

## Mixed categories and participles: syntax and morphology

The standard LFG approach to mixed categories was developed by Bresnan (1997, 2001) (Figures 1–2, illustrating two of the possible structures). In certain respects, this approach is similar to the GPSG approach to mixed categories proposed by Pullum (1991) (Figure 3), but is specifically contrasted by Bresnan with the more recent HPSG approach of Malouf (1996, 2000a,b) (Figure 4). Some recent LFG work has, however, moved closer to an HPSG type approach. So Börjars et al. (2015) explicitly note that their proposals regarding the Arabic masdar reflects Malouf’s (2000a) treatment of the English gerund, in that the masdar is categorially noun-like but has verbal selectional properties (Figure 5); also, Spencer (2015) proposes a treatment of participles within LFG that involves an intermediate category (Figure 6), similar to Malouf’s category *gerund*.

Work on mixed categories in LFG includes Bresnan (1997, 2001: 289–296), Bresnan and Mugane (2006), Seiss (2008), and Nikitina (2008). Most recently, Nikitina and Haug (2015), Spencer (2015) and Börjars et al. (2015) have discussed mixed category phenomena.

In this paper we critically assess some recent work in LFG that provides ‘mixed category’ analyses. We show that two distinct phenomena have become conflated under the ‘mixed category’ heading, and argue that the term ‘mixed category’ should be reserved for only one of these. The other does not, in fact, require a mixed category analysis within LFG.

There are three properties that are invoked in the analysis of a phrase as ‘mixed’: the internal syntax of the phrase, the external syntactic distribution of the phrase, and morphological properties such as agreement. We argue that only the first is crucial for mixed category status. Phrases that show internal syntax consistent with a single category type may be treated as plain instances of that category type, regardless of whether they show the external distribution or agreement features characteristic of another category.

The most commonly discussed ‘mixed category’ is undoubtedly the English gerund, which can display either entirely nominal, entirely verbal, or ‘mixed’ phrasal structure:

- (1) a. His stupid missing of the penalty lost us the game.
- b. Him stupidly missing the penalty lost us the game.
- c. His stupidly missing the penalty lost us the game.

In (1a), the syntax of the phrase headed by *missing* is entirely nominal: the semantic object of *missing* appears as a prepositional complement, and *missing* is premodified by an adjective and a possessor phrase indicating the semantic subject. In (1b), the syntax of the phrase headed by *missing* is entirely verbal: the semantic object appears in the same form as an object of a finite verb, not embedded under a preposition, the semantic subject appears in the ‘bare’ (‘accusative’) form, and the modifier is an adverb. In (1c), the construction is mixed: the semantic object and the modifier are of the verbal type, but the semantic subject appears as a possessive phrase.

Bresnan (2001: 289–296) provides an analysis of the mixed English gerund (1c) which treats it in terms of a head-sharing construction, as heading a VP with a DP extended head (Figure 1).<sup>1</sup> This differs little from Pullum’s (1991) GPSG account (Figure 3). The entirely nominal construction can be analysed without difficulty as simply an NP, with no head sharing or ‘mixed’ status. The entirely verbal construction is analysed by Bresnan (2001) as involving an S complement of DP (Figure 2); this is discussed below.

In the case of the mixed English gerund construction (1c), it is clear that a mixed category analysis is desirable, however effected, since the phrase itself shows unambiguous features of both verbal and nominal projections. However, many authors assume that there is more to a syntactic category than its internal structure: specifically, the external syntactic distribution of a phrase (the ‘external distribution’), for example whether the phrase occurs in the same sorts of positions as noun phrases, or verb phrases, and the morphosyntax of the phrase, e.g. whether the head of the phrase in question declines and agrees like a noun, adjective, or verb.

So, as noted, Bresnan (2001) provides an analysis of the purely verbal English gerund construction (1b) via a mixed category, specifically an S embedded within a DP (Figure 2). Under this analysis, the only function of the DP is to capture the distribution of the phrase: gerund phrases distribute as DPs, as shown in (1). Although Bresnan contrasts her proposal with that of Malouf (2000a) (Figure 4), it is notable that Malouf too assumes that both fully verbal and mixed gerunds in English are partially nominal (being part of the category *gerund*).

The distribution argument is adopted by Nikitina and Haug (2015), who propose an analysis of the Latin ‘dominant’ participle construction involving an S with an NP extended head, where again the only function of the NP projection is to constrain external distribution. It is also adopted by Börjars et al. (2015) in their analysis of the Arabic masdar, and by Spencer (2015) in his analysis of attributive Indo-European

<sup>1</sup>Unchanged in Bresnan et al. (2016: 311–319).

type participles, which show consistently verbal internal syntax but (largely) adjectival distribution (see also Spencer 2013). Börjars et al. (2015) go so far as to give greater weight to the external distribution of the Arabic masdar than its internal syntax, arguing that masdar phrases are plain NPs throughout, with no head sharing, partly because of their NP-like distribution, despite the fact that there is clear evidence of a verbal projection inside the masdar phrase (e.g. the possibility of a ‘verbal’ object complement phrase); see Figure 5.

However, the distribution argument is weak: different category types may have roughly (or exactly) the same distribution, and many positions can be filled by more than one phrase type. For example, the complement of V in English may be filled by at least DP/NP, CP, PP, AdjP and possibly IP. The within-clause distributions of DP/NP and CP are almost identical. What clearly distinguishes DP/NP from CP in English is not distribution, but internal syntax. Internal syntax is therefore of primary importance in distinguishing at least some phrase types, contra the approach of Börjars et al. (2015), who move towards eliminating the internal syntactic distinctions between different categories. In addition, Dalrymple (2001: 28–30) argues that subcategorization is primarily functional, and hardly ever categorial: verbs select for object complement phrases, for example, but do not place constraints on the category of their complements; rather, constraints on categories appearing as object complements for different types of verbs are primarily semantic in nature. Thus distribution is not the primary means of distinguishing categories, at least in a theory such as LFG that draws a distinction between category and grammatical function.

In any case, it is unproblematic to incorporate constraints on the distribution of phrases of different categories in the rules specifying the internal syntax for those phrases. For example, we assume that it is a specific feature of Vs (and not, e.g., Ns), that they can take OBJ complements:

$$(2) \quad V' \rightarrow V \quad XP \\ \uparrow = \downarrow \quad (\uparrow \text{OBJ}) = \downarrow$$

Although this allows in principle any phrase to appear as the complement of V, specifications in the PS rules for those phrases can easily constrain this:

$$(3) \quad NP \rightarrow \quad \begin{array}{c} XP \quad N' \\ (\uparrow \text{POSS}) = \downarrow \quad (\text{NGF} \uparrow) \end{array} \quad (4) \quad \text{NGF} \equiv \{ \text{SUBJ} \mid \text{OBJ} \mid \text{PREDLINK} \mid \text{POSS} \dots \}$$

NGF is the set of grammatical functions that NPs can fill. Thus NPs can appear as the complement of V, but e.g. the rule for AdvP may not license its use as OBJ, preventing AdvP from appearing as complement of V. In addition, for example, if it is the case that only NPs can fill the role of POSS, only they can appear in the specifier position of another NP, even though (3) in principle admits anything in SpecNP. In this way rules for the internal syntax of phrases can constrain external distribution (if indeed we wish to constrain distribution at all in the syntax). In the case of masdars or participles, which we argue are VPs distributed (broadly) as NPs or AdjPs, the use of complex categories or additional f-structure constraints permit non-standard distribution to be specified without the need for NP or AdjP projections.

Furthermore, external distribution may be deceptive. So, Spencer (2015) notes that participles in Sanskrit and Lithuanian have largely the same distribution as adjectives in these languages (e.g. serving as adjunct modifiers of NP) justifying, together with their morphology (see below), their categorization as (at least partially) adjectives. However, while participles in Sanskrit and Lithuanian have largely the same distribution as adjectives, they differ in some important respects (just as the distributions of DP/NP and CP in English differ in some important respects). The data for Sanskrit comes from Lowe (2015); for example, participles in early Sanskrit cannot be the primary predicate in a clause, in sharp contrast to adjectives. The data for Lithuanian is more subtle, but comes down to the ability, discussed by Spencer (2015), of participles in Lithuanian to serve as the primary predicates in their clause, in which case they show an evidential sense. When adjectives serve as primary predicates in Lithuanian, a copula is possible; the evidential sense and the impossibility of a copula with participles necessitate a different structure, meaning that the distribution of participles and adjectives are not identical. We argue that the distributional criteria in Sanskrit and Lithuanian do not necessitate the assumption of an AdjP projection for participles, or indeed anything intermediate between AdjP and VP, but that participial phrases in both these languages are plain VPs.

Secondly, morphosyntactic properties such as agreement are often taken to be crucial to determining the category of a phrase. So, Spencer (2015) takes the adjectival agreement features of participles in Sanskrit and Lithuanian as key evidence that their category must be at least partially adjectival. But again, an argument for syntactic category based on morphology is weak: processes of diachronic change often result in adjectives or nouns being reanalysed as verb forms, without concomitant morphological reformation. In Sanskrit, the so-called ‘past passive participle’ (not the type under discussion) became the primary means of expressing the past tense. Originally this was a derived adjective, of category Adj, but it became a verbal form, of category V, without losing any of its adjectival morphosyntax. The same development is attested in many languages, of course, including Germanic languages and Slavic languages. So in Russian, past tense verb forms agree in number and gender with their subject, rather than number and person, but

they are not thereby any less a part of the category verb, or any more a part of the category adjective, than present/future tense verb forms.

Spencer (2015) reasonably argues that the identical agreement properties of participles and adjectives in languages like Lithuanian and Sanskrit should be reflected at some level. We show that under the model for morphology in LFG developed by Dalrymple (2015), it is possible to account for the adjectival nature of participles from a morphological perspective while still permitting them to be Vs at c-structure. The lexemic entry for a verb will look something like the following (for the Sanskrit verb *gam* ‘go’):

(5)  $LE \langle \{ \text{ROOT: } gam; \text{STEM1: } gaccha \}, \{ (\uparrow \text{ PRED}) = \text{'go'}, \lambda e.goe(e) : (\uparrow_{\sigma} EV) \rightarrow \uparrow_{\sigma} \}, GO1 \rangle$

There will be a morphological realization relation  $R$  that specifies the properties of the nom. pl. masc. present participle *gáčchantah* ‘going’:

(6)  $R \langle GO1, gáčchantah, /gátfantah/, \{ \text{M-TENSE: PRES, M-VOICE: ACT, M-CAT: ADJ, M-CASE: NOM, M-NUM: PL, M-GEN: MASC} \} \rangle$

The set of m-features specified in this realization relation can be understood as the union of two distinct sets of m-features: the set associated with the morphology of the present active verbal stem (*gáčcha-*), and the set associated with the adjectival suffix, declined according to case/number/gender. The first two m-features in (6) constitute the former set, the others the latter. Abstracting over sets of m-features using templates, we rewrite (6) in the following way:

(7)  $R \langle GO1, gáčchantah, /gátfantah/, \{ @M\text{-PRESACT}, @M\text{-ADJ}(\text{NOM, PL, MASC}) \} \rangle$

where the templates have the following definitions:

(8) a.  $M\text{-PRESACT} \equiv M\text{-TENSE: PRES, M-VOICE: ACT}$   
 b.  $M\text{-ADJ}(\_CASE, \_NUM, \_GEN) \equiv M\text{-CAT: ADJ, M-CASE: } \_CASE, M\text{-NUM: } \_NUM, M\text{-GEN: } \_GEN$

Using templates in this way permits us to generalize over the morphological contribution of specific morphological categories and classes. So the instantiation of (8b) with the arguments NOM, PL and MASC produces a set of m-features which can be assumed to be associated with every nom.pl.masc. adjective in the language, shown in (6). Thus morphological ‘adjective-hood’ has a unified and coherent morphological contribution in the lexicon.

In order to produce a lexical entry for this word, we also require a description function  $D$ , which maps the set of m-features to the appropriate c-structure category and f-description. For the most part this is trivial; M-TENSE: PRES will map to something like  $(\uparrow \text{ TENSE} = \text{PRES})$ , M-GEN: MASC will map to something like  $(\uparrow \text{ GEN} = \text{MASC})$ , etc. What matters is the c-structure category. Dalrymple (2015) uses the label  $D_{cat}$  for the subcomponent of a function  $D$  that specifies the grammatical category. She proposes the following structure:

(9)  $D_{cat} \langle LI, m\text{-features}, N \rangle$  iff  $M\text{-CAT: N} \in m\text{-features}$ .  
 $D_{cat} \langle LI, m\text{-features}, V \rangle$  iff  $M\text{-CAT: V} \in m\text{-features}$ .  
 $D_{cat} \langle LI, m\text{-features}, Adj \rangle$  iff  $M\text{-CAT: ADJ} \in m\text{-features}$ . etc.

These examples represent the expected mappings, and are highly likely to be the defaults cross-linguistically. However, the ability to specify these mapping by the lexemic index LI means that in principle the mappings between M:CAT features and grammatical category need not be uniform, even within a single language. So we can assume that the following applies for all lexical adjectives in Sanskrit:

(10)  $D_{cat} \langle LI_{adj}, m\text{-features}, Adj \rangle$  iff  $M\text{-CAT: ADJ} \in m\text{-features}$ .

using  $LI_{adj}$  to generalize over the set of lexemic indices associated with lexemic entries which are fundamentally adjectival, i.e. {HAPPY1 | SAD1 | TALL1 | SHORT1...}.

However, we can assume that in the case of morphological adjectives based on verbal lexemes, we have a different specification:

(11)  $D_{cat} \langle LI_{vb}, m\text{-features}, V_{[ptc]} \rangle$  iff  $M\text{-CAT: ADJ} \in m\text{-features}$ .

where  $LI_{vb}$  refers to any LI associated with a verbal lexeme, i.e. {GO1 | FIND1 | LOVE1...}.

It is possible also to be more specific, and permit only, say, forms of verbal lexemes with the properties M-CAT: ADJ and M-TENSE: PRES to be of category  $V_{[ptc]}$ , licensing the possibility of categorially adjectival forms of verbal lexemes alongside categorially verbal, but morphologically adjectival, forms of verbal lexemes.

Thus, although the morphological adjective-hood of a participle supplies the same m-features as for any lexemic adjective, the one specifying grammatical category is treated differently due to the verbal nature of the base lexeme, resulting in a mapping from M-CAT: ADJ to the grammatical category V in the case of participles. This captures the intuition that participial and adjectival agreement properties are fundamentally the same thing, without requiring this to be reflected in their syntactic categories.

## References

- BÖRJARS, KERSTI, SAFIAH MADKHALI, and JOHN PAYNE (2015). ‘Masdars and mixed category constructions’. In Miriam Butt and Tracy Holloway King (eds.), *Proceedings of the LFG15 Conference*, Stanford, CA: CSLI Publications, pp. 26–42.
- BRESNAN, JOAN (1997). ‘Mixed Categories as Head Sharing Constructions’. In Miriam Butt and Tracy Holloway King (eds.), *Proceedings of the LFG97 Conference*, Stanford, CA: CSLI Publications.
- BRESNAN, JOAN (2001). *Lexical-Functional Syntax*. Oxford: Blackwell.
- BRESNAN, JOAN, ASH ASUDEH, IDA TOIVONEN, and STEPHEN WECHSLER (2016). *Lexical-Functional Syntax*. Oxford: Wiley-Blackwell. Second edition. First edition by Joan Bresnan, 2001, Blackwell.
- BRESNAN, JOAN and JOHN MUGANE (2006). ‘Agentive Nominalizations in Gīkūyū and the Theory of Mixed Categories’. In Miriam Butt, Mary Dalrymple, and Tracy Holloway King (eds.), *Intelligent Linguistic Architectures: Variations on themes by Ronald M. Kaplan*, Stanford, CA: CSLI Publications, pp. 201–234.
- DALRYMPLE, MARY (2001). *Lexical Functional Grammar*. San Diego, CA: Academic Press.
- DALRYMPLE, MARY (2015). ‘Morphology in the LFG Architecture’. In Miriam Butt and Tracy Holloway King (eds.), *Proceedings of the LFG15 Conference*, Stanford, CA: CSLI Publications, pp. 43–62.
- LOWE, JOHN J. (2015). *Participles in Rigvedic Sanskrit: The Syntax and Semantics of Adjectival Verb Forms*. Oxford: Oxford University Press.
- MALOUF, ROBERT (1996). ‘A constructional approach to English verbal gerunds’. In *Proceedings of the Twenty-Second Annual Meeting of the Berkeley Linguistics Society: General Session and Parasession on the Role of Learnability in Grammatical Theory*, Berkeley: Berkeley Linguistics Society, pp. 255–266.
- MALOUF, ROBERT (2000a). *Mixed Categories in the Hierarchical Lexicon*. Stanford, CA: CSLI Publications.
- MALOUF, ROBERT (2000b). ‘Verbal gerunds as mixed categories in HPSG’. In R. Borsley (ed.), *The Nature and Function of Syntactic Categories*, New York: Academic Press, pp. 133–166.
- NIKITINA, TATIANA V. (2008). *The Mixing of Syntactic Properties and Language Change*. Ph.D. thesis, Stanford University.
- NIKITINA, TATIANA V. and DAG T. T. HAUG (2015). ‘Syntactic nominalization in Latin: a case of non-canonical subject agreement’. *Transactions of the Philological Society* To appear.
- PULLUM, GEOFFREY K. (1991). ‘English nominal gerund phrases as noun phrases with verb phrase heads’. *Linguistics* 29(5), pp. 763–799.
- SEISS, MELANIE (2008). ‘The English *-ing* Form’. In Miriam Butt and Tracy Holloway King (eds.), *Proceedings of the LFG08 Conference*, Stanford, CA: CSLI Publications, pp. 454–472.
- SPENCER, ANDREW (2013). *Lexical Relatedness: A Paradigm-Based Approach*. Oxford: Oxford University Press.
- SPENCER, ANDREW (2015). ‘Participial relatives in LFG’. In Miriam Butt and Tracy Holloway King (eds.), *Proceedings of the LFG15 Conference*, Stanford, CA: CSLI Publications, pp. 378–398.

Figure 1: Bresnan (2001: 292, ex. 22)

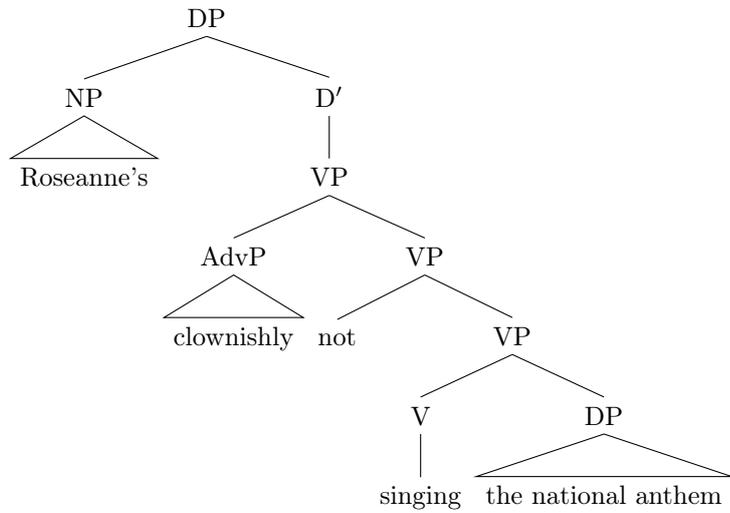


Figure 2: C-structure for (1b), flg. Bresnan (2001)

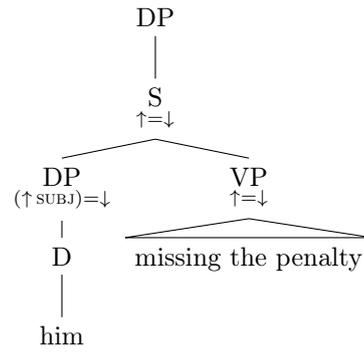


Figure 3: *your breaking the record* (Pullum 1991: 782)

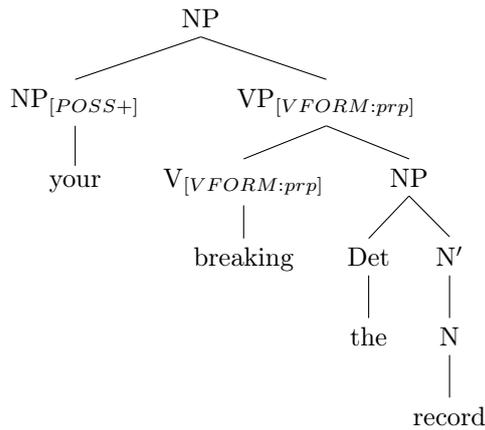


Figure 4: English gerund in HPSG (Malouf 2000b: 22)

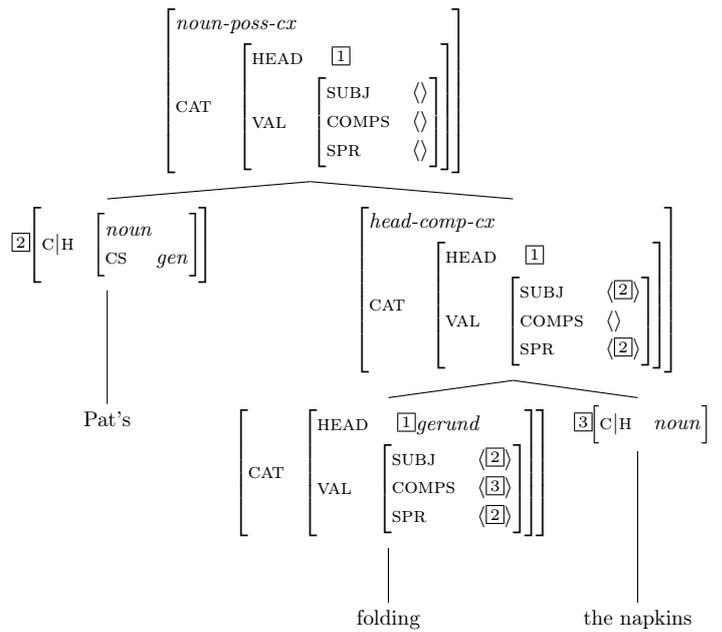


Figure 5: Arabic: 'her arranging the flowers recently' (Börjars et al. 2015: 33)

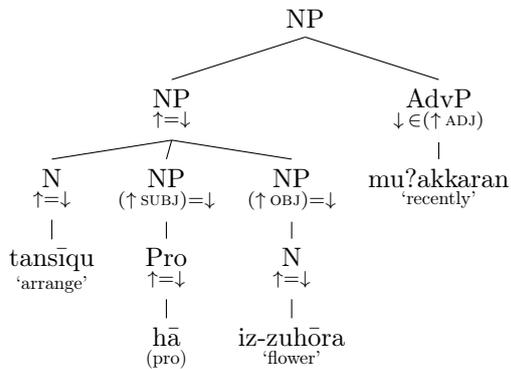


Figure 6: Attributive participles: Spencer (2015: 391)

