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# The simpler syntax hypothesis

Peter W. Culicover<sup>1</sup> and Ray Jackendoff<sup>2</sup>

<sup>1</sup> Department of Linguistics, The Ohio State University, Columbus, OH 43210, USA

<sup>2</sup> Center for Cognitive Studies, Tufts University, Medford, MA 02155, USA

**What roles do syntax and semantics have in the grammar of a language? What are the consequences of these roles for syntactic structure, and why does it matter? We sketch the Simpler Syntax Hypothesis, which holds that much of the explanatory role attributed to syntax in contemporary linguistics is properly the responsibility of semantics. This rebalancing permits broader coverage of empirical linguistic phenomena and promises a tighter integration of linguistic theory into the cognitive scientific enterprise. We suggest that the general perspective of the Simpler Syntax Hypothesis is well suited to approaching language processing and language evolution, and to computational applications that draw upon linguistic insights.**

## Introduction

What roles do syntax and semantics have in the grammar of a language, and what are the consequences of these roles for syntactic structure? These questions have been central to the theory of grammar for close to 50 years. We believe that inquiry has been dominated by one particular answer to these questions, and that the implications have been less than salutary both for linguistics and for the relation between linguistics and the rest of cognitive science. We sketch here an alternative approach, Simpler Syntax (SS), which offers improvements on both fronts and contrast it with the approach of mainstream generative grammar [1–3]. Our approach, developed in three much more extensive works [4–6], draws on insights from various alternative theories of generative syntax [7–11].

## Two views on the relation between syntax and semantics

A central idealization behind mainstream generative grammar, shared by much of formal logic and other approaches to language, is classical Fregean compositionality (FC):

*FC*: ‘The meaning of a compound expression is a function of the meaning of its parts and of the syntactic rules by which they are combined’ [12].

Although many linguistic phenomena are known to be problematic for this view, it is fair to say that a strong form of FC is generally taken to be a desideratum of syntactic theory construction.

FC appears to be violated, for example, in circumstances where certain aspects of sentence meaning do not seem to be represented in the words or syntactic structure of the

sentence. In sentence (1), one understands Ozzie to be not only the ‘tryer’ but also the ‘drinker’, even though the noun phrase *Ozzie* is not overtly an argument of the verb *drink*.

(1) Ozzie tried not to drink.

The masterstroke behind mainstream generative grammar was to propose that the missing piece of meaning is supplied by an element in a covert level of syntactic structure (‘Deep Structure’ in early work, later ‘Logical Form’). Sentence (1) has the covert form (2), in which the verb *drink* actually does have a subject – PRO, an unpronounced pronoun whose antecedent is *Ozzie*.

(2) Ozzie tried [PRO not to drink].

Such an approach is effective – and appealing – for relatively straightforward situations such as (1). However, we show that carrying this strategy through systematically leads to unwelcome consequences.

Alternatives to FC are:

*Autonomous Semantics/AS*: Phrase and sentence meanings are composed from the meanings of the words plus independent principles for constructing meanings, only some of which correlate with syntactic structure.

*Simpler Syntax Hypothesis/SSH*: Syntactic structure is only as complex as it needs to be to establish interpretation.

Under SSH, sentence (1) needs no hidden syntactic structure. The fact that Ozzie is understood as the ‘drinker’ results from a principle of semantic interpretation that assigns *Ozzie* this extra role. Thus, semantics can have more-elaborate structure than the syntax that expresses it. **Box 1** makes more precise our notion of syntactic complexity.

## Mainstream syntactic structures compared with Simpler Syntax

The choice between the two approaches to (1) does not seem especially consequential. However, following FC to its logical end turns out to have radical consequences for the syntactic analysis of even the simplest sentences. For example, **Figure 1a** shows the structure of the sentence *Joe has put those raw potatoes in the pot*, based on the treatment in a contemporary mainstream textbook for beginning graduate students [13]. The literature offers many other variants of comparable complexity.

**Figure 1a** is representative of the most recent version of mainstream theory, the Minimalist Program [3,14]. Such a structure typically incorporates many elements that do not

Corresponding author: Jackendoff, R. (ray.jackendoff@tufts.edu).  
 Available online 8 August 2006.

### Box 1. Syntactic complexity

For Simpler Syntax, the complexity of syntactic structure involves the extent to which constituents contain subconstituents, and the extent to which there is invisible structure. Thus, the structure of A in (ia) is simpler than in (ib) or (ic), where  $\beta$  is an invisible element. SS will choose (ib) or (ic) only if there is empirical motivation for the more-complex structure.

- (i) a. [<sub>A</sub> B C D]  
 b. [<sub>A</sub> B [ <sub>$\alpha$</sub>  C D]]  
 c. [<sub>A</sub> B [ <sub>$\alpha$</sub>   $\beta$  C D]]

SSH allows the possibility of abstract elements in language when there is empirical motivation for their syntactic (and psychological) reality. In particular, it acknowledges the considerable linguistic and psycholinguistic evidence for 'traces' – the gaps that occur in languages such as English when constituents appear in non-canonical position [35]:

- (ii) What do you think you're looking at \_\_\_\_?  
 Theories like that, I have a really hard time believing in \_\_\_\_.

Despite the considerable reduction of complexity under Simpler Syntax, syntactic structure does not disappear altogether (hence the term 'simpler syntax' rather than 'simple' or 'no syntax'). It is not a matter of semantics that English verbs go after the subject but Japanese verbs go at the end of the clause – nor that English and French tensed clauses require an overt subject but Spanish and Italian tensed clauses do not; that English has double object constructions (*give Bill the ball*) but Italian, French and Spanish do not; that English has *do*-support (*Did you see that?*) but Italian, French, German and Russian do not; that Italian, French, and Spanish have object clitics (French: *Je t'aime*) before the verb but English does not. It is not a matter of semantics that some languages use case morphology or verbal agreement, or both, to individuate arguments. That is, there remains some substantial body of phenomena that require an account in terms of syntactic structure.

correspond to perceived form (e.g. *v*, *n* and multiple copies of *Joe*, *have*, *put* and *potatoes*), as well as many constituents that are motivated largely on theoretical grounds. Classical constituency tests, such as the ability to displace as a unit, provide motivation only for major constituent divisions such as TP, DP and PP.

By contrast, in SS this sentence has the structure in Figure 1b, which contains only the classical constituent divisions and which has no hidden elements or inaudible copies.

#### Application to Bare Argument Ellipsis

Differences between mainstream theory and SS emerge also in many other cases. One compelling phenomenon is Bare Argument Ellipsis (BAE), illustrated in B's reply to A in example (3) (We sketch here only the highlights of the detailed argument in [6]).

- (3) A: Ozzie says that Harriet's been drinking.  
 B: Yeah, scotch.

B's reply conveys the same meaning as sentence (4), thus going beyond the meanings of *Yeah* and *scotch*.

- (4) B: Yeah, Harriet's been drinking scotch.

If all aspects of understanding must be explicit in syntactic structure, it is necessary to posit (i) a complete syntactic structure for B's reply along the lines of (4), and (ii) a syntactic or phonological process that deletes everything

but the words *yeah* and *scotch*. This deletion has to be based on syntactic identity with the *antecedent* of the ellipsis – that is, the relevant portions of A's preceding statement.

In SS, such full syntactic structure and deletions are unnecessary. The syntactic structure of B's reply is just the string of two words, and its interpretation is determined by grafting the meanings of the two words onto an appropriate place in the *meaning* of A's statement, without any necessary syntactic support [15–18].

At this point, the FC and SS accounts diverge. The relation between the elliptical utterance and its antecedent depends not on syntactic identity, but rather on delicate factors in the semantics of the antecedent. For instance, there is no *syntactic* difference among A's utterances in (3) and (5), but the interpretation of the antecedent is clearly different.

- (5) a. A: Ozzie fantasizes that Harriet's been drinking.  
 B: Yeah, scotch. ['Ozzie fantasizes that Harriet's been drinking scotch', not 'Harriet's been drinking scotch']  
 b. A: Ozzie doubts that Harriet's been drinking.  
 B: Yeah, scotch. [no plausible interpretation]

An approach to ellipsis that depends only on syntactic structure cannot capture these differences.

Moreover, in many examples of ellipsis, the putative hidden syntactic forms either are ungrammatical (6 and 7i) or diverge wildly from the form of the antecedent (6 and 7ii).

- (6) A: John met a guy who speaks a very unusual language.  
 B: Which language?  
 i. \*Which language did John meet a guy who speaks?  
 ii. Which language does the guy who John met speak? [19–21]  
 (7) A: Would you like a drink?  
 B: Yeah, how about scotch.  
 i. \*Yeah, how about would you like scotch.  
 ii. Yeah, how about you giving me scotch.

The antecedent can even extend over more than one sentence, so the ellipsis cannot possibly be derived from a hidden syntactic clause.

- (8) It seems we stood and talked like this before.  
 We looked at each other in the same way then.  
 But I can't remember where or when [22].

This is not to say that ellipsis is a purely semantic phenomenon. It is also constrained by the syntax and lexicon of the language, as seen in (9) and (10).

- (9) A: Ozzie is flirting again.  
 B: With who(m)?  
 B': \*Who(m)?  
 (10) A: What are you looking for?  
 B: Those. [pointing to a pair of scissors]

The ellipsis in (9) must include *with* because *flirt*, in the antecedent, requires it; this is often taken to be evidence for deletion of a syntactic copy of the antecedent [20]. However, the ellipsis in (10) must be plural, not because

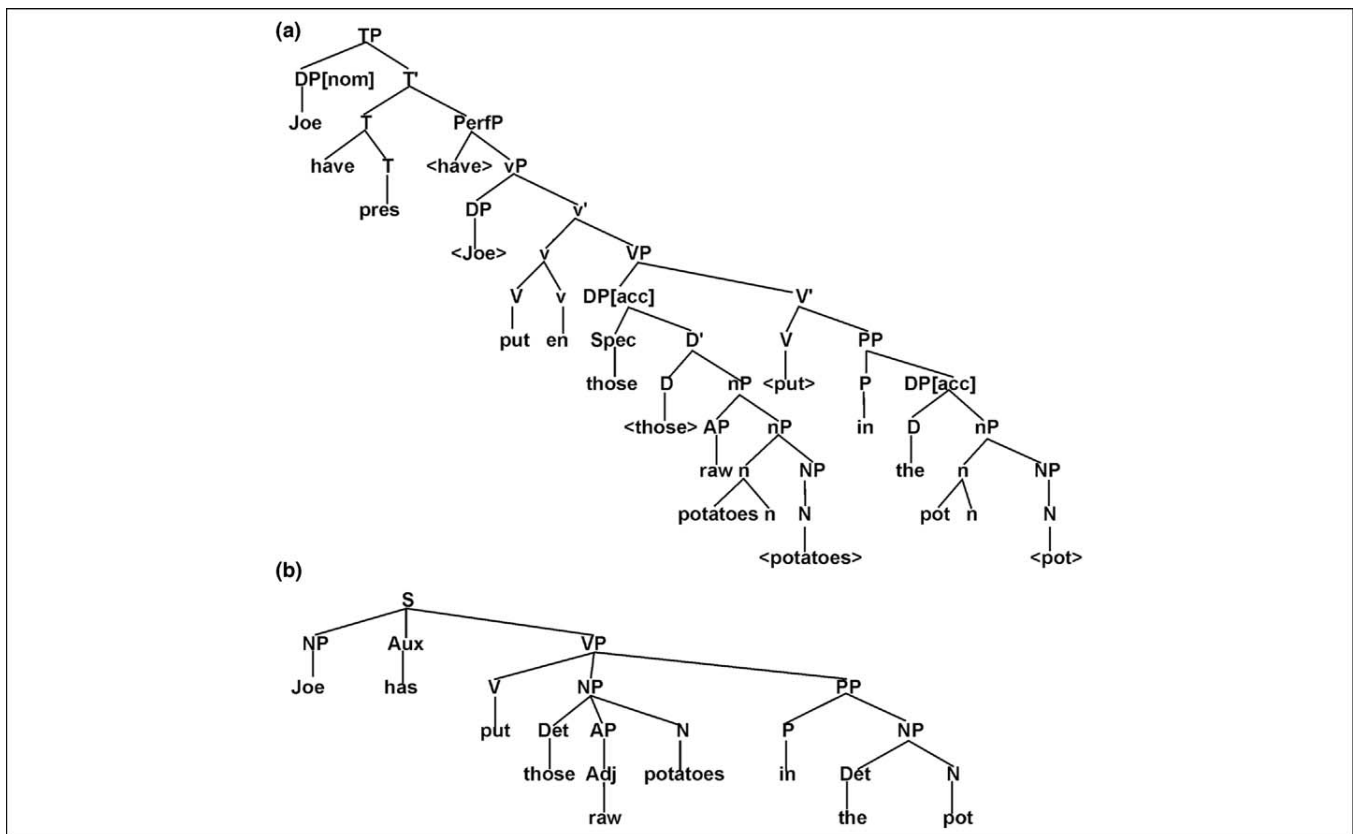


Figure 1. (a) A mainstream analysis of *Joe has put those raw potatoes in the pot*. Elements in brackets are unpronounced copies of elements elsewhere in the tree. (b) Simpler Syntax analysis of *Joe has put those raw potatoes in the pot*.

of something in the antecedent but because the unmentioned word *scissors* is plural. SSH proposes a mechanism that accounts for these cases together [6].

Examples (6)–(8) and (10) show that *in general* BAE cannot be accounted for by deletion of syntactic structure that is identical to the antecedent. Thus, there appears to be no reason to invoke such an account for cases such as (3) and (9) either. Although the meanings of the words certainly contribute to the interpretation of the sentence, they are combined by semantic principles that go beyond a simple mapping determined by syntactic structure – a richer compositionality than FC.

BAE is by no means unique. Box 2 illustrates several other cases, drawn from [6].

We thus face a choice between two approaches: one in which semantics and syntax are closely matched but syntactic structure is elaborate and abstract, and one in which syntactic structure is relatively simple and concrete but there is considerable mismatch between semantics and syntax. How does one decide between the two?

### Choosing between the two approaches

We have seen that SSH offers a more general account of empirical linguistic phenomena such as BAE. Therefore, it should be preferred on grounds internal to linguistics. However, there are also two reasons why Simpler Syntax is preferable within the broader cognitive scientific enterprise.

The first reason is that SS enables closer ties between linguistic theory and experimental research on language

processing. Virtually all research on language perception and production from the earliest days [23] to contemporary work [24] presumes syntactic structures along the lines of Figure 1b. We know of no psycholinguistic research that strongly supports the invisible copies, the empty heads and the elaborated branching structure of structures such as Figure 1a (but see [25,26] for recent attempts to find evidence for them). Tests of processing or memory load involving reaction time, eye movements and event-related potentials appear to be sensitive to relative complexity in structures of the SS sort. We know of no convincing predictions based on structures such as Figure 1a that bear on processing complexity.

Mainstream generative grammar has tended to distance itself from processing considerations by appealing to the theoretical distinction between competence – the 'knowledge of language' – and performance – how knowledge is put to use in processing. According to this stance, psycholinguistics need not bear directly on the adequacy of syntactic analyses. In SS, by contrast, rules of grammar are taken to be pieces of structure stored in memory, which can be assembled online into larger structures. Box 3 sketches some of the motivation behind this construal of grammatical rules. Thus, Simpler Syntax suggests a transparent relation between knowledge of language and use of this knowledge, one that has begun to have a role in experimental studies of online processing and of aphasia [27,28].

Along related lines, a major objective of computational linguistics is to assign meanings to strings of words on the

### Box 2. Other phenomena where Fregean compositionality is inadequate

In the following cases, as in BAE, substantive aspects of the meaning of a phrase or sentence cannot be identified with the meaning of any individual word or constituent.

#### Metonymy

An individual can be identified by reference to an associated characteristic, as when a waitperson says to a colleague,

- (i) The ham sandwich over there wants more coffee.

The intended meaning is '*the person who ordered/is eating a ham sandwich*'. FC requires the syntax to contain the italicized material at some hidden syntactic level. Another example is (ii), in which the interpretation of *Chomsky* is clearly '*a/the book by Chomsky*'.

- (ii) Chomsky is next to Plato up there on the top shelf.

Simpler Syntax says that the italicized parts of the interpretation are supplied by semantic/pragmatic principles, and the syntax has no role.

#### Sound + motion construction

- (iii) The trolley rattled around the corner.

The meaning of (iii) is roughly 'The trolley went around the corner, rattling'. *Rattle* is a verb of sound emission, not a verb that expresses motion. Hence, no word in the sentence can serve as source for the understood sense of the trolley's motion. FC requires a hidden verb *go* in the syntax; SS says this sense is supplied by a conventionalized principle of interpretation in English that is specific to the combination of sound emission verbs with path expressions such as *around the corner* [36,37].

#### Beneficiary dative construction

In a double object construction such as *build Mary a house* (paraphrasing *build a house for Mary*), the indirect object (*Mary*) is understood as coming into possession of the direct object (*a house*). The possession component of meaning does not reside in the meaning of *build*, *Mary* or *house*, but in the construction itself. FC requires an explicit but hidden representation of possession in syntactic structure; SS supplies this sense as a piece of meaning associated with the double object construction as a whole [38].

These cases are a small sample of the many well-studied phenomena in which FC requires hidden elements in syntactic structure, motivated only by the need for syntax to express full meaning explicitly.

basis of some syntactic analysis; many approaches (e.g. [29,30]) combine symbolic and statistical methods to identify the syntactic structure associated with a string. The syntactic theory most-widely used in computational linguistics is Head-Driven Phrase Structure Grammar [7], one of the frameworks that adopt some version of SSH. Again, we think that the reason for this choice is that SSH is sufficient for establishing interpretation, and more elaborate structure is unnecessary.

There is a second, deeper reason why SSH should be of interest to cognitive science as a whole. Recall that mainstream generative grammar is based on the assumption of Fregean compositionality. FC implies that sentence meaning has no combinatorial structure that is not derived from the syntactic structure that expresses it.

Now, intuitively, the meaning of a sentence is the thought that the sentence expresses. Thus, Fregean compositionality suggests that *without language there is no combinatorial thought* – a position reminiscent of Descartes. Such a conclusion flies in the face of overwhelming evidence from comparative ethology that the behavior

### Box 3. Rules of grammar are stored pieces of structure

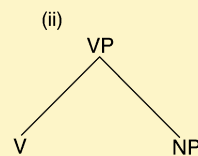
Like every other theory of language, Simpler Syntax treats words as stored associations of pieces of phonological, syntactic and semantic structure. However, unlike approaches that assume FC, where only individual words contribute to the construction of a meaning, SS enables storage of more complex structures with associated meanings. For instance, an idiom such as *kick the bucket* can be stored as an entire verb phrase, associated in memory with its idiosyncratic meaning, 'die'. All languages contain thousands of such complex stored units.

Among the idioms are some with idiosyncratic syntactic structure as well as idiosyncratic meaning, for example (i) [4]:

- (i) *Far be it from NP to VP*. Far be it from me to disagree with you.  
*PP with NP!* Off with his head! Into the house with you!  
*How about X?* How about a scotch? How about we talk?  
*NP and S*. One more beer and I'm leaving [39].  
*The more S*. The more I read, the less I understand [6,40].

These reside in the lexicon as associations of meanings with noncanonical syntactic structure. Other idioms, including the sound + motion construction and the beneficiary dative (Box 2), attach idiosyncratic meaning to a standard syntactic structure, but do not involve particular words.

Once pieces of syntactic structure can be stored in the lexicon associated with meanings, it is a simple step to store pieces of syntactic structure that have no inherent meaning beyond Fregean composition, such as (ii).



This piece of structure is equivalent to a traditional phrase structure rule  $VP \rightarrow V-NP$ . Thus, it is possible to think of the lexicon as containing all the rules that permit syntactic combinatoriality. These are put to use directly in processing, as pieces available for constructing trees.

Simpler Syntax shares this continuity between idiosyncratic words and general rules with several related frameworks, most notably Head-Driven Phrase Structure Grammar [7] and Construction Grammar [9].

of many animals must be governed by combinatorial computation. Such computation is arguably involved, for instance, in comprehending complex visual fields, planning of action, and understanding social environments, capacities present in primates as well as many other species [31,32]. Given its focus on syntax, mainstream generative grammar has not taken the apparent conflict between these two conclusions as a central concern.

Simpler Syntax, by contrast, regards linguistic meaning as largely coextensive with thought; it is the product of an autonomous combinatorial capacity, independent of and richer than syntax. This allows the possibility that thought is highly structured in our nonlinguistic relatives – they just cannot express it. Combinatorial thought could well have served as a crucial preadaptation for the evolution of combinatorial expression, i.e. human language [5,33,34].

Some components of meaning, particularly argument structure, are encoded fairly systematically in syntax. Others, such as modality, aspect, quantifier scope and discourse status receive relatively inconsistent syntactic

#### Box 4. Questions for future research

- *Language acquisition*: Much empirical research on syntactic development does not presuppose contemporary mainstream theory [41–43]. There is also a robust tradition of research based on mainstream assumptions [44,45]. Can the results of these disparate research paradigms be reconciled by taking a Simpler Syntax perspective?
- *Language processing*: Simpler Syntax provides a baseline for measuring structural complexity, in particular focusing on the relative transparency or opacity of the syntax-to-semantics mapping in different constructions [46]. Can this measure of complexity be applied to the explanation of relative difficulty in processing and acquisition, and to accounts of language variation and change [47,48]?
- *Properties of thought*: What are the combinatorial properties of primate thought? How do they compare with human thought? How much of human thought is encoded in language?
- *Language in the brain*: How are linguistic structures neurally instantiated, both in long-term memory and in processing? Simpler Syntax, with its emphasis on mapping between structures rather than algorithmic computation, makes different demands from mainstream theory on an account of neural implementation. Whichever theory of syntax is correct, many challenges still remain, in particular how the brain encodes combinatorial structures and builds them in working memory [5,49].

encoding within and across languages. On this view, language is an imperfect but still powerful means of communicating thought.

#### Conclusion

Simpler Syntax re-opens many standard questions about the relationship between linguistics and the other cognitive sciences (Box 4).

First, Simpler Syntax affords broader empirical coverage of grammatical phenomena.

Second, Simpler Syntax enables a stronger link between linguistic theory and experimental and computational accounts of language processing. Changing the balance between syntax and semantics along the lines proposed by Simpler Syntax might contribute to resolving long-standing disputes about their relative roles in language processing [24].

Third, Simpler Syntax claims that the foundation of natural language semantics is combinatorial thought, a capacity shared with other primates. It thus offers a vision of the place of language in human cognition that we, at least, find attractive.

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