Is Linear Order Derived?

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Abstract

The paper casts a critical eye on those dependency grammars (DGs) that view linear order as derived from hierarchical order. It argues that MTT is such a DG insofar as language synthesis begins with a semantic representation, progresses through syntactic representations that lack linear order, and then proceeds to the morphological and phonological representations that include linear order. The difficulty that the intermediate syntactic representations generate is they necessitate that certain phenomena of syntax be subjected to analyses that ignore linear order. This necessity is problematic in various areas, such as idiosyncratic meaning and coordination. Monostratal DGs are not faced with these difficulties, since they do not posit intermediate syntactic strata that lack linear order.

Keywords: coordination, hierarchical order, idioms, linear order, monostratal, multistratal

1 Introduction

Is linear order derived? This question seems to be (at least tacitly) answered positively by many dependency grammars (DGs) insofar as many DGs view hierarchical order as being less deep than linear order. These DGs are backed to some extent by the following crucial passage from Tesnière:

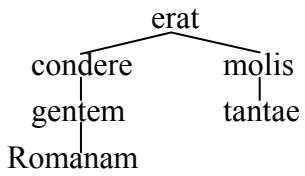
> De ce point de vue, nous pouvons dire, en reprenant notre definition du début […] pour la préciser et la developer, que parler une langue, c'est en transformer l'ordre structural en ordre linéaire, et inversement que comprendre une langue, c'est en transformer l'ordre linéaire en ordre structural.
> (Tesnière, 1959/69:19).

According this passage, a speaker transforms structural order (=hierarchical order) to linear order. Such transformation necessitates that the hierarchical order precede the linear order. But if the hierarchical order precedes the linear order, then the hierarchical order is primitive and the linear order is (at least in some sense) derived (for the speaker). The understanding of speech production implied by this view is that a more or less complete hierarchical structure of morphological units exists in cognition immediately before that speaker begins an utterance. Considering the extended length and major complexity of many utterances, one can

question whether this understanding of speech production is accurate. The burden placed on the cognition of a speaker (to first construct a more or less complete hierarchical structure in cognition before speech production begins) would be extreme. A more plausible understanding of speech production assumes that hierarchical order is established (in an abstract sense) online in tandem with linear order.

That many DGs indeed derive linear order from hierarchical order is implied by the widespread trees that encode hierarchical order alone (not linear order as well). Tesnière seems to have initiated this practice; the majority of tree structures in *Éléments de syntaxe structurale* convey hierarchical order only. The structure of the Latin sentence *Tantae molis erat Romanam condere gentem* 'It was such a massive task to establish the Roman race', for instance, is given as follows:

(1)

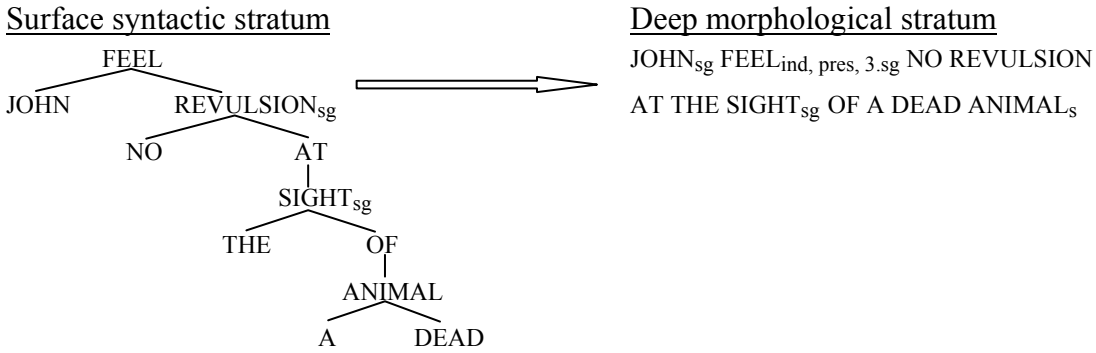


(Tesnière, 1959/69:20)

Tesnière's proposal can be interpreted to mean that the Latin speaker has this hierarchy of words present in cognition immediately before he/she begins to utter the corresponding sentence. Speech production entails the transformation of hierarchical structure to linear order.

Meaning to Text Theory (MTT: Mel'čuk, 1988, 2003; Kahane, 2003) can be interpreted as following this practice. MTT posits two strata of syntax, each of which encodes hierarchical order but not linear order. Viewed from the perspective of language synthesis, linear order appears first in the deep morphological stratum after the surface syntactic structure is mapped to it. The following representations have been adapted (syntactic functions omitted) from Kahane (2003:557f.):

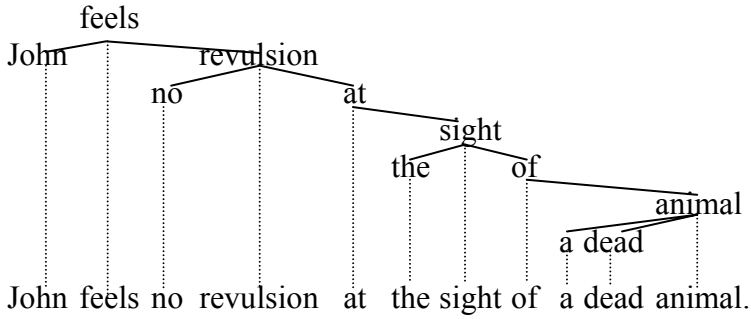
(2)



The surface syntactic stratum is a tree that contains all the lexemes of the actual utterance *John feels no revulsion at the sight of a dead animal*, but lacks linear order. Again from the perspective of synthesis, linear order is appearing first as the unordered tree is mapped to the deep morphological stratum, which now encodes linear order but lacks hierarchical order.

Monostratal DGs reject this view of how linear order is established (e.g. Hays, 1964; Hudson's Word Grammar, 1990; Starosta's Lexicase, 1988; Groß, 1999; Osborne et al., in press). These grammars assume a single syntactic stratum, whereby this stratum encodes both hierarchical and linear order simultaneously. Such systems might produce a tree like the following one for the sentence *John feels no revulsion at the sight of a dead animal*:

(3)



This tree encodes both hierarchical and linear order simultaneously. The underlying premise behind monostratal syntax in this area is that both ordering dimensions are always simultaneously present in syntax. The one dimension is not more basic than the other, which means that the one cannot be derived from the other. While monostratal systems may on occasion examine or reference the dominance dimension alone, doing so for them does not entail that they view such a representation as corresponding to anything that is real (and thus worthy of receiving an analysis at a putatively distinct level of syntactic representation).

This contribution considers some conceptual and empirical arguments that support monostratal syntax. In particular, some observations from idioms, coordinate structures, and the general trend associated with Construction Grammar (CxG) are brought to bear on the debate. The main objection raised by anonymous reviewers is addressed in the penultimate section.

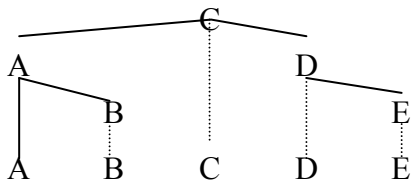
2 Construction Grammar

Insights coming from construction grammars in recent years have been influencing our understanding of syntax and grammar in significant ways (e.g. Fillmore et al., 1988; Kay & Fillmore, 1999; Goldberg, 2006). The strict compositionality of generative grammars (in the GB/MP tradition) is under debate, and the systems that derive syntactic structure incrementally are being challenged, whereby representations have come to play a greater role in our knowledge of how meaning is encoded and conveyed. The primary unit of construction grammars is of course the construction, which is understood to be a conventionalized means of connecting meaning to sound and sound to meaning. Constructions are stored units that consist of information from a variety of domains, i.e. logical-semantic, lexical, functional, prosodic, purely syntactic, pragmatic, etc. The key aspect of constructions in the current context is that many of them are widely acknowledged to include linear order (e.g. Lakoff, 1987:489; Kay & Fillmore, 1999:3; Croft, 2001:196f.). In other words, many constructions impose both linear and hierarchical order on their parts. Since constructions are stored units, i.e. they are stored on the lexicon-syntax continuum, and these stored units often necessitate a specific linear order to their parts, linear order is inseparable from constructions. The point, then, is that syntactic representations that encode hierarchical order alone deliver an inaccurate impression about the nature of these constructions. Tree structures that encode both hierarchical and linear order simultaneously, however, are not faced with this difficulty.

An important aspect of the DG view of syntactic (and morphosyntactic) structure bears on these matters. Holmes & Hudson (2005) argue that dependency-based structures are particularly compatible with the tenets of Construction Grammar. Indeed, adopting the DG *catena* (O'Grady, 1998; Osborne, 2005; Osborne et al. in press) as the fundamental unit of syntax and morphosyntax, one is in a position to give many constructions a concrete

expression in surface (morpho)syntax. This point will be illustrated here with respect to a couple of lexical and syntactic constructions that necessarily impose linear order on their parts. The catena is defined as A WORD OR A COMBINATION OF WORDS THAT IS CONTINUOUS WITH RESPECT TO DOMINANCE. This definition identifies any dependency tree or subtree of a dependency tree as a catena. The following abstract tree is used to illustrate the concept; the letters represent words:

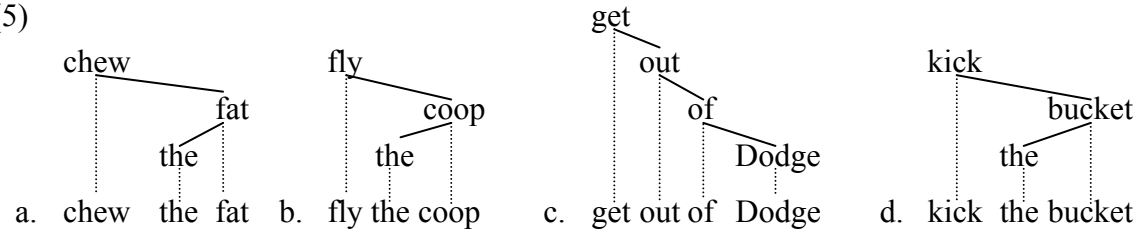
(4)



This structure contains 15 distinct catenae: A, B, C, D, E, AB, AC, CD, DE, ABC, ACD, CDE, ABCD, ACDE, and ABCDE. It also contains 16 distinct non-catenae: AD, AE, BC, BD, BE, CE, ABD, ABE, ACE, ADE, BCD, BCE, BDE, ABCE, ABDE, and BCDE. As the number of words increases, the percentage of non-catena combinations increases. The importance of the catena for constructions is that many units that arguably qualify as constructions are stored as catenae.

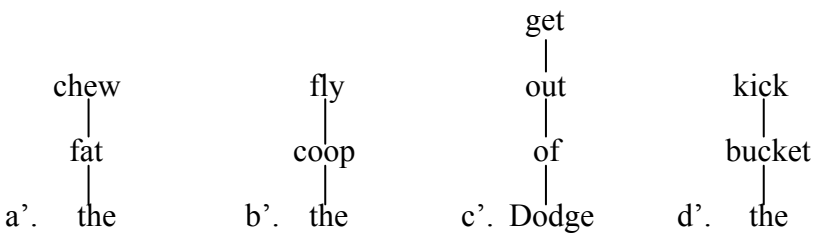
Construction grammars view idiosyncratic expressions of all sorts as lexically fixed constructions (e.g. Croft, 2001:15). One particular group of idioms is of particular interest to the current discussion, e.g. *chew the fat, fly the coop*, *get out of Dodge*, *kick the bucket*. The words of these idioms are syntactically fixed insofar as the order in which they appear is set. First, note that these idioms are catenae:

(5)



Unlike many "mobile idioms" (see Horn, 2003), these idioms cannot be altered in any major way (without losing their idiomatic meaning). For instance, passivization is not possible: **The fat was chewed by us*, **The coop was flown by the thief*, **Dodge was got out of by us*, **The bucket was kicked by him*. The noun (phrase) cannot be topicalized: **..and the fat we chewed*, **…and the coop the thief flew*, **…and Dodge we got out of*, **…and the bucket he kicked*. The nouns cannot be modified/questioned: **Which fat did they chew?*, **Which coop did the thief fly?*, **Which bucket did he kick?* The importance of these data for the discussion should be apparent. Linear order is clearly part of these idiom catenae. Unordered dependency trees deliver an inaccurate impression about the nature of these idioms, e.g.

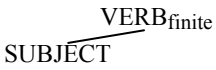
(5)



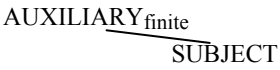
Linear order is absent from these hierarchies. Models of syntax (like MTT) that posit one or more syntactic strata that include hierarchical order but exclude linear order in this manner are delivering an inaccurate impression about the nature of these idiom constructions. They are inaccurately suggesting that the linear order of the words of these idioms is flexible. This situation should motivate one to question the legitimacy of the intermediate, syntactic strata.

Major syntactic constructions that are syntactically fixed but lexically free also encode linear order. For instance the SV construction (e.g. Kay & Fillmore, 1999:12; Sag 2010) and aux-inversion construction (Kay & Fillmore, 1999:18; Goldberg, 2006:Ch. 8; Goldberg, 2009:110ff.; Sag 2010:46f.) of English:

(6) SV Construction



(7) Aux-inv. construciton

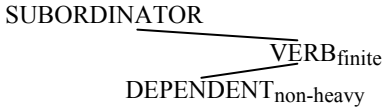


The SV construction shown in (6) is perhaps the most frequently occurring syntactic construction of English. Certainly the majority of clauses in this paper contain this construction. The SV construction is associated with neutral declarative illocutionary force. In the current context, the key point about the SV construction is that the subject must precede the finite verb, which means linear order is an inseparable part of the construction. The same insight is applicable to the aux-inversion construction. This construction is associated with interrogative or affective illocutionary force. Goldberg (2009:112) posits that the main semantic content expressed by the aux-inversion construction is "non-positivity".

The major syntactic constructions of German most responsible for establishing word order in clauses are also constructions that encode linear order. The catenae of the V2 and VF constructions are represented schematically as follows:

(8) V2 construction

(9) VF construction



The V2 construction requires that one and only one pre-dependent attach to the finite verb. As long as this pre-dependent has some semantic content, its syntactic status is unconstrained; it can be an argument, an adjunct, or part of the predicate. The V2 construction is associated with matrix clauses that have neutral illocutionary force. The VF construction also encodes linear order; the finite verb daughter of a subordinator must be a post-dependent. The key trait of the VF construction is that it lacks independent illocutionary force (since it is the mark of an embedded clause). Another important aspect of the VF construction is that it requires non-heavy dependents of the finite verb to appear as pre-dependents, whereby only relatively heavy dependents can appear as post-dependents (e.g. clauses, heavy *zu*-phrases, heavy PPs).

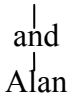
The Construction Grammar understanding of the constructions schematized in (6-9) is that the linear order shown is an inseparable part of each construction. Models of syntax like MTT that acknowledge no level of representation that simultaneously encodes both hierarchical and linear order are therefore challenged. These models are, namely, faced with the difficult question of discerning the appropriate level of representation where these constructions exist and can be represented. Intermediate hierarchies that only encode hierarchical order ignore a primary trait of these constructions, namely that they cannot exist without linear order.

3 Coordination

The message delivered by the previous section is that many constructions necessarily encode linear order and that tree structures omitting linear order deliver an inaccurate impression of the nature of syntax and the lexicon. This section examines the issue from another perspective, that of coordination. Assuming the existence of intermediate levels of syntax lacking linear order forces one to subject coordinate structures to an implausible hierarchical analysis. This analysis is inconsistent with various empirical aspects of coordination.

Multistratal MTT grants coordinate structures a hierarchical organization that is essentially the same as that of non-coordinate structures. The following (b)-example is from Mel'čuk (2003:217):

(10) a. Leo and Alan

b.


c. [[Leo] and [Alan]]

According to Mel'čuk, the dependency structure of (10a) is as shown in (10b). Coordinate structures therefore receive an analysis that is close to the analysis of non-coordinate structures. The important thing to acknowledge in this regard is that the analysis shown in (10b) is forced by theory-internal necessity of the MTT multistratal system. MTT's surface syntactic stratum lacks linear order at the same time that it includes a complete hierarchy of lexical items. In order for the surface syntactic stratum to accommodate coordinate structures, they must receive an analysis that allows them to be integrated into the unordered tree. An analysis like that shown in (10b) can accomplish this task.

The problem with the analysis in (10b), though, is that it is contradicted by a number of empirical facts. The analysis in (10c) is more plausible, since it assumes that coordinate structures are organized in terms of constituency (not in terms of dependency). Before examining two empirical arguments that support (10c) over (10b), consider how Mel'čuk (2003:217) motivates (10b). He points to facts from Bantu languages and from Nias, an Indonesian language, whereby the first conjunct of a coordinate structure often receives a morphological marking that the other conjuncts do not receive. Based on this observation, Mel'čuk concludes that the first conjunct must be the root of the coordinate structure, the other conjuncts being subordinate to it. While this reasoning is understandable given the multistratal nature of MTT, it is not necessary or plausible if one assumes a monostratal system, since a monostratal system puts linear order on equal footing with hierarchical order and can hence address the asymmetries that Mel'čuk observes in terms of linear ranking. The first conjunct is more prominent than the following conjuncts by virtue of the simple fact that it precedes the other conjuncts. In other words, the monostratal system grants linear order a similar power of organization as it does hierarchical order. This possibility is not available for MTT, since the MTT understanding of language synthesis views linear order as derived.

A DG analysis of coordinate structures like the one shown in (10c) is preferable. This analysis takes coordinate structures to be fundamentally different from non-coordinate structures. While non-coordinate structures are organized with respect to both dimensions simultaneously, coordinate structures are organized along the horizontal dimension only. They therefore behave in a manner that is distinct from non-coordinate structures. As stated, a

number of empirical facts suggest that (10c) is correct. One of these is the nesting that occurs in coordinate structures. These nestings are organized in terms of constituency, e.g.

(11) a. [Sam] and [Fred] and [Susan] arrived late.
b. [[Sam] and [Fred]] and [Susan] arrived late.
c. [Sam] and [[Fred] and [Susan]] arrived late.

The groupings indicated by the brackets carry meaning depending on who arrived with whom, but these meanings cannot be accommodated with pure dependency structures of the sort shown in (10b). Instead, one can assume constituency as the underlying principle of organization, and in order to acknowledge constituency in this manner, one has to assume that linear order is basic.

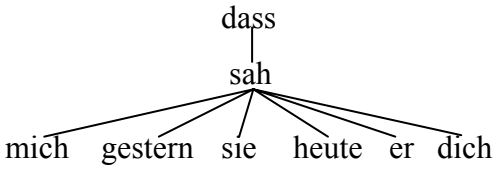
A similar type of datum involving coordination occurs when the conjuncts fail to qualify as complete subtrees (=constituents), as the following clause from German illustrates:

(12) dass [er mich heute] und [sie dich gestern] sah
that he me today and she you yesterday saw
'that he saw me today and she you yesterday'

The structure of the conjuncts in this case is flat. In order to accommodate this flatness, an analysis along the lines of (10b) might assume a deletion mechanism that reduces the conjunct(s) down to their surface form. Such a mechanism would, however, be contrary to the non-derivational nature of most DGs.

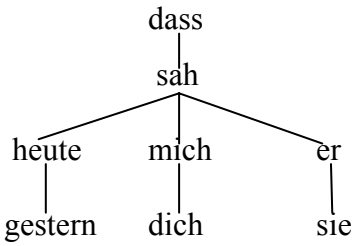
Or if one nevertheless chooses to subject (12) to a hierarchical analysis that lacks linear order, one might end with something like (12'):

(12')



The difficulty now is that it is not at all clear how this representation can be mapped to a representation that shows linear order. An alternative analysis might try the following hierarchy:

(12'')



While this hierarchy correctly groups the words bearing the same syntactic function together, it is still faced with the difficulty of linearizing the words of the conjuncts in a plausible manner. Note that if the hierarchy of words were to be maintained and shown in a tree that also shows linear order, projectivity violations would be present on a grand scale.

Monostratal DGs are challenged to a lesser extent by these issues, since they encode hierarchical and linear order simultaneously. They can assume that the conjuncts of coordinate structures are organized in terms of constituency along the linear dimension. See Osborne 2006a, 2006b, 2008.

4 The objection

Two anonymous reviewers have objected that the message of this paper misunderstands and misrepresents the nature of the MTT model. They emphasize that the model is "bi-directional". The blanket statement that MTT views linear order as derived is wrong, since the model operates in both directions depending on whether it is interpreted from the synthesis or analysis perspective. From the synthesis perspective (= the speaker's perspective) the model begins with SemR and progresses in sequence through DSynR, SSynR, DMorphR, SMorphR, and DPhonR to SPhonR. But from the analysis perspective (= the listener's perspective), the model begins with the SPhonR and progresses in sequence through DPhonR, SMorphR, DMorphR, SSynR, and DSynR to SemR. Thus the claim that hierarchical order is more basic than linear order is simply wrong for the analysis perspective.

None of the claims or points raised and discussed above misrepresent the bi-directionality of the MTT model. The discussion surrounding the quotation from Tesnière in the introduction makes it clear that the message is concerned primarily with the synthesis perspective, not so much with the analysis perspective. That is, the synthesis perspective of MTT, which sees linear order being derived from hierarchical order, is implausible. A model that necessitates syntactic representations that lack linear order misrepresents the nature of many phenomena. A solid understanding is hampered by the necessity to force representations on the syntactic strata that lack an integral aspect of the phenomena under scrutiny, namely linear order. The analysis of coordination is perhaps the most vivid example of this problem, as discussed above. In order to produce a structural analysis of coordinate structures on the syntactic strata (which, again, lack linear order), one has to impose a dependency-based analysis onto the conjuncts. There is, however, considerable empirical evidence suggesting that constituency is the principle that organizes the conjuncts of coordinate structures. In order to acknowledge the role of constituency, however, one has to acknowledge linear order.

While the discussion above has focused primarily on the synthesis perspective of the MTT model, the basic message is also valid for the analysis perspective. The current stance is that the analysis perspective of MTT is implausible insofar as it takes hierarchical order to be derived from linear order. The same sorts of difficulties are going to arise in this area. The necessity to produce analyses of certain phenomena while neglecting the role of hierarchical organization is going to deliver an inaccurate impression of the nature of these phenomena.

5 Concluding remarks

Some remarks about MTT and related DGs conclude this contribution. According to Kahane (2003:546), MTT was developed in the 1960s in Moscow as the theoretical background for a project to computationally parse Russian. The fact that Russian was the original object of inquiry is important, since as a Slavic language, the word order of Russian is of course quite free compared to that of other languages like English and German. This aspect of Russian likely influenced the development of the theory. In other words, the relatively free word order of Russian found an expression in MTT insofar as linear order could more easily be granted

secondary status. In this vein, it is worth taking note of Mel'čuk's (1988:4) comments concerning the creation of phrase structure (=PS) grammars of the Chomskian tradition:

> Even though it sounds a bit too Whorfian, I am fairly sure that PS-syntax could not have been invented and developed by a native speaker of Latin or Russian…To promote PS-syntax, one has to be under the overall influence of English, with its rigid word order and almost total lack of syntactically driven morphology. (Mel'čuk 1988:4)

While I agree with this statement, its expression raises a flag concerning the influences surrounding the creation of MTT. One should inquire, namely, whether a theory like MTT was originally conceivable because the object of inquiry was Russian (with its relatively free word order), and not, say, English (with its relatively fixed word order).

The message delivered with this contribution is that in many cases, linear order is not derived, but rather it is primitive. It is often encoded as an integral part of a construction. The relatively free word order of a language like Russian is explained in part by the assumption that relatively few constructions in Russian encode linear order, whereas relatively many constructions in a language like English or German do encode linear order. Russian, for instance, lacks an SV construction, a V2 construction, and a VF construction. Lacking these constructions, word order in Russian relies more on functional principles associated with information structure.

A final comment speculates about the inability of DG to establish a foothold in many linguistics circles. Compared to constituency-based syntax, dependency-based syntax is by most objective measures truly minimal. The expectation should therefore be that dependency-based syntax is preferred. The fact that it clearly is not – constituency-based systems still occupying center stage in theoretical linguistics (at least in North America) – should motivate one to question what DGs have overlooked. The unordered trees frequently produced by many DGs may play a negative role in this regard. Established and aspiring linguists who are first exposed to dependency-based theories encounter these unordered trees. The impression one gets is that DG is vague, the tree structures lacking linear order. Constituency-based systems, in contrast, necessarily encode linear order and thus linear order has been front and center for them from the start. DGs can perhaps learn a lesson in this area. Tree structures that encode linear order may be a more effective tool for conveying the advantages of dependency-based syntax, and given the message of this contribution, the ordered tree structures now enjoy greater theoretical legitimacy.

Bibliography

Croft, W. 2001. *Radical construction grammar: Syntactic theory in typological perspective*. New York: Oxford University Press.

Fillmore C., P. Kay & M. O'Connor. 1988. Regularity and idiomaticity in grammatical constructions: The case of *let alone*. *Language* 64:501-538.

Goldberg, A. 2006. *Constructions at work*. Oxford: Oxford University Press.

Goldberg, A. 2009. The nature of generalizations in language. *Cognitive Linguistics* 20:93-127.

Groß, T. 1999. *Theoretical foundations of dependency syntax*. Munich: Iudicium.

Hays, D. 1964. Dependency theory: A formalism and some observations. *Language* 40:511-525.

Holmes, J. & R. Hudson. 2005. Constructions in Word Grammar. J-O. Ostman & M. Fried (eds.), *Construction grammars: Cognitive grounding and theoretical* extensions, 243-272. Amsterdam: Benjamins.

Horn, G. 2003. Idioms, metaphors, and syntactic mobility. *Journal of Linguistics* 39.245-273.

Hudson, R. 1990. *An English Word Grammar*. Oxford: Basil Blackwell.

Kahane, S. 2003. The Meaning-Text Theory. V. Ágel et al. (eds.), *Dependency and valency: An international handbook of contemporary research*, vol. 1, 546-569. Berlin: Walter de Gruyter.

Kay, P. & C. Fillmore. 1999. Grammatical constructions and linguistic generalizations: The What's X doing Y? construction. *Language* 75:1-33.

Lakoff, G. 1987. *Women, fire, and dangerous things: What categories reveal about the mind*. Chicago: The University of Chicago Press.

Mel'čuk, I. 1988. *Dependency syntax: theory and practice*. Albany: State University of New York Press.

Mel'čuk, I. 2003. Levels of dependency description: Concepts and problems. V. Ágel et al. (eds.), *Dependency and valency: An international handbook of contemporary research*, vol. 1, 188-229. Berlin: Walter de Gruyter.

O'Grady, W. 1998. The syntax of idioms. *Natural Language and Linguistic Theory*16:79-312.

Osborne, T. 2005. Beyond the constituent: A dependency grammar analysis of chains. *Folia Linguistica* 39:251-297.

Osborne, T. 2006a. Shared material and grammar: A dependency grammar theory of non-gapping coordination. *Zeitschrift für Sprachwissenschaft* 25:39-93.

Osborne, T. 2006b. Parallel conjuncts. *Studia Linguistica* 60(1):64-96.

Osborne, T. 2008. Major constituents: And two dependency grammar constraints on sharing in coordination. *Linguistics* 46(6):1109-1165.

Osborne, T., M. Putnam & T. Groß (in press). Catenae: Introducing a novel unit of syntactic analysis. *Syntax*.

Sag, I. 2010. Sign-Based Construction Grammar: An informal synopsis. H. Boas & I. Sag (eds.), *Sign-Based Construction Grammar*, 39-160. CSLI.

Starosta, S. 1988. *The Case for Lexicase: An Outline of Lexicase Grammatical Theory*. New York: Pinter Publishers.

Tesnière, L. 1959. *Éléments de syntaxe structurale*. Paris: Klincksieck.

Tesnière, L. 1969. *Éléments de syntaxe structurale*, 2nd edition. Paris: Klincksieck.