V-V (aka 'Larsonian') shells for ditransitives

We have then shown that Categorial Deficiency can be extended to accommodate the contrast between (15) and (16) without any extra assumptions about its nature or that of phrase structure. Not only are lexical heads banned from being sandwiched by functional material, but also we can capture the possibility of *two* lexical heads in a single projection line, one in the middle, our V_1 and N_1 in (17) and (18), and one at the bottom, our V_2 and N_2 in (17) and (18).[9]

4 Head Movement

4.1 Two types of Head Movement

Below are some examples of (X^0-) Head Movement:

(22)	V to Asp to T	*Romance*	= (11)
(23)	V to Asp to T to C	*Germanic V2 / Arabic*	= (12)
(24)	N to Num to D	*Danish*	
(25)	N to Num to D to P	*Lezgian* (van Riemsdijk 1998)	

Setting *Incorporation* aside, Head Movement seems to otherwise involve lexical heads climbing up the functional heads of their projection lines. For exposition, and exactly in order to distinguish this type of Head Movement from Incorporation, we will call it **Climbing**.

Now, recall from section 3 that Climbing may place a lexical head in the midst of its projection line without offending LF. Apparently, this happens because Climbing of the lexical head can check the uninterpretable categorial features of the functional heads it has 'passed through' (Matushansky 2004; see also Zwart 2001; Julien 2002: 62-4). This leads us to formulate the following hypothesis:

(26) Lexical heads moving up (=climbing) their projection lines check uninterpretable categorial features of the functional heads therein.

Climbing is near universal, manifested in a diverse multitude of languages (Julien 2002): categorial features as its trigger, universal themselves (Baker 2003), seems a correlation worth exploring. Moreover, (26) provides a *major* LF motivation for (the most common type of) head movement.

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[9] At this point at least two questions open up for further investigation: whether more than two lexical heads can appear in a projection line and why V_1 and N_1 are both semi-lexical. At this moment, and in rather programmatic terms, it can be suggested here that too much concept-denoting material is perhaps not tolerated in a single projection line. This could be used as a way towards explaining the appearance of semi-lexical (i.e. non-concept denoting) elements as V_1 and N_1.

4.2 Does Head Movement exist?

Before continuing, giving some background on Head Movement is in order, as its status has been a source of interesting debate during the last decade, for mainly two reasons:

a. As commonly conceived, it violates the Extension Condition (but see Roberts 2003 and Matushansky 2003 for different views on this crucial point), because moved heads do not extend the phrase marker. Consequently, it has been suggested that X^0-movement is in fact the result of a series of applications of remnant movement that lines heads up (Kayne, 2000; Mahajan, 2000), or that it is morphophonological in nature (Chomsky, 2001; Boeckx & Stjepanović, 2001; Harley, 2003).

b. It is very hard for X^0-movement to be motivated along the lines of LF convergence – but see Lechner (2004).[10]

Here I argue that the commonest version of X^0-movement is not only LF-related, but, a fortiori, that it is triggered by a fundamental property of Universal Grammar. As for the exact mechanism of its realisation, I would side with Roberts (2003) and Matushansky (2004) – although the familiar notation will be used here, e.g. in (28) and (30). Nothing hinges on this.
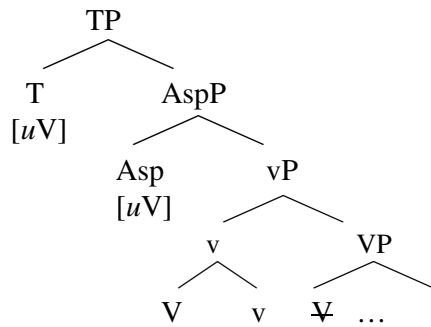
4.3 Climbing and categorial feature checking

Returning to Climbing per se and the hypothesis in (26), the question we must ask now is not if Climbing *can* check uninterpretable categorial features, but whether *the purpose* of Climbing is to check uninterpretable categorial features. To clarify, let us compare the English TP with the French one and the English DP with the Danish one *at Spell Out*, ignoring specifiers here.
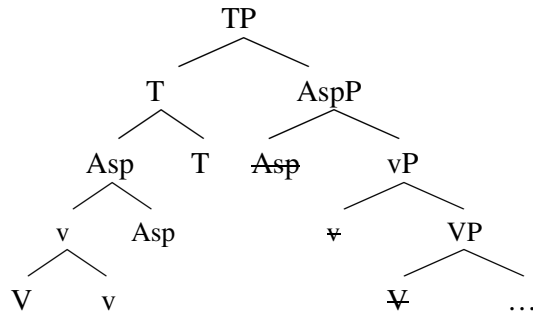
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[10] The crux of the matter here is what counts as LF-motivation. If feature checking is a valid / the only type thereof, then Head Movement is not hard to construe as LF-motivated, as will be shown. If, nevertheless, interpretive effects of a 'deeper' nature are to be sought, then Head Movement is in the same dire position as (the arguably invariably reconstructing) A-movement…
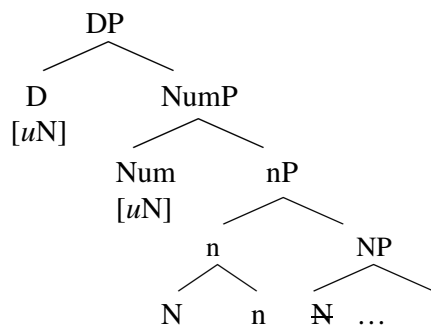
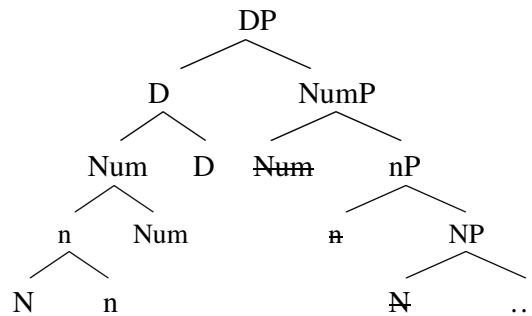(27)   English TP: V climbing up to v – *Nadine often drinks (*often) milk.*

```
            TP
          /    \
        T       AspP
      [uV]     /    \
            Asp      vP
           [uV]     /  \
                  v     VP
                /  \   /  \
               V    v  V̶  …
```

(28)   French TP: V climbing up to T – *Nadine (*souvent) boit souvent du lait.*

```
                    TP
                  /    \
                T       AspP
              /  \     /    \
           Asp    T  A̶s̶p̶    vP
          /  \           /    \
         v    Asp      v̶      VP
        / \                  /  \
       V   v               V̶    …
```

(29)   English DP: N climbing up to n – *The idiots.*

```
            DP
          /    \
        D       NumP
      [uN]     /    \
            Num      nP
           [uN]     /  \
                  n     NP
                /  \   /  \
               N    n  N̶  …
```

(30)   Danish DP: N climbing up to D – *Idiot-er-ne*.

```
                        DP
                   ┌─────┴─────┐
                   D          NumP
              ┌────┴────┐   ┌──┴──┐
             Num    D    N̶u̶m̶    nP
          ┌───┴───┐           ┌──┴──┐
          n      Num          n̶    NP
       ┌──┴──┐                   ┌──┴──┐
       N     n                   N̶     …
```

In (28) and (30) *all* uninterpretable categorial features in the projection line of V and N respectively have been checked already by Spell Out. This has been achieved through Climbing, by hypothesis, as per (26). What about the remaining [uV] features in (27) and the remaining [uN] features in (29)?

We can conceive these features as being eliminated by either categorial *feature movement* or categorial ***Agree***. Let us opt for the second option and complete the picture: categorial Agree is responsible for eliminating uninterpretable categorial features in a projection line. This Agree operation may or may not be accompanied by pied-piping and overt movement of the (lexical) head hosting the checker, the interpretable categorial feature (see Zwart 2001 and Matushansky 2004 for similar proposals). Schematically:

(31)   Climbing = Categorial Agree + Pied-piping

So, using Categorial Deficiency we can conceive Climbing as the overt subpart of a categorial Agree operation, which goes a long way towards motivating this type of Head Movement. At the same time, this explains away neither why pied-piped feature matrices reach only as far as a particular head (say, *v*, Tns or C), nor the exact mechanism of 'head-to-head' adjunction. The reason for this only partial unification is no less the existence of the other type of X^0 movement, Incorporation, whether Baker Incorporation (1988) or Hale-Keyser Incorporation (1993; 2002). This operation clearly has a different motivation, although it is probably served by the same mechanism as Climbing.

4.4   A note on Agree and checking.

It is now necessary to say more about constraints on categorial Agree and Agree in general.[11] Implicitly, it has been here taken for granted that (categorial) Agree can only take place in the following configuration:

(32)   [uX] … [X]

In other words, we constrained Agree so that it can only take place between a *c-commanding* probe ([uX], the uninterpretable feature) and a goal c-commanded by it ([X], the interpretable one). This is a restrictive version of the appropriate configuration for Agree and crucially excludes cases like this:

(33)   * [X] … [uX]

Whether this more constrained view is correct is of course an empirical matter. Nevertheless, should we permit categorial Agree to be established between a probe [uX] and a goal c-commanding it, as in (33), then we would immediately lose the contrast between 'lexical sandwiches' and two lexical heads per projection – as expressed in (14) and illustrated in (15) and (16).

A second argument for (32) being the only valid configuration for Agree has to do with derivational plausibility and the undesirability of look-ahead. Working with a bottom-up merger model, the feature [X] is merged before any probe. Suppose now that the reverse were possible, as in (33). Exemplifying in the verbal domain, cf. (13), suppose we take Asp and Tns from the numeration and merge them. At this stage, the derivation contains two [uV] features and in order for it to converge, it will have to wait for the [V] feature of the verb to be merged later and Agree with them. Setting aside extra complications phases would impose, we can already see that if we do not restrict Agree configurations to (32), we admit an amount of (non-local) look-ahead, with [uX] features 'waiting' for a target to be merged later, so that checking *will* eventually take place.

Categorial Deficiency provides us with a way to tease apart the two options and predict that the more restrictive one is valid.
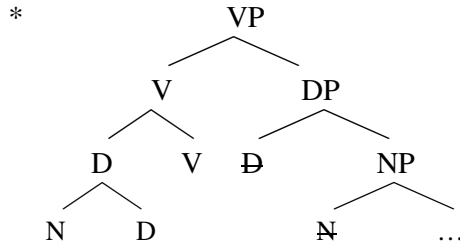
4.5   Li's Generalisation

Li (1990) observed that Head Movement of a lexical head through a functional head to another lexical head is impossible. Hence, syntactic objects like the (simplified for exposition) one below are impossible:

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[11] I am grateful to Andrew Radford for valuable discussion of these constraints.

(34)   Impossible Head Movement

```
    *                    VP
                    ╱          ╲
                 V              DP
               ╱   ╲          ╱    ╲
             D       V      D̶      NP
           ╱   ╲                  ╱    ╲
          N     D               N̶      …
```

The generalisation follows automatically from Categorial Deficiency: prior to the application of Head Movement, (34) would look like this:

(35)   V [V] … D [uN] … N [N]

First, the uninterpretable [uN] feature on D, a functional head, will attract the [N] feature of the N head by (26), triggering Climbing. Nevertheless, there is subsequently *no* attractor on V for the complex head [$_D$ N D]. V marks an interpretable [V] feature (which, moreover, is in mismatch with [N]). Hence, Climbing of [$_D$ N D] to V is impossible.[12]

5   Mixed Projections

If functional heads are of the categorial specification [uX], how do we capture *mixed projections*? This brings us to Question (3). Mixed Projections are a prima facie problem for Categorial Deficiency because (9) forces *consistency* of categorial features in a projection line. At first blush, van Riemsdijk's (1998) analysis founded on his less restrictive Categorial Identity Thesis fares better in this respect, as it allows the merging of heads typed for different categorial features in a single M-Projection.

Research in mixed categories and mixed projections is *huge* and I will not even attempt to give a sample of bibliography. Nevertheless, from Malouf (2000), Borsley & Kornfilt (2000) and Hudson (2003), who have undertaken the task to partly summarise it, *two* recurring themes emerge. I will call them generalisations and present them:

(36) Nominal and verbal properties in a mixed projection are distinct and occupy different 'sides' thereof.

(37) Externally, mixed projections behave as nominal.

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[12] This cannot be the whole story. The above show that [$_D$ N D] cannot climb to V, but why but why can [$_D$ N D] not be *incorporated* into V? (Baker 2003: 268-275). No answer can be provided here, as it is not clear what class of features triggers Incorporation.

Let us clarify the above somehow. Beginning with (36), is has been repeatedly observed that verbal and nominal properties do not manifest themselves mixed up in mixed projections. Let us review how this is manifested in the case of English gerunds and Japanese verbal nouns. In English *gerunds* the higher part of the projection may assign Genitive (a nominal characteristic: the signature of *Det*) whereas the lower one assigns Accusative (a verbal characteristic: the signature of *v*). Nominal properties are both distinct and higher than the verbal ones. In (a class of) Japanese *verbal nouns* (Tsujimura 1992: 477-9; Manning 1993) the higher part of the projection may assign –*ga* Nominative (a verbal characteristic: the signature of *Tns*) whereas the lower one may assign Genitive (a nominal characteristic: the signature of *n*). Verbal properties are both distinct and higher than the nominal ones.

As for (37), I know of no exceptions to this generalisation. Interestingly, Japanese 'verbal noun' projections, although their higher part is verbal and the lower one nominal, also seem to comply with it. *Adverbial* uses of gerundive mixed categories, which are also very common, will be briefly dealt with below.

Now it is time to try to capture these generalisations, beginning with (36). Before proceeding to do so, it is necessary to keep in mind that we need an endocentric account that will be compatible with a Bare Phrase Structure, bottom-up merger model for syntax. Hence we cannot benefit from employing special rewrite rules (Jackendoff 1977), exclusively to be used in the case of mixed projections. Nor can we benefit from proposals taking the gerund phrase itself to head the projection containing it (Pullum 1991, Lapointe 1993, Bresnan 1997), at least not without considerably extending the definition of head. Here we will proceed in the tradition of taking the gerundive head to be a specialised element. This will be implemented by proposing the following hypotheses:

(38)   Mixed projections contain a 'mixed' functional category head between their two parts, call it a **switch**. This switch 'mediates' between the nominal and the verbal half.
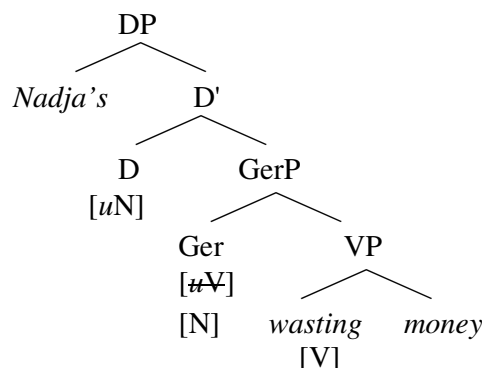
(39)   Switches combine interpretable *and* uninterpretable categorial features.

While the hypothesis in (38) should be quite straightforward, the one in (39) merits some elaboration, exemplifying on English gerunds: Let us start by supposing, essentially following Reuland (1983) and Hazout (1994), that gerundive projections contain a head *Ger*, which

takes a verbal complement (an AspP most probably). Hence we can claim it bears a [uV] feature, as it matches a complement that ultimately contains an interpretable [V] feature.[13]

Ger can also function as an argument and, almost independently of this (Hudson 2003 for the details) it *may* be selected by Det. Hence it also marks an [N] feature, which can be matched by the [uN] one of determiners:

(40) *Ger* in its projection – *Nadja's wasting money*

```
                    DP
                  /    \
            Nadja's     D'
                       /   \
                      D     GerP
                    [uN]    /    \
                         Ger      VP
                        [u̶V̶]     /   \
                         [N]  wasting  money
                                 [V]
```

The intuition that *Ger* contains an [uN] is already captured by Reuland (1983: 113), Hazout (1994) and van Hout & Roeper (1998: 186) who claim it to be an actual noun. But can Ger be a noun, in other words, a lexical category?

Remember that so far we have perceived heads as bundles of features. A bundle of features characterised as a noun would mark an [N] feature. Such a noun would have no concept-denoting features and, paradoxically, would select verbal constituents. On the other hand, if categorial features are not taxonomic-classificatory features, but LF interpretable instead, it makes sense to perceive switches as [N][uV], as in (39), making their category sortal, by virtue of [N], and also forcing them to belong to the projection line of a verb, by virtue of [uV].

Are then switches like *Ger* functional (as they mark a [uV]) or lexical (as per [N])? The question has no import in a theory, such as the one developed here, where 'lexical' and 'functional' are not primitive notions. *Ger* can be said to have its behaviour defined by its feature content. It is devoid of descriptive content, so it behaves like functional and semi-lexical elements. At the same time, again like semi-lexical elements, it can type a whole

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[13] In fact, van Hout & Roeper (1998: 186) suggest that the V head overtly climbs up to Ger. As Ad Neeleman (p.c.) argued, this is probably not correct, as indicated by adjacency facts: gerunds are not higher than other verb forms with respect to adverbs.

projection as sortal, by virtue of its interpretable [N] feature, in a fashion similar to the one in which semi-lexical elements license the functional projections dominating them (Panagiotidis 2002: Ch. 5). Unlike these, though, and like functional elements, with which they share uninterpretable categorial features such as [uV], switches cannot appear in isolation or without a lexical element at the bottom of their projection line. Under Categorial Deficiency, none of these properties needs be stipulated.

Turning to (40), the projection containing *Ger*, as a whole, we have to note that not only does it contain *Ger*'s [N] feature, but also the interpretable [V] feature of its lexical verb. This is what ultimately accounts for its 'mixed' behaviour at LF. In line with (7) and our granting 'grammatical category' to boil down to nothing but the presence of interpretable categorial features at LF, we can also obviate the need for a mechanism whereby it is the topmost functional head of a projection to define its category, as in Alexiadou (2001).[14]

Before closing, a note on the adverbial function of mixed projections in a number of languages is in order, although this is a separate and exciting topic by itself. Departing from Reuland (1983), we first have to note that (most of) these are absolutes and usually cannot be used as ordinary adverbial modifiers, as exemplified by Latin gerundives, Japanese verbal nouns, Classical Greek absolute participles and many other similar entities. Building on the fact that the above, especially absolute participles, clearly abide by (36), with their 'upper crust' being nominal and marking case, number and gender, we could extrapolate saying that adverbial usages of mixed projections involve a selecting *P*, one that is actually overt in Japanese (Shibatani 1990: 247) and Hebrew (Siloni 1997: Ch. 5). More research is needed on the issue. As a general note, we can observe that these adverbial / absolute usages are available because of a GerP bringing together an interpretable [N] feature with a complete argument structure and aspectual information but, crucially, absence of T, hence nominalising them.

Recapitulating, let's see what becomes of the two generalisations presented in (36) and (37):

  a. (36) is automatically captured: (D-)Ger is nominal and VP is verbal because of the categorial feature content of the *Ger* switch: [N][uV].

  b. (37) – to the extent it is a universally generalisation – can be captured if *all* switches ('mixed categories') are [N][uV]. This implies a crucial asymmetry, namely the accidental absence or impossibility of [V][uN] combinations, a rather peculiar fact, if

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[14] Which would predict the projection in (40) to be nominal, as it is headed by a Det as its topmost head.

true. Resolving this is an empirical matter and, also, there is much more to be said about the categorial features of mixed categories cross-linguistically.[15]

6   Conclusion

Combining a theory of categorial features as LF-interpretable with Categorial Deficiency (9), we explain the absence of a) complementless functional elements and b) lone lexical heads merged in mid-projection. We also motivate most instances of Head Movement and Li's Generalisation. We can even buy a coherent and endocentric analysis for mixed projections.

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[15] As David Adger (p.c.) noted, if both [N][uV] and [V][uN] switches exist, an added question is why they do not 'flip-flop', alternately combining with each other in large numbers or, even, ad infinitum. Probably this is precluded by the resulting accumulation of interpretable categorial features [X] on each of these hypothetical projections, a problem similar to the one we were faced with regarding (6).

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