Monotonic DM as consequence of a pairing with LFG

In this paper we propose a synthesis of *Distributed Morphology* (DM; Halle & Marantz 1993) and *Lexical-Functional Grammar* (LFG; Kaplan & Bresnan 1982): *Distributed Lexical-Functional Grammar* (DLFG). We argue that this is not contradictory or quixotic, but rather yields a synthesis that maintains complementary strengths of the two frameworks and mitigates some of their weaknesses. DLFG enables a syntactocentric explanation for *morpheme ordering*, such as the Mirror Principle (Baker 1985) — a strength of DM but a potential weakness of any strictly word-based realizational version of LFG (e.g., Dalrymple 2015) — while also offering an account of *stem allomorphy* — a strength of LFG but a potential weakness of DM.

It initially seems that DM and LFG would be strange bedfellows, because the former rejects the Lexicalist Hypothesis (Chomsky 1970, Lapointe 1980), whereas the latter embraces it. However, the two theories share the assumption that there must be a level of syntactic structure to which *parts* of words can contribute information; let us call this the Syntactic Factorization Hypothesis (SFH). The relevant level of syntactic structure is the one and only level of syntax in DM and is the level of f(unctional)-structure in LFG, which also assumes another syntactic level of c(onstitutent)-structure. The frameworks' distinct decisions about how SFH is to be captured (which are in both cases also independently motivated by other theoretical considerations) in turn affect their stances on the Lexicalist Hypothesis (LH): Since DM assumes only one level of syntax, embracing SFH entails rejecting LH, whereas LFG can embrace SFH as a general claim about the morphology–syntax/f-structure interface, but accept LH as a claim about c-structure.

Despite the common ground offered by SFH, the two theories are not on level footing with respect to their investigations of the morphological component and its interaction with syntax. Distributed Morphology was conceived with this research topic very much foremost, whereas research into the morphological component of the grammar in LFG has only recently been reinvigorated (as witnessed by the inclusion of a Workshop on Morphology at the LFG 2015 conference), after a period of relative stagnation. The biggest repercussion of this stagnation is that LFG has not kept pace with developments in morphological theory. LFG by default assumes an incremental model of the lexicon (in the terminology of Stump 2001). However, morphology for some time has been experiencing a shift away from incremental approaches (words gain functional meaning as they are composed) to realizational approaches (words or morphemes express grammatical meaning that is somehow composed separately). The reinvigoration of morphological research has brought with it an agenda to develop a realizational morphology-syntax interface (see Dalrymple 2015, for example). Most of the work in this domain assumes a realizational-inferential (word-based) approach to morphology as exemplified by PFM (*Paradigm Function Morphology*, Stump 2001, in press). However, realizational approaches to morphology are divided between the realizational-inferential approach and the realizational-lexical (morpheme-based) approach, which is dominated by DM.

We have two goals: First, we aim to propose simple changes to LFG's c-structure that enable any realizational model. Second, we aim to propose simple constraints on exponence that enable specifically a realizational-lexical (DM-like) morphology-syntax interface. To achieve this, we first propose that c-structure rules do not generate a structure with words as its terminal nodes, but rather that c-structure trees terminate in sets of unexpressable functional material that map to f-structure (such as (↑ TENSE = PAST) or (↑ SUBJ PERS = 3^{RD})), paired with arbitrary lexical identifiers which we abbreviate with mnemonic morphosyntactic categories. We adopt the template technology developed by Asudeh, Dalrymple, & Toivonen (2013), which allows specific reference to a given bundle of functional material, whether it is associated with material below the level of a word or with non-terminal c-structure nodes. We also propose a new function that encodes what the composition of those mappings entails and how that information is inherited by dominating nodes in the syntax. Each mother node contains (at least) the function DISTRIBUTE (↑ ° ↓), which does two things: a) union the functional material sets of the two daughter nodes, and b) distribute semantic features across the members of the new set. For example, at some level within the verb phrase, (V, {(↑ PRED) = √SAY}) unions with (AGR, {(↑ SUBJ PERS) = 3}) to create (V+AGR, {(↑ PRED) = √SAY, (↑ SUBJ PERS) = 3}). At S, that {(↑ SUBJ PERS) = 3} unions with the {(↑ PERS) = 3} in the NP and the SUBJ feature distributes, enforcing agreement. This mechanism allows the f-structure mappings to be inherited by mother nodes, where it can be combined with the material from other daughters. This combined material can then be exponed (realized) by the morphology.

While this formulation enables an interface with a PFM-style morphology, the ability to expone non-terminal nodes also enables a DM-style morphology, but one that addresses a significant weakness of traditional DM: stem allomorphy. For example, because there is a node that contains (V+AGR, {(↑ PRED) = √SAY, (↑ SUBJ PERS) = 3}), that node can be targeted for exponence and expressed with the suppletive form "says" /sɛz/ rather than the regular form /sej+z/ that results from the exponence of the contained terminal nodes. Restricting this non-terminal exponence requires only a small set of constraints:

1. Use the fewest listemes you can for the job.
2. Use the listeme that expones the most amount of information in the node it expones.
3. Leave the least amount of information unexponed as possible.
4. Expone the information only once (that information can condition exponence elsewhere).

This model poses significant advantages over traditional DM. First, since exponence is not derivational or cyclical, but monotonic, certain constraints like inflectional class matching or agreement marking can be done on the overall structure without covert movement. Second, since the f-structure mappings are inherited by mother nodes, those nodes can be exponed without ad hoc mechanisms such as *fusion*. Non-terminal exponence of this sort allows for an explanation of stem allomorphy in a morpheme-based model without resorting to powerful ad hoc mechanisms such as readjustment rules (see for example Haugen & Siddiqi 2013, Bermudez-Otero 2013). Furthermore, stem allomorphy and other such non-decomposable alternations form the chief criticism against morpheme-based models. Accounting for it thusly allows for a morpheme-based morphology within LFG as an alternative to the word-based PFM. Such an alternative enables syntactocentric explanation for morpheme ordering, such as the Mirror Principle (Baker 1985), an explanation for which the incremental model of LFG already excelled at (Baker 1985) but a realizational word-based model would lose. Lastly, from a morphosyntactic perspective, a c-structure-based theory of exponence enables stronger locality conditions than an alternative f-structure based theory of exponence built on a more traditional view of LFG. F-structures by design flatten c-structure distinctions, particularly in the predicational "spine" of a ↑ = ↓ path through a c-structure tree: All information in a ↑ = ↓ path maps to the same f-structure; e.g., the verb, verb phrase and clause all map to one f-structure. However, the realizational possibilities in stem allomorphy are considerably more local than this predicts, since it would allow stem allomorphy to be potentially conditioned by the entire clause.

References: Asudeh, Ash, Mary Dalrymple, & Ida Toivonen. 2013. “Constructions with Lexical Integrity”. *Journal of Language Modelling*. Baker, Mark. 1985. “The mirror principle and morphosyntactic explanation.” *Linguistic Inquiry*. Bermúdez-Otero, Ricardo. 2013. “The Spanish lexicon stores stems with theme vowels, not roots with inflectional class features”. *Probus*. Chomsky, Noam. 1970. “Remarks on nominalization.” *Readings in English Transformational Grammar*. Dalrymple, Mary. 2015. “Morphology in the LFG architecture” *Proceedings of the LFG15 Conference*. Halle, Morris & Alec Marantz. 1993. “Distributed morphology and the pieces of inflection.” *The View from Building 20: Essays in Linguistics in Honor of Sylvain Bromberger*. Haugen, Jason D., & Daniel Siddiqi. 2013. “Roots and the derivation.” *Linguistic Inquiry*. Kaplan, Ronald & Joan Bresnan. 1982. “Lexical-Functional Grammar: A formal system for grammatical representation.” *The Mental Representation of Grammatical Representation.* Lapointe, Steven. 1980. *A Theory of Grammatical Agreement.* Stump, Gregory. 2001 *Inflectional Morphology: A Theory of Paradigm Structure.* Stump, Gregory. In press. “Paradigms at the interface of a lexeme’s syntax and semantics with its inflectional morphology” *Morphological Metatheory*.