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Form and Function in the Evolution of Grammar
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Abstract:	<p>This paper focuses on the evolutionary claims of the Simpler Syntax model developed by Jackendoff and his colleagues. It is argued that there is little support for the idea each step in the development of grammar described in this model was shaped by biological evolution. However, one central aspect of Jackendoff's general approach — the idea of the autonomy of syntax — poses a challenge to the idea, central to most functionalist approaches, that the nature of grammar is a product of purely historical (as opposed to biological) evolution.</p>

Form and Function in the Evolution of Grammar

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1. Introduction

An enormous amount has been written on language evolution in the past two decades, including several dozen books, and hundreds of articles and book chapters. However, the bulk this body of work has little to say about grammar *per se*. Rather, it looks at language as a cultural tool for communication and tries to localize its origins in some (predominantly) cultural change, whose result is increased communicative success. Among the hypothesized triggering factors are shared intentionality (Tomasello et al. 2005); a bonding mechanism in order to use social time more efficiently (Aiello and Dunbar 1993); social grooming (Dunbar 1996); female coalitionary strategies (Power 1998); female choice of mate (Miller 2001); territorial scavenging (Bickerton 2009); need for mother-child communication (Falk 2004); and foraging efficiency among hunter-gatherers (MacDonald and Roebroeks 2013).

There is certainly nothing amiss about looking at cultural prerequisites for language. But a cultural focus is not likely to lead to an understanding of why grammatical systems have the architectural properties that they have, why long-distance dependencies exist and how they are constrained, what determines the set of grammatical categories and relations across languages, why some word orders are more common than others, and how syntax, morphology, semantics, and phonology interact.

I offer this paper as a contribution to the discussion of the origins and evolution of grammar. Rather than put forward a new theory of language origins, I look at the developments in terms of the interaction of formal factors and functional factors and their relative weight. In §2, I review a few of the leading approaches, focusing on the role that functional explanation plays in each approach. Section 3 is devoted to examining in depth some evolutionary claims presented in Jackendoff (2002) and later work by the same scholar (especially Culicover and Jackendoff 2005 and Jackendoff and Wittenberg 2014), again focusing on the form-function interplay in that work. Section 4 discusses a topic that is rarely addressed in language evolution studies, namely the fact that grammars are structural systems, in which syntax manifests a considerable degree of autonomy with respect to meaning and use. Section 5 provides some highly speculative remarks on how the autonomy of syntax may have originated and §6 is a brief conclusion.

2. Approaches to the origins and evolution of grammar

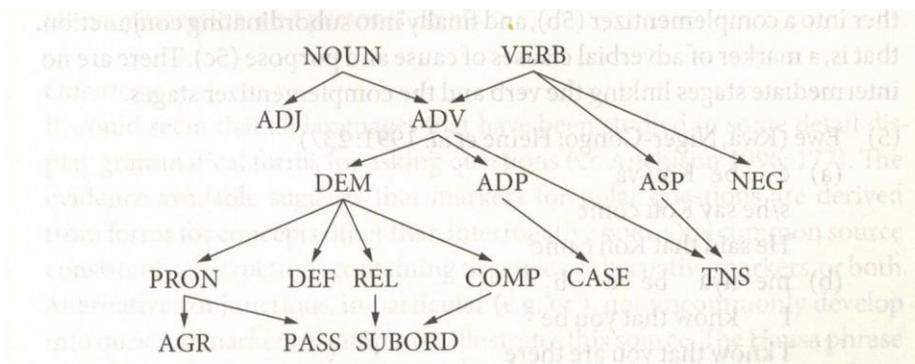
It should not be surprising that the publications that focus on the evolution of grammar differ markedly from each other, given the lack of consensus on the correctness of any particular model of grammar. As Jackendoff has aptly put it: ‘Your theory of language evolution depends on your theory of language’ (Jackendoff 2010: 63). For a starting point, let us take the classic divide among linguistic theories, namely between those that are ‘formal’ in orientation and those that are ‘functional’. In a nutshell, formal theories posit a formal structural system at the heart of language. Functional theories take as a given the idea that the main purpose of language is communication and that grammars have been shaped to reflect communicative needs, though such theories differ from each other on the degree to which purely structural generalizations exist in language. Surprisingly (as we will see), everybody’s theory of language evolution is functionalist to one degree or another, even those approaches that focus on the formal aspects of language. By this I mean that all theories posit evolutionary events specific to language that have been shaped by natural selection or its kin genetic assimilation (the Baldwin Effect) and/or grammatical features that derive evolutionarily from domain-general capacities (i. e., those that are not specifically restricted to language). The functionalist nature of natural selection needs no comment. And in linguistics, for better or worse, explanations appealing to domain-general capacities (i. e., those that appeal to external cognitive and/or communicative factors) are generally described as ‘functionalist’.

The following subsections discuss four approaches to grammatical evolution: the grammaticalization-based theory of Heine and Kuteva (2002) (§2.1); followed by §2.2, which presents three approaches that assume an innate Universal Grammar (UG).¹

2.1. A purely functionalist approach

We begin with an explicitly functionalist non-UG-based theory of language evolution: Heine and Kuteva’s book *The genesis of grammar* (Heine and Kuteva 2007). In this theory, the unidirectional process of grammaticalization has led to the progressive elaboration over time of grammatical systems, with no need for guidance from a grammar-specific UG. Figure 1 gives a picture of the sequence of historical – not evolutionary – developments (from Heine and Kuteva 2002: 383):

¹ For a comprehensive critical overview of approaches to the evolution of grammar, see Hurford (2012). Hurford himself opts for a Construction-Grammar-based approach, which space limitations do not allow me to present.



ADP=adposition; ADJ=adjective; ADV=adverb; AGR=agreement; ASP=aspect; COMP=complementizer; DEF=definite marker; DEM=demonstrative; NEG=negation; PASS=passive; PRON=pronoun; REL=relative clause marker; SUBORD=subordination marker; TNS=tense

Figure 1: The unidirectional paths of grammaticalization in Heine and Kuteva (2002)

Heine and Kuteva have also speculated that verbs derive historically from nouns, though they have remained agnostic about what started the whole process going. The Heine-Kuteva model is probably the predominant one among functional and cognitive linguists. A question that might be asked is the following: If grammaticalization is unidirectional, then why wasn't it 'complete' tens of thousands of years ago? The answer is that forces (phonetic erosion, contact-induced simplification, etc.) wear down what grammaticalization has created, so the process keeps recycling. It needs to be stressed that in their approach there is little discussion of the systematic aspects of grammars and how such aspects might have originated and developed.

2.2. UG-based approaches to evolution

There are two broad classes of UG-based approaches to evolution: abrupt and incremental. The leading abrupt approach is put forward by advocates of the Minimalist Program (Chomsky 1995 and much subsequent work) (§2.2.1). Two incremental approaches of note are Layered Minimalism (Progovac 2009, 2014, 2015) (§2.2.2) and Simpler Syntax (Jackendoff 2002; Culicover and Jackendoff 2005) (§2.2.3).

2.2.1. The Minimalist Program

The most visible UG-based approach to grammar (and the evolutionary origins of grammar) is the Minimalist Program (MP). On the surface, the MP seems

utterly non-functional, given that the narrow faculty of language (FLN) is given a purely structural characterization:

[We] propose in this hypothesis that FLN comprises only the core computational mechanisms of recursion as they appear in narrow syntax and the mappings to the interfaces. (Hauser et al. 2002: 1573)

But clearly there is more to grammar *as a whole* than recursion. Where is the remainder handled? The answer can be gleaned from Chomsky's discussion of what he calls 'the three factors in language design', namely, genetic endowment, experience, and principles not specific to the faculty of language (Chomsky 2005). Having limited the genetic endowment specific to language to recursion and minimizing (as always) the role of experience, Chomsky appeals heavily to third factor principles:

The MP seeks to approach the problem 'from the bottom up': How little can be attributed to UG while still accounting for the variety of I-languages attained, relying on third factor principles. (Chomsky 2007: 4)

As far as third factor principles are concerned:

[they fall] into several subtypes: (a) principles of data analysis that might be used in language acquisition and other domains; (b) principles of structural architecture and developmental constraints that enter into canalization, organic form, and action over a wide range, including principles of efficient computation, which would be expected to be of particular significance for computational systems such as language. It is the second of these subcategories that should be of particular significance in determining the nature of attainable languages. (Chomsky 2005: 6)

'Principles of data analysis' and wide-ranging 'developmental constraints' are just the sort of constructs that functionalists have stressed over the years (see, for example, Tomasello 2003). In other words, Chomsky's theory, taken as a whole, has become a functionalist one. As an example of how formal principles have been replaced by functional ones within the MP, consider the following. Kayne (1994) provided an elaborate UG-based parametric explanation of why rightward movement is so restricted in language after language. Ackema and Neeleman (2002), on the other hand, argue that the lack of acceptability of structures in 'right-displaced' position should not be accounted for by syntax proper (that is, by the theory of competence), but rather by the theory of performance. In other words, they provide a third-factor explanation.

It is also worth pointing out that the evolutionary appearance of grammar, given minimalist assumptions, was not necessarily abrupt, despite the claims in the following quote:

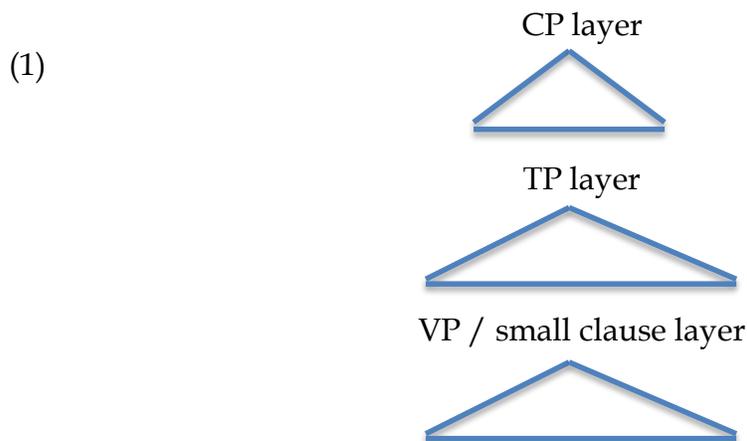
There is no possibility of an ‘intermediate’ syntax between a non-combinatorial syntax and full natural-language syntax – one either has Merge in all its generative glory, or one has effectively no combinatorial syntax at all, but rather whatever one sees in the case of agrammatic aphasics: alternative cognitive strategies for assigning thematic roles to word strings. (Berwick 1997: 248)

But Brady Clark has pointed out the MP does allow for gradualism in language evolution:

In conclusion, syntactocentric architectures like the one presupposed by most work within the Minimalist Program are compatible with an incremental view of the evolution of syntax. The evolution of syntax on minimalist assumptions must have involved several distinct stages, including the evolution of Merge, the evolution of words, and externalization. One or more of these stages (for example, the emergence of Merge) might have involved further stages, once FLB and FLN are distinguished. (Clark 2013: 191)

2.2.2. Layered Minimalism

Progovac (2015) assumes the basic picture of minimalist clause structure, as illustrated in (1), where a VP (or small clause) layer is embedded in a TP layer, which is itself embedded in a CP layer:



It is postulated that each higher level was added gradually over evolutionary time. In Progovac’s view, the addition of each new level of structure was

functionally motivated, in that the human communicative capacity was thereby increased.

It is difficult for me to evaluate Progovac's theory, since it is wedded to a view of clause structure that I do not share. I can certainly see how the deepest layer – tenseless small clause-like structures – would be a huge evolutionary step forward from single word utterances. But I have a hard time imagining biological evolution favouring the addition of the TP and CP levels. After all, if David Gil is right, Riau Indonesian speakers get along very well without these layers (see §3.3 below). Nevertheless, if one accepts the view of clause structure that is put forward in mainstream approaches to syntax, Progovac's theory is an interesting alternative to the (on paper) 'everything at once' approach of Chomsky, Berwick, and others.

2.2.3. Simpler Syntax

The 'Simpler Syntax' theory of Ray Jackendoff and his collaborators is the most prominent UG-Based approach that is explicitly incrementalist. In this model, language evolution proceeded in stages, each stage improving communicative efficiency. Figure 2 illustrates:

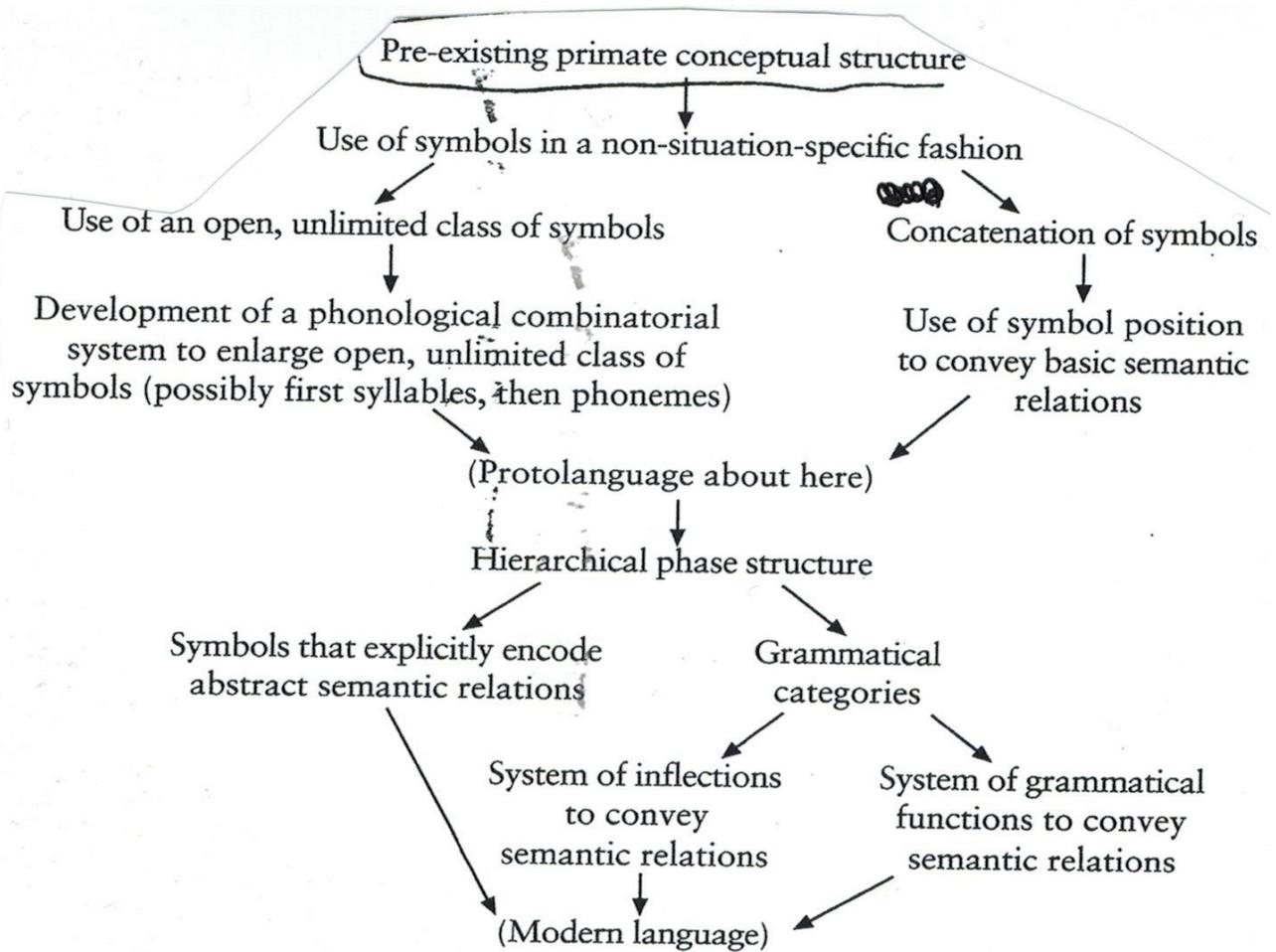


Figure 2: The incremental evolutionary steps posited in Jackendoff (2002)

Furthermore, each stage represented a change to the human genome, shaped by the Baldwin effect (see especially Jackendoff 2007: 394). For example, he writes about the grammatical function tier: 'There is something innate about it' (Ray Jackendoff 2002: 539)

In Jackendoff's theory, the earlier stages of evolution are still visible as 'living fossils' in certain speech varieties. So Protolanguage manifests itself today in the agrammatic speech of Broca's aphasics, in pidgins, and in the 'Basic Variety' spoken by second language learners. Finally, in this approach, UG is a 'toolkit', in the sense that not all languages need choose all of its elements:

Universal Grammar is not supposed to be what is universal among languages: it is supposed to be the 'toolkit' that a human child brings to learning any of the languages of the world. ... When you have a toolkit, you are not obligated to use every tool for every job. Thus we might

expect that not every grammatical mechanism provided by Universal Grammar appears in every language. (Jackendoff 2002: 75)

The following section focuses exclusively on the Simpler Syntax model of grammatical evolution. I conclude that there is very little evidence that the later stages represented in Figure 1 arose in the course of biological (as opposed to historical) evolution.

3. The Simplex Syntax model: Formal and functional considerations

This section examines the principal claims of the Simpler Syntax model with respect to the evolution of grammar. It concludes that its incremental approach to the development of UG lacks convincing empirical evidence. In particular, it address the following five questions, each of which is discussed in a separate subsection: Are syntactic categories, grammatical functions, theta-roles, and their possible interactions provided by an innate UG? (§3.1); Do we find ‘living fossils’ in speech varieties spoken today? (§3.2); Do the incremental steps aid communication to the point that they would be incorporated into the genome? (§3.3); Is ‘decremental’ development attested? If so, how can that be reconciled with an incremental model? (§3.4); Are there alternative explanations for the development of morphosyntactic complexity that do not involve biological evolution? (§3.5).

3.1. Are syntactic categories, grammatical functions, theta-roles, and their possible interactions provided by an innate UG?

How do we know what is innate? The usual answer appeals to ‘arguments from the poverty of the stimulus’ (APS). APS have generally been applied to motivate highly abstract syntactic principles – the sorts of principles that Jackendoff generally rejects. So the question is whether there are APS to motivate the hypothesized innateness of well-accepted grammatical constructs, such as categories, grammatical relations, thematic roles, and so on. That is not clear. Consider syntactic categories. Most formal linguists simply *assume* that the inventory of categories – and in some frameworks there are dozens or even hundreds of them – is innate. Chomsky wrote long ago: ‘I shall assume that these elements [syntactic categories] too are selected from a fixed universal vocabulary’ (Chomsky 1965: 65-66). However, APS to that effect are lacking. In fact, there is some evidence that categories can be learned inductively, using distributional evidence (Gerken et al. 2005: 25; Redington et al. 1998). Hurford (2012: 331-336) concludes (contra Croft 2001 and other radical construction grammarians) that the noun/verb and functional/lexical distinctions have neurological correlates. But at the same time he emphasizes that ‘that this does not entail that biology in any sense codes for, or hardwires, these [Noun and Verb] syntactic categories’ (p. 307). In his

view, humans are biologically equipped to learn systems incorporating nouns and verbs, but are not narrowly biased to learn these particular categories.

What about grammatical relations like 'subject', 'direct object', and 'indirect object'? Are they innate? Any theory that says that they are innate runs up against the fact that not all languages have them. Along these lines, Van Valin and LaPolla (1997) and Kibrik (1997) show that not all languages present evidence to the language learner that would lead him or her to posit distinct grammatical relations. Based on the work of Mark Durie (1985, 1987), Van Valin and LaPolla identify Acehnese as one such language and Primus (1999) makes the same point with respect to Guarani and Tlingit. No learner of these languages would be led to posit a distinction between subjects and objects. Now, logically, a construct can be innate, but not be universally attested, as in Jackendoff's 'toolkit' approach. But the absence of distinct grammatical relations in a number of languages should lead us to be skeptical that they are provided by an innate UG.

As far as thematic roles are concerned, they very well might be innate, given that they represent core elements of human (and, possibly, pre-human) cognition. But Jackendoff strongly implies that the *hierarchies* linking thematic roles, grammatical relations, and word order are also innate. For example, Jackendoff (2002: 247-248) writes that the principle 'Agent First' is inherited from Protolanguage and appears as a 'default principle' in modern language. Thematic hierarchies would not be my main candidates for innate knowledge, given the fairly clear functional motivation for many of them. Cognitive and functional linguists have rooted Agent First and other hierarchies in notions such as 'perceptual salience', 'communicative efficiency', and so on. In brief, agents tend to be topical and topics grammaticalize to subjects. For Goldberg (2006), agents come first because they are more perceptually salient than patients. If approaches such as these are on the right track, the positing of innate knowledge of the relevant hierarchies might not be necessary.

So the answer to the question: 'Are syntactic categories, grammatical functions, theta-roles, and their possible interactions provided by an innate UG?' is 'Possibly, but there is no strong evidence to that effect'.

3.2. Do we find 'living fossils' in speech varieties spoken today?

Many investigators have found 'living fossils' in language today, that is, elements present in modern language that are taken to be evolutionary holdovers from an earlier stage of language evolution. There are many examples, though they differ from researcher to researcher. A non-exhaustive list includes single-word utterances like *shh* and *hello* (Jackendoff 2002: 240); the 'Basic Variety' (Klein and Perdue 1997) used by second-language learners (Jackendoff 2002: 247); pidgins (Bickerton 1990 and much later work, Jackendoff 2002: 248); agrammatism in aphasia (Bickerton 1990 and much later work); principles like 'Agent First' and 'Focus Last' (Jackendoff 2002: 249); compound nouns like *snowman* and *blackboard* (Jackendoff 2002: 249); sentential adverbs (Jackendoff 2002: 255); default inheritance hierarchies (Hurford 2012: 515); small clauses

(Progovac 2015); exocentric V-N compounds (Progovac 2015); Motherese (Falk 2004); and the linguistic behaviour of contemporary hunter-gatherers (MacDonald and Roebroeks (2013).

Jackendoff himself is very cautious about reading too much into the idea of living fossils:

Following the lead of Bickerton and many others, I will draw on evidence from child language, late second language acquisition, aphasia, pidgin languages, and ape language experiments. It is of course never clear how relevant such evidence is for evolutionary concerns – in particular, to what degree ontogeny really recapitulates phylogeny. Nevertheless, this is all the evidence we've got, so we must make the most of it, while recognizing that it should be taken with a grain of salt. (2002: 237)

There are a number of questions that one can raise about 'living fossils'. First of all, from the fact that some contemporary speech variety is in some obvious sense 'simpler' than modern language combined with the reasonable assumption that the earliest human languages were simpler than those spoken today, does it follow that this simpler speech variety is a 'throwback' to an earlier evolutionary stage of language? I think not (see especially Fitch 2010, Tallerman 2011, Botha 2012: 1313). Pidgins and the Basic Variety, for example, might just be the result of bare-bones communicative strategies called upon by people who already have a full human I-language. And as far as the Basic Variety is concerned, even some of the most die-hard advocates of UG reject the idea that it is an I-language (as opposed to something resulting from general learning strategies: Bierwisch 1997 and Meisel 1997, for example). If that is the case, then it is hard to see how it could count as a living fossil.

The facts surrounding agrammatism are even murkier. First of all, there is a huge range of deficits that fall under the heading 'agrammatism'. Which of these are intended to be the 'true' living fossils? And not all neurolinguists agree that agrammatism is even a deficit of the grammatical system. Quite a few maintain that it results from a limitation of cognitive capacities, rather than from a deficit of syntactic competence.

As far as finding living fossils in modern human grammar is concerned, does evolution really work that way? For example, Jackendoff argues that compounds are living fossils and Progovac attributes the same property to small clauses. What would an evolutionary parallel be? Are there little swim bladders embedded in our lungs? Do dolphin flippers have mammalian feet inside of them? Certainly, evolution builds on existing layers and at times traces of those earlier layers are revealed. But rarely if ever are those layers preserved intact over evolutionary time.

3.3. Do the incremental steps aid communication to the point that they would be incorporated into the genome?

It is clear that the earlier (pre-Protolanguage) steps of the Jackendoff progression are selectionally advantageous. The ability to use an unlimited class of symbols and to concatenate them was obviously a great leap forward evolutionarily. There is selective advantage in being able to convey an unlimited range of meanings. But what about the later steps in the progression: the steps that added grammatical categories, grammatical relations, and so on? That is not clear. Jackendoff asserts that they were indeed incorporated into the genome:

I will not inquire as to the details of how increased expressive power came to spread through a population (I agree with practically everyone that the 'Baldwin effect' had something to do with it), [a footnote here describes the Baldwin effect] nor how the genome and the morphogenesis of the brain accomplished these changes. (Jackendoff 2002: 237)

Was the gain in expressive power (if it was indeed accomplished) sufficient for the Baldwin effect to do its work? It is true that a more elaborated grammar can overtly express more semantic nuances, but at the same time elaboration can slow down production (if a lot needs to be made overt). Grammaticalization-related changes can offset this slowdown to a certain extent, by shortening the time needed to express certain frequently-called upon concepts (affixes are faster to produce than words). Viewed from another angle, a less elaborated grammar seems to place more interpretive demands on the hearer, but requires less syntactic processing. We simply do not have a good way of measuring whether overall communication is enhanced by more elaboration.

The strongest reason to doubt that biological evolution has shaped grammatical elaboration is the fact that there are languages that do very well without some of the putatively evolved devices. So there are languages that present little or no evidence of hierarchical phrase structure, such as the Australian languages Warlpiri, Jiwari, and Wambaya (Hale 1983, Nordlinger 1998, Austin 2001). There are languages (as we have seen) that present no evidence for grammatical relations. There are languages lacking sentential recursion, or where, at least, recursion is highly restricted (Pirahã; see Everett 2005). And there are languages lacking major categorial distinctions (Riau Indonesian; see Gil 2007). The question is whether these languages are less expressive than languages with the 'full set' of features. Gil says such is not the case for Riau (see especially Gil 2009). In any event, how would one test the idea that one language might be more 'expressive' than another?

I have no problem with UG as a 'toolkit', but we need to acknowledge that speakers of languages having only hand tools manage to build the necessary structures as well as speakers that have power tools.

3.4. Is 'decremental' development attested? If so, how can that be reconciled with an incremental model?

Do some languages 'regress', in the sense that they lose features that are putatively evolutionarily 'advanced'? The answer is 'yes'. Starting with grammatical relations, it is apparently the case that some (if not all) languages that lack them now did have them at an earlier stage in their history. John Lawler has told me (p.c.) that comparative evidence points to Acehnese being an innovation, as far as grammatical relations are concerned. Closely-related Austronesian languages do indeed have them.

The same point can be made about the miniscule categorial inventory of Riau Indonesian. Related languages are much more 'developed' in terms of their categorial inventory. As Gil (2005) notes:

Comparison of Riau Indonesian with related Austronesian languages suggests that their common ancestor, Proto-Austronesian, spoken perhaps 5000 years ago, was substantially more complex than Riau Indonesian in many grammatical domains. Thus, at some stage between Proto-Austronesian and Riau Indonesian, the accretion of complexity must have been reversed ... (p. 375).

While we know nothing about the prehistory of Pirahã, the loss of recursive structures has been observed in a number of cases. Matsumoto (1988) calls attention to two ways of expressing in Japanese the proposition 'Although Taro is young, he does a good job'. One is by the simple conjunction of the two main propositions (2a), the other by use of the adversative subordinating suffix *-ga* (2b):

- (2) a. Taro-wa wakai(-yo). Ga, yoku yar-u(-yo)
Taro-TOP young. but well do-PRES
'Taro is young. But he does a good job.'
- b. Taro-wa wakai-ga, yoku yar-u(-yo)
Taro-TOP young, well do-PRES
'Although Taro is young, he does a good job.'

According to Matsumoto, paratactically-formed sentences such as (2a) have been recorded only since the seventeenth century, while the hypotaxis manifested in (2b) is observed much earlier. In other words, a recursive structure was lost (for more discussion of this and similar cases, see Traugott 1997).

The loss of case markers is so well attested in Indo-European that no examples are necessary. The absence of case markers is often accompanied by rigid word order, but not always. On the one hand, a number of languages have

no case marking, yet allow very flexible word order. Steele (1978) lists Classical Aztec, Karok, Achi, Wiyot, Tuscarora, Garadjari, and Maleceet-Passamoquoddy in this group and goes so far as to claim that 'the presence or absence of case marking has nothing to do with freedom of word order' (Steele 1978: 610). In fact, of the eight free word order languages in the sample discussed in Siewierska and Bakker (1996), three lack case marking. Conversely, some languages, like Khamti, combine case marking with rigidity of word order (Mallinson and Blake 1981). That is even partly true for English, which case-marks pronouns, but does not thereby grant them freedom of occurrence (**I saw in the garden her*).

As far as losing the putatively 'ancient' principle Agent First is concerned, any OS language that derives historically from an SO language has done just that. Quite a few languages have comment-before-topic ordering. The Nilotic languages (Payne 1990: 11), for example, have no topic-comment structures at all. Other languages, such as Ojibwa (Tomlin and Rhodes 1979), Ute (Givón 1983), O'odham (Papago) (Payne 1987), and Cayuga (Mithun 1987) have more comment-before-topic structures than topic-before-comment structures. And the great majority of languages allow at least some structures of the former type. If agents correspond generally to topics and patients to comments, it seems likely that many of these language have lost their 'agent-firstness'.

So the question is how decremental development can be reconciled with an incremental model. If the development of a certain grammatical feature represents an evolutionary advance, then why would a language lose that feature, in most cases without any obvious compensating gain elsewhere? If speakers think of UG is a toolkit, then why would they stop using a useful tool?

3.5. Are there alternative explanations for the development of morphosyntactic complexity that do not involve biological evolution?

The essential question here is whether it is *necessary* to posit biological evolution to account for the development of the grammatical features that Jackendoff considers to have arisen post-Protolanguage. The answer appears to be 'no'. The literature of diachronic linguistics is rich with examples of how these features have developed over time by means of 'natural' processes of language change.

Let us start with grammatical relations (for an overview, see Cristofaro 2014). One common development is the transformation of topic markers into subjects. König (2008) gives a number examples of this change in various African languages. In the Australian language Bagandji, subjects developed from demonstratives (McGregor 2008) and in the Sahaptian languages from directional markers (Rude 1997). Objects as well have historical sources – it is not necessary to assume that an evolutionary event was responsible for their appearance in grammar. For example, object markers can develop from 'take' verbs in constructions of the type 'take X and Verb (X)'. Such a development has

been described for Mandarin Chinese (Li and Thompson 1981) and West African languages (Lord 1993).

Kulikov (2009) gives a detailed account of how case systems can arise over historical time. One common source of case morphemes is adpositions, where the development is attested in Indo-Aryan, Lithuanian, and Iranian. Other sources for case markers are adjectives and adverbials, and indexical elements such as pronouns and articles.

Even some of the features that Jackendoff considers to be evolutionarily ancient can arise through normal language change. The foremost of these is recursion. Deutscher (2000) documents the origins of finite recursive structures in Akkadian over the millennia in adverbial constructions and from the merging of two distinct arguments of a verb into one complement clause. The complementizers themselves arose from demonstratives. Another example of historically attested rise of recursivity is what happened in Sranan (Heine and Kuteva 2007). In its pidgin stage there were no formally marked relative clause structures at all. In a period of only a couple of hundred years, the demonstrative *disi* 'this' evolved into a relativizer with the concomitant development of full relative clause structures. If the Akkadian and Sranan cases are representative, it may not be necessary to appeal to biological evolution to explain the origins of recursivity, much less to assume that it was the major defining feature of the transition from non-language to language.

As we have seen, for both Jackendoff and Progovac, compounds are 'living fossils', harking back to the earliest stage of language, Jackendoff finding noun-noun compounds to be particularly ancient. But in fact new ones are created in spontaneous speech when needed. Downing (1977) gives examples like *pumpkin bus*, *giraffe-cow*, and *hedge hatchet*. Compounds also seem to arise naturally in languages like Chinese that have developed increasingly reduced syllable structure over time and lack simplex accomplishment verbs (Huang to appear).

It is not easy to find examples of specific grammatical phenomena that *necessarily* arose via biological evolution. In all or almost all cases, understood processes of diachronic change suffice to explain their appearance. That is, UG may well be a toolkit, but speakers seem to avoid going to the trouble of shopping in the hardware store, given that they know that they can easily make the tools themselves.

3.6. Summary and a look ahead

We have asked five questions about the Simpler Syntax approach with respect to innatist claims about the evolution of grammatical properties. In each case, we have found reasons to doubt that an innate UG was necessary. Indeed, classical functionalist approaches that posit historical (as opposed to biological) evolution appear to be adequate. Does that mean that a purely historical approach to the

evolution of grammar will suffice? I would argue not. There is one crucial design feature of language that has to be accounted for by any theory of language origins: the fact that grammars are *structural systems*. Classically (i. e., since Chomsky 1957), this property of language has been known as the ‘Autonomy of Syntax’ (AS). In a nutshell, AS posits that syntactic patterning has an algebra of its own, not derivable from meaning, function, or language use. In fact, Ray Jackendoff, more than almost anybody else, has been a leading advocate of such an idea (see Jackendoff 1990). Yet oddly, accounting for existence of AS plays a very small role in his writings on language evolution. The following section presents evidence for AS, while §5 discusses whether its existence supports the idea of an innate UG that evolved over evolutionary (as opposed to historical) time.

4. The autonomy of syntax

Several types of structurally-based morphosyntactic generalizations illustrate AS. They are, first, the existence of broad architectural constraints on how grammatical components interact (§4.1); second, the existence of purely structural crosslinguistic constraints (§4.2); and third, the existence of purely structural generalizations within a language (§4.3).²

4.1. The existence of broad architectural constraints on how grammatical components interact

In a series of publications written by Geoffrey Pullum and Arnold Zwicky (Zwicky and Pullum 1983, 1986; Miller et al. 1997), the following principle is defended:

(3) The Principle of Phonology-Free Syntax (PPFS): In the grammar of a natural language, rules of syntax make no reference to phonology.

PPFS is too strong: There are syntactic rules that seem to refer to suprasegmental aspects of phonology, including syllable structure, phonological weight, and aspects of stress and intonation. However, a weaker version of PPFS does appear to be viable:

(4) The Principle of Segmental Phonology-Free Syntax (PSPFS): In the grammar of a natural language, rules of syntax make no reference to segmental phonology.

According to PSPFS, there is no language where the process forming, say,

² Due to space constraints only, one example of each type will be provided.

passives, or displaced question elements, or inverted auxiliaries pays attention to the phonological shape of any or all of the segments in one of the elements undergoing the process. There are no languages in which only verbs containing front vowels passivize or in which the word order of two adjoining constituents is determined by the relative sonority of their initial consonants. This constraint is surprising, given the widespread agreement that phonological rules have access to syntactic information (see Selkirk 1972, Kaisse 1985, and much subsequent work). There is no (logically) necessary reason why language should incorporate this architectural feature, nor is there any obvious functional explanation for this interesting fact. Nor is PSPFS a principle likely to have developed over historical time. Hence it may well be a feature of innate UG.³

4.2. The existence of purely structural crosslinguistic constraints

The existence of purely structural crosslinguistic constraints also supports AS. Consider an example from Baker (1988), based on earlier work by Mithun (1984, 1986). There is a universal constraint that in transitive clauses, the direct object may be incorporated into the verb, but not the subject. So complex incorporated verbs like those in (5a) are possible, but not like those in (5b):

- (5) a. The baby house-likes.
b. *Martin baby-likes the house.

Note that there is nothing semantically or pragmatically deviant about (5b). One could imagine an interpretation along the lines of 'Martin likes the house in the manner of a baby'. Baker's explanation is a purely structural one. A principle of UG (the Empty Category Principle) blocks movement of a subject 'downward' towards the verb.

4.3. The existence of purely structural generalizations within a language

The principal support for AS derives from the existence of purely structural generalizations within a language. Many syntactic patterns have a 'reality' independently of the meanings with which they are associated. Consider the adjective with infinitival complement structure in English:

- (6) Noun - Copula - Adjective - Infinitive

There are six logically possible ways that the NP subject can relate (in terms of understood semantic relations) to the Adjective and the Verb. All six occur:

³ Phenomena in Somali and French seem to refute the PSPFS. See Zwicky and Pullum (1983) and Miller et al. (1997) respectively for arguments that they do not do so.

(7) Relation of NP subject	to A	to V
a. Mary is eager to please	subject	subject
b. Mary is easy to please	none	object
c. Mary is liable to be offended	none	subject
d. Guns are cheap to buy	subject	object
e. It is useless to try	none	none
f. It is too dark to see	subject	none

Clearly there is something 'real' about that pattern itself, whatever meanings or uses it might manifest. In other words, formal patterns in language have an autonomy, that is, they are not directly derivable from meaning or use.

5. Some speculative remarks on the origins of the autonomy of syntax⁴

The existence of AS is perhaps unexpected, given that it plays no obvious role in the two major functions of language: communication and thought. Why does it exist then? One might speculate that it is the very multifunctionality of language that is behind its origins. What is good design from the point of view of enabling rational thought might not be good design from the point of view of communication. And, as we have known for over a century (Passy 1890, Gabelentz 1891), what is good design from the point of view of the speaker is not necessarily good design from the point of view of the hearer. The problem, then, is to provide grammar with the degree of stability rendering it immune from the constant push-pull of conflicting forces. A natural solution to the problem is to provide language with a relatively stable core immune to the immanent pressure coming from all sides. That is, a natural solution is to embody language with a structural system at its core. Put another way, the autonomy of syntax is a clever design solution to the problem of how to make language both learnable and usable. This system allows language to be nonarbitrary enough to facilitate acquisition and use and yet stable enough not to be pushed this way and that by conflicting forces. In short, there are good functional reasons for the autonomy of syntax.

The crucial question is whether the functional explanation for AS lies at the evolutionary level or at the historical level. My intuition – and it is only an intuition – is to opt for the former possibility. One can see fairly easily how grammaticalization and other historical processes shaped the origins of syntactic categories, grammatical relations, and even recursivity. But I know of no 'natural' historical processes that would have engendered the autonomy of syntax. An important research project for the future is to probe its evolutionary origins.

⁴ Some of the comments in this section are elaborated upon in Newmeyer (1998).

6. Conclusion

This paper has examined several leading approaches to the evolution of grammar, focusing on the relative centrality of formal and functional contributing factors. Interestingly, all theories accord central importance to functional factors. The core of the paper focuses on the evolutionary claims of the Simpler Syntax model developed by Jackendoff and his colleagues. It is argued that there is little support for the idea each step in the development of grammar described in this model was shaped by biological evolution. However, one central aspect of Jackendoff's general approach – the idea of the autonomy of syntax – poses a challenge to the idea, central to most functionalist approaches, that the nature of grammar is a product of purely historical (as opposed to biological) evolution.

REFERENCES

- Ackema, Peter and Ad Neeleman. 2002. Effects of short term storage in processing rightward movement. In *Storage and computation in the language faculty*, ed. Sieb Noteboom, Fred Weerman, and Frank Wijnen. 219-56. Dordrecht: Kluwer.
- Aiello, Leslie C. and Robin I. M. Dunbar. 1993. Neocortex size, group size, and the evolution of language. *Current Anthropology* 34: 184-93.
- Austin, Peter. 2001. Word order in a free word order language: The case of Jiwari. In *Forty years on: Ken Hale and Australian languages*, ed. Jane Simpson, et al. 305-23. Canberra: Pacific Linguistics.
- Baker, Mark C. 1988. *Incorporation: A theory of grammatical function changing*. Chicago: University of Chicago Press.
- Berwick, Robert C. 1997. Syntax facit saltum: Computation and the genotype and phenotype of language. *Journal of Neurolinguistics* 10: 231-49.
- Bickerton, Derek. 1990. *Language and species*. Chicago: University of Chicago Press.
- Bickerton, Derek. 2009. *Adam's tongue: How humans made language, how language made humans*. New York: Hill and Wang.
- Bierwisch, Manfred. 1997. Universal Grammar and the Basic Variety. *Second Language Research* 13: 348-66.
- Botha, Rudolf. 2012. On protolanguage and the 'God particle'. *Lingua* 122: 1308-24.
- Chomsky, Noam. 1957. *Syntactic structures*. The Hague: Mouton.
- Chomsky, Noam. 1965. *Aspects of the theory of syntax*. Cambridge, MA: MIT Press.
- Chomsky, Noam. 1995. *The minimalist program*. Cambridge, MA: MIT Press.
- Chomsky, Noam. 2005. Three factors in language design. *Linguistic Inquiry* 36: 1-22.
- Chomsky, Noam. 2007. Approaching UG from below. In *Interfaces + recursion = language?*, ed. Uli Sauerland and Hans-Martin Gärtner. 1-29. Berlin: Mouton de Gruyter.
- Clark, Brady. 2013. Syntactic theory and the evolution of syntax. *Biolinguistics* 7: 169-97.
- Cristofaro, Sonia. 2014. Competing motivation models and diachrony: What evidence for what motivations? In *Competing motivations in grammar and usage*, ed. Brian MacWhinney, Andrej Malchukov, and Edith A. Moravcsik. xxx-xxx. Oxford: Oxford University Press.
- Croft, William. 2001. *Radical construction grammar: Syntactic theory in typological perspective*. New York: Oxford University Press.
- Culicover, Peter W. and Ray Jackendoff. 2005. *Simpler syntax*. Oxford: Oxford University Press.

- Deutscher, Guy. 2000. *Syntactic change in Akkadian: The evolution of sentential complementation*. Oxford: Oxford University Press.
- Downing, Pamela. 1977. On the creation and use of English compound nouns. *Language* 53: 810-42.
- Dunbar, Robin. 1996. *Grooming, gossip, and the evolution of language*. Cambridge, MA: Harvard University Press.
- Durie, Mark. 1985. *A grammar of Acehnese*. Dordrecht: Foris.
- Durie, Mark. 1987. Grammatical relations in Acehnese. *Studies in Language* 11: 365-99.
- Everett, Daniel L. 2005. Cultural constraints on grammar and cognition in Pirahã: Another look at the design features of human language. *Current Anthropology* 46: 621-46.
- Falk, Dean. 2004. Prelinguistic evolution in early hominids: Whence motherese? *Behavioral and Brain Sciences* 27: 491-541.
- Fitch, W. Tecumseh 2010. *The evolution of language*. Cambridge: Cambridge University Press.
- Gabelentz, Georg von der. 1891. *Die Sprachwissenschaft: Ihre Aufgaben, Methoden und bisherigen Ergebnisse*. Leipzig: Weigel.
- Gerken, Louann, Rachel Wilson, and William Lewis. 2005. Infants can use distributional cues to form syntactic categories. *Journal of Child Language* 32: 249-68.
- Gil, David. 2005. Isolating-monocategorial-associational language. In *Handbook of categorization in cognitive science*, ed. Henri Cohen and Claire Lefebvre. Oxford: Elsevier.
- Gil, David. 2007. Creoles, complexity and associational semantics. In *Deconstructing creole: New horizons in language creation*, ed. Umberto Ansaldo, Stephen Matthews, and Lisa Lim. 67-108. Amsterdam: John Benjamins.
- Gil, David. 2009. How much grammar does it take to sail a boat? In *Language complexity as an evolving variable*, ed. Geoffrey Sampson, David Gil, and Peter Trudgill. 19-33. Oxford: Oxford University Press.
- Givón, Talmy (ed.), (1983), *Topic continuity in discourse: A quantitative cross-language study* (Typological Studies in Language, 3; Amsterdam: John Benjamins).
- Goldberg, Adele E. 2006. *Constructions at work: The nature of generalization in language*. Oxford: Oxford University Press.
- Hale, Kenneth. 1983. Warlpiri and the grammar of nonconfigurational languages. *Natural Language and Linguistic Theory* 1: 5-47.
- Hauser, Marc D., Noam Chomsky, and W. Tecumseh Fitch. 2002. The faculty of language: What is it, who has it, and how did it evolve? *Science* 298: 1569-79.

- Heine, Bernd and Tania Kuteva. 2002. On the evolution of grammatical forms. In *The transition to language*, ed. Alison Wray. 376-97. Oxford: Oxford University Press.
- Heine, Bernd and Tania Kuteva. 2007. *The genesis of grammar: A reconstruction*. Oxford: Oxford University Press.
- Huang, C.-T. James. to appear. On syntactic analyticity and parametric theory. In *Chinese syntax in a crosslinguistic perspective*, ed. Audrey Li, Andrew Simpson, and Dylan Tsai. xxx-xxx. Oxford: Oxford University Press.
- Hurford, James R. 2012. *The origins of grammar: Language in the light of evolution*. Oxford: Oxford University Press.
- Jackendoff, Ray. 1990. *Semantic structures*. Cambridge, MA: MIT Press.
- Jackendoff, Ray. 2002. *Foundations of language: Brain, meaning, grammar, evolution*. Oxford: Oxford University Press.
- Jackendoff, Ray. 2010. Your theory of language evolution depends on your theory of language. In *The evolution of human language: Bilingual perspectives*, ed. Richard K. Larson, Viviane Déprez, and Hiroko Yamakido. 63-72. Cambridge: Cambridge University Press.
- Jackendoff, Ray and Eva Wittenberg. 2014. What you can say without syntax: A hierarchy of grammatical complexity. In *Measuring grammatical complexity*, ed. Frederick J. Newmeyer and Laurel B. Preston. Oxford: Oxford University Press.
- Jackendoff, Ray 2007. Linguistics in cognitive science: The state of the art. *Linguistic Review* 24: 347-402.
- Kaisse, Ellen M. 1985. *Connected speech: The interaction of syntax and phonology*. Orlando: Academic Press.
- Kayne, Richard S. 1994. *The antisymmetry of syntax*. Cambridge, MA: MIT Press.
- Kibrik, Aleksandr E. 1997. Beyond subject and object: Toward a comprehensive relational typology. *Linguistic Typology* 1: 279-346.
- Klein, Wolfgang and Clive Perdue. 1997. The basic variety, or: Couldn't language be much simpler? *Second Language Research* 13: 301-47.
- König, Christa. 2008. *Case in Africa*. Oxford: Oxford University Press.
- Kulikov, Leonid. 2009. Evolution of case systems. In *The Oxford handbook of case*, ed. Andrej Malchukov and Andrew Spencer. 439-57. Oxford: Oxford University Press.
- Li, Charles N. and Sandra A. Thompson. 1981. *Mandarin Chinese: A functional reference grammar*. Berkeley: University of California Press.
- Lord, Carol. 1993. *Historical change in serial verb constructions*. Amsterdam: John Benjamins.
- MacDonald, Katharine and Wil Roebroeks. 2013. Neanderthal linguistic abilities: An alternative view. In *The evolutionary emergence of language: Evidence and inference*, ed. Rudolf Botha and Martin Everaert. 97-117. Oxford: Oxford University Press.

- Mallinson, Graham and Barry J. Blake. 1981. *Language typology: Cross-linguistic studies in syntax*. Amsterdam: North Holland.
- Matsumoto, Yo. 1988. From bound grammatical markers to free discourse markers: History of some Japanese connectives. *Berkeley Linguistics Society* 14: 340-351.
- McGregor, William B. 2008. Indexicals as sources of case markers in Australian languages. In *Interdependence of diachronic and synchronic analyses*, ed. Folke Josephson and Ingmar Söhrman. 299-321. Amsterdam: John Benjamins.
- Meisel, Jürgen. 1997. The L2 Basic Variety as an I-language. *Second Language Research* 13: 374-85.
- Miller, Geoffrey. 2001. *The mating mind: How sexual choice shaped the evolution of human nature*. New York: Doubleday.
- Miller, Philip H., Geoffrey K. Pullum, and Arnold M. Zwicky. 1997. The Principle of Phonology-Free Syntax: Four apparent counterexamples in French. *Journal of Linguistics* 33: 67-90.
- Mithun, Marianne. 1984. The evolution of noun incorporation. *Language* 60: 847-93.
- Mithun, Marianne. 1986. On the nature of noun incorporation. *Language* 62: 32-38.
- Mithun, Marianne. 1987. Is basic word order universal? In *Coherence and grounding in discourse*, ed. Russ Tomlin. 281-328. Amsterdam: John Benjamins.
- Newmeyer, Frederick J. 1998. *Language form and language function*. Cambridge, MA: MIT Press.
- Nordlinger, Rachel. 1998. *Constructive case: Evidence from Australian languages*. Standord, CA: CSLI.
- Passy, Paul. 1890. *Étude sur les changements phonétiques et leurs caractères généraux*. Paris: Fermin-Didot.
- Payne, Doris L. 1987. Information structuring in Papago narrative discourse. *Language* 63: 783-804.
- Payne, Doris L. 1990. *The pragmatics of word order: Typological dimensions of verb-initial languages*. Berlin: Mouton de Gruyter.
- Power, Camilla. 1998. Old wives' tales: The gossip hypothesis and the reliability of cheap signals. In *Approaches to the evolution of language: Social and cognitive bases*, ed. James R. Hurford, Michael Studdert-Kennedy, and Chris Knight. 111-29. Cambridge: Cambridge University Press.
- Primus, Beatrice. 1999. *Cases and thematic roles: Ergative, accusative, and active*. Tübingen: Max Niemeyer.
- Progovac, Ljiljana. 2009. Layering of grammar: Vestiges of protosyntax in present-day languages. In *Language complexity as an evolving variable*, ed. Geoffrey Sampson, David Gil, and Peter Trudgill. 203-12. Oxford: Oxford University Press.

- Progovac, Ljiljana. 2014. Degrees of complexity in syntax: A view from evolution. In *Measuring grammatical complexity*, ed. Frederick J. Newmeyer and Laurel B. Preston. 83-102. Oxford: Oxford University Press.
- Progovac, Ljiljana. 2015. *A program for evolutionary syntax*. Oxford: Oxford University Press.
- Redington, Martin, Nick Chater, and Steven Finch. 1998. Distributional information: A powerful cue for acquiring syntactic categories. *Cognitive Science* 22: 425-69.
- Rude, Noel. 1997. On the history of nominal case in Sahaptian. *International Journal of American Linguistics* 57: 24-50.
- Selkirk, Elisabeth. 1972. The phrase phonology of English and French. Ph. D. dissertation, MIT.
- Siewierska, Anna and Dik Bakker. 1996. The distribution of subject and object agreement and word order type. *Studies in Language* 20: 115-61.
- Steele, Susan. 1978. Word order variation: A typological study. In *Universals of human language*, ed. Joseph H. Greenberg, Charles A. Ferguson, and Edith A. Moravcsik. 585-623. Stanford, CA: Stanford University Press.
- Tallerman, Maggie. 2011. Protolanguage. In *Oxford handbook of language evolution*, ed. Maggie Tallerman and Kathleen R. Gibson. 479-91. Oxford: Oxford University Press.
- Tomasello, Michael. 2003. *Constructing a language: A usage-based theory of language acquisition*. Cambridge, MA: Harvard University Press.
- Tomasello, Michael, Malinda Carpenter, Josep Call, Tanya Behne, and Henrike Moll. 2005. Understanding and sharing intentions: The origins of cultural cognition. *Behavioral and Brain Sciences* 28: 675-735.
- Tomlin, Russell S. and Richard Rhodes (1979), 'An introduction to information distribution in Ojibwa', *Chicago Linguistic Society* (15), 307-20.
- Traugott, Elizabeth C. 1997. The role of the development of discourse markers in a theory of grammaticalization. In *Papers from the 12th International Conference on Historical Linguistics*, ed. Linda van Bergen and Richard M. Hogg. Amsterdam: John Benjamins.
- Van Valin, Robert D. and Randy J. LaPolla. 1997. *Syntax: Structure, meaning, and function*. Cambridge: Cambridge University Press.
- Zwicky, Arnold M. and Geoffrey K. Pullum. 1983. Phonology in syntax: The Somali optional agreement rule. *Natural Language and Linguistic Theory* 1: 385-402.
- Zwicky, Arnold M. and Geoffrey K. Pullum. 1986. The principle of phonology-free syntax: Introductory remarks. *Ohio State University Working Papers in Linguistics* 32: 63-91.