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On the goals of theoretical linguistics

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Abstract: We review some of the main goals of theoretical linguistics in the tradition of Generative Grammar: description, evolvability and learnability. We evaluate recent efforts to address these goals, culminating with the Minimalist Program. We suggest that the most prominent versions of the Minimalist Program represent just one possible approach to addressing these goals, and not a particularly illuminating one in many respects. Some desirable features of an alternative minimalist theory are the dissociation between syntax and linear order, the emphasis on representational economy (i.e. Simpler Syntax) and an extra-grammatical account of non-local constraints (e.g. islands). We conclude with the outline of an alternative minimalist perspective that we believe points to more satisfactory accounts of the observed phenomena.

Keywords: minimalist program; simpler syntax; evolvability; learnability; linear order

This paper discusses aspects of the architecture of linguistic theory. In Section 1 we review plausible goals of theoretical linguistics, looking particularly at the role of syntactic theory within the broader architecture. Section 2 introduces the framework of the Parallel Architecture and Simpler Syntax (Culicover and Jackendoff 2005; Jackendoff 2002). In Section 3 we lay out how this general approach addresses the goals. Section 4 outlines a program of research suggested by this alternative perspective.

1 The goals of a linguistic theory

In many respects the goals of linguistic theory that we identify echo those already established in *Aspects* (Chomsky 1965, Chapter 1). First, the theory should provide sufficient DESCRIPTIVE CAPACITY to be able to express relationships between the form of linguistic expressions and their meanings, as well as other functions. A theory that does not do this is not adequate, regardless of whether it internally satisfies aesthetic

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criteria such as 'simplicity', 'elegance', 'minimalism', etc. Second, the theory should attribute to language properties that could have plausibly evolved, given what we know about evolution. And third, the theory should explain how learners arrive at linguistic knowledge on the basis of experience.

To get a feel for the descriptive capacity, we construct two toy theories of a toy language. One is explicit about the correspondence between form and meaning, while the other is 'minimalist', in that it eschews most details. Let the language L^0 consist of the pairing of two phonological forms, say /dɔg/ and /its/, and two concepts, say 'dog' and 'eats'. A theory, call it Theory D, would be (more or less) descriptively adequate if it said, in effect, (1).

(1) Theory D
  (i) L^0 consists of a pair $\langle W^0$, COMBINE$\rangle$.
  (ii) W^0=$\{w_1, w_2\}$, where w_1=⟨/dɔg/, $\iota(\text{dog}')$⟩, w_2=⟨/its/,$\lambda x[\lambda y[\text{eat}'(y, x)]]$⟩.
  (iii) The application of COMBINE to w_1 and w_2 yields δ_3=⟨/dɔgits/, $\exists x[\text{eat}'(\iota(\text{dog}'), x)]$⟩ and the application of COMBINE to w_2 and w_1 yields δ_4=⟨/itsdɔg/, $\lambda y[\text{eat}'(y, \iota(\text{dog}'))]$⟩.
  (iv) The EXPRESSIONS of L^0 are $E^0 = W^0 \cup \{\delta_3, \delta_4\}$.

In contrast, a minimalist theory, call it Theory M, would not in itself be descriptively adequate if it said simply (2).

(2) Theory M
  (i) L^0 consists of a pair $\langle W^0$, COMBINE$\rangle$.
  (ii) W^0 consists of a set of words $\{w_1, w_2\}$, where each member is a PAIR of the form $\langle \sigma, \mu \rangle$.
  (iii) The application of COMBINE w_1 and w_2 yields δ_3 and the application of COMBINE to w_2 and w_1 yields δ_4. The form and meaning of δ_3 and δ_4 are determined by interfaces PF and LF.
  (iv) The EXPRESSIONS of L^0 are $E^0 = W^0 \cup \{\delta_3, \delta_4\}$.

Theory M is not exactly false, nor is it unfalsifiable per se. The real problem is that the observable facts entailed by Theory M are abstract and trivial: e.g. L^0 has words and words have sounds and meanings. The main difference between Theory D and Theory M is that the latter eliminates the direct connection between its contents and any kind of non-trivial prediction about what speakers of L^0 actually know and do. While Theory M is ostensibly a linguistic theory and contains many of the same features of Theory D (to the point that we can actually compare the two), the task of connecting Theory M to any interesting observable facts of L^0 is left to some unspecified theory of the interfaces.

The differences between the two types of theories become starker for more complex languages. Suppose theories D* and M* claim that a language L_N consists of a lexicon W_N of n primitive elements, a set of rules P_N of recursive combination of these elements depending on their category. Theory D* specifies, in addition, the category, form and meaning of items in L_N's lexicon and the rules for constructing and interpreting larger expressions on the basis of smaller ones. Theory M* leaves these matters to the 'interfaces'. The picture is similar to that of Theories D and M; Theory D* is descriptively adequate, while Theory M* leaves form and meaning to the interfaces and categories to a language-external labeling algorithm, a kind of 'minimal search' (Chomsky 2013). The only concrete prediction that M* makes is the trivial observation that some expressions of L_N are hierarchically structured.

This shows that we need to go beyond assessing theories solely on the basis of an abstract simplicity metric. In comparing two proposals, it may be that one has fewer specific statements, or posits fewer formal devices. Theories M/M* are more minimalist than Theories D/D* in this respect; however, in their greater minimalism M/M* say less about how the languages actually work.

These toy examples make a general point: if a theory is 'minimalist' because it says little about the phenomenon or because it defines its object so as to exclude non-trivial aspects of the phenomenon, it may not be an adequate theory. The primary 'phenomena', in the case of language, are things speakers have introspective access to, namely: (i) **intuitions about form** (a string σ_1 is acceptable); (ii) **intuitions about meaning** (an inferential relation holds between meaning μ_1 and μ_2); and (iii) **intuitions about correspondences** (σ_1 corresponds to μ_1).

With the foregoing as preamble, we state what we take to be the first fundamental goal of a linguistic theory, DESCRIPTION.

> **Goal 1. Description**: An adequate linguistic theory should provide the minimal resources to account for the correspondences between form and meaning observed in natural languages.

DESCRIPTION echoes the *Aspects* criterion of DESCRIPTIVE ADEQUACY. As stated above, this implies that form and meaning have epistemological priority over syntax: syntactic structure is only posited to the extent that it aids in the explanation of independent properties of form, meaning and their relation.

Crucially, if we elaborate a minimalist theory so that it can seriously satisfy Goal 1, the extent to which it continues to be minimalist comes into question. An elaborated theory must be evaluated against plausible alternatives, 'minimalist' or not, with respect to Goal 1 and other goals. We show in Section 2 that Simpler Syntax is a minimalist theory that offers the possibility of achieving Goal 1.

A second goal of a linguistic theory is EVOLVABILITY. To quote Chomsky et al. (2019, 230):

> … any theory of UG must meet a criterion of *evolvability*: the mechanisms and primitives ascribed to UG (as opposed to deriving from independent factors) must be sufficiently sparse to plausibly have emerged as a result of what appears to have been a unique, recent, and relatively sudden event on the evolutionary timescale.

In the MP, this ‘relatively sudden event’ is the advent of Merge. But it is by no means obvious that an adequate account of language evolution rests on a single sudden event of this sort (Boeckx 2017; Fitch 2017; Pinker and Bloom 1990). As Jackendoff (2002, 2010) has argued, one’s theory of evolution of language depends in part on one’s theory of language. Taking a ‘minimalist’ perspective that departs from the MP allows us to look at evolution of language in a different way. Section 3.1 summarizes how Simpler Syntax’s minimalist approach outlined in Section 2 is compatible with the goal of evolvability. Following Chomsky et al. (2019), we state this goal as follows:

> **Goal 2. Evolvability**: A linguistic theory should define a framework of mechanisms and primitives that can plausibly be understood as having evolved independently and recently on the evolutionary timescale.

A third goal is LEARNABILITY. Again echoing *Aspects*, we state this as follows:

> **Goal 3. Learnability**: A linguistic theory should define a set of grammars that can be acquired in plausible time and on the basis of plausible data.

One’s theory of language acquisition also depends in part on one’s theory of language (Culicover 2021). Our answer to the question of how language is learned depends on our characterization of what is learned. A theory like Government and Binding, which ascribes to speakers a substantial knowledge of abstract structures that cannot be inferred from input, requires a rich system of innate principles (Chomsky 1981). A radical minimalist theory like the MP makes minimal demands on learnability, since it makes minimal assumptions about knowledge of language. However, it does so by leaving the details to the interfaces, principles of computational efficiency and other so-called ‘third-factor’ properties whose causal role in shaping knowledge of language is unclear (Johansson 2013; Johnson and Lappin 1999). Hence it does not actually explain how this knowledge is acquired. In Section 3.2 we sketch Simpler Syntax’s minimalist approach to learnability.

2 A minimalist architecture

We summarize here the minimalist architecture of Simpler Syntax, developed in the general framework of the Parallel Architecture (PA) (Culicover and Jackendoff 2005;

Jackendoff 2002). Simpler Syntax is implemented in terms of the relationships that hold between the various domains of linguistic representation in the PA: phonological (π), syntactic (σ) and semantic or conceptual structure (μ).[1]

Simpler Syntax addresses the goal of DESCRIPTION by defining linguistic expressions as *constructs* which have to be licensed by *constructions*. A construct is a correspondence between the various levels of representation afforded by the PA:

(3) $$\begin{bmatrix} \text{PHON} & \pi_1 \\ \text{SYN} & \sigma_1 \\ \text{CS} & \mu_1 \end{bmatrix}$$

A construction is a description of what counts as a well-formed configuration in any of these levels or of correspondences between them. A construction may be a lexical item, an idiom, a phrasal schema or a general rule of interpretation. A grammar is a set of constructions of this sort, the disjunction of which is satisfied by all and only the well-formed constructs in a language. Thus, a complex construct will be such that each of its parts (π, σ and μ) and correspondences has to satisfy the conditions of one or more grammatical constructions (Culicover 2021, 39).[2]

We contend that Simpler Syntax is a minimalist syntactic theory. Its core principle is that syntactic devices should be minimized to the extent possible. Syntactic structures are much closer to what is directly inferable from input. This commitment to representational economy reduces, therefore, the amount of linguistic knowledge attributed to speakers and minimizes demands on learnability and evolvability. However, Simpler Syntax does not downplay DESCRIPTION (Goal 1). Phenomena that are optimally accounted for in terms of semantics, phonology, pragmatics, processing complexity, etc. are not represented syntactically.

Thus, there are many linguistic phenomena that Simpler Syntax treats very differently than mainstream syntactic approaches.

– *Syntactic structure* is as flat as possible (Varaschin and Culicover under review).

1 A similar research program motivated frameworks like LFG (Bresnan and Kaplan 1982), HPSG (Pollard and Sag 1994), and CG (Kubota and Levine 2020). Space limitations do not allow us to trace how the approach described here draws from these other theories. For an explicit comparison between Simpler Syntax and LFG, see Varaschin (2023).

2 Since we define well-formedness in terms of a satisfaction relation holding between constructs and a *disjunction* of constraints, a single grammar can include constructions that are not mutually consistent. This feature is particularly useful to model intra-individual register variation (Machicao y Priemer et al. 2022) as well as idiosyncratic constructions that deviate from general ‘macro-parametric’ properties in a language (Culicover 1999).

- *Linear order* is a phonological property, not a property of syntactic representations (as in MP and Distributed Morphology).
- *Constructional variation* within a language is accounted for by distinct constructions with different licensing conditions, not by converting one syntactic structure into another (Culicover 2021).
- *Typological variation* across languages is accounted for by distinct constructions with different licensing conditions, not by deriving diverse syntactic structures from a single uniform structure (Culicover 2021).
- *Constructional relatedness* is accounted for in terms of links between distinct constructions (essentially entailment relationships), not by converting one syntactic structure into another (Jackendoff and Audring 2020).
- *Binding/coreference*: There are no indices in syntax to mark the relationship between an antecedent and a pronoun interpreted as a variable in syntax. Binding is a semantic relation constrained by syntactic structure and linear order. Coreference is constrained by discourse/pragmatics (Reuland 2011).
- *Morphological generalizations* are not represented by syntactic derivations but, as with constructional relatedness, by implicational relations between independently stored lexical items (Jackendoff and Audring 2020).
- *Islands* are the consequence of processing complexity and other extra-grammatical factors (Culicover et al. 2022).

3 Meeting the goals

As a constructional theory, Simpler Syntax is expressive enough to describe arbitrarily specific or general correspondences between form and meaning. Hence it addresses by default the goal of DESCRIPTION. We take up the goal of EVOLVABILITY in Section 3.1, and that of LEARNABILITY in Section 3.2.

3.1 Evolvability

The crucial question of linguistic evolution, from our perspective, is where syntax *per se* comes from. We assume that rich conceptual structure is evolutionarily prior to linguistic structure, and that syntax is an imperfect reflection of conceptual structure (Culicover 2021; Jackendoff 2002; Sauerland and Alexiadou 2020, i.a.). On this view, the crucial evolutionary step is the ‘discovery’ that parts of conceptual structure can correspond systematically to parts of the phonological form.

Contrasting this view with that of the MP highlights the differences. Berwick and Chomsky (2016) propose that a single mutation gave rise to the capacity to compose two linguistic elements into a complex linguistic element, i.e. the operation Merge. Merge maps two objects α, β to form a set $\{\alpha, \beta\}$. The linear order of the atoms over which Merge applies is determined by an algorithm – one which is sensitive to the asymmetric c-command relations that result from Merge (Chomsky 1995). The category of the resulting object is determined by a labeling algorithm that assigns a feature of one of the elements to the combination as a whole, typically the syntactic category of the head, e.g. $[_\alpha\ \alpha^0, \beta]$ (Chomsky 2013).

When iterated, the resulting structures in this system can be quite complex. Crucially, most strings thus generated do not constitute well-formed expressions, and have to be filtered out somehow. For example, Merge can in principle produce $[_D\ [_D$ *some*$]\ [[_N$ *me*$]\ [_D$ *none*$]]]$, which is nonsense. But there is no interpretation of *none* or *some* that will allow them to combine with an instance of *me* to produce a coherent interpretation. In contrast, if the atomic elements are *some*, *happy* and *man*, then presumably there is an assignment of interpretations to the individual words that yields a coherent interpretation for the string *some happy man*.

Assuming that there is no language in which structures like *some me none* are well-formed, the question then arises as to why. There must be something logically prior to the production of hierarchical representations corresponding to sets of categories that determines which structures are those of a natural language. What filters out nonsense in MP must be something in the *interpretation* that corresponds to the string – i.e. Conceptual-Intentional Interface in Chomsky's (1995) terminology. Given the uselessness of a system that generates unconstrained hierarchical structures like what we sketched above for *some me none*, it is difficult to conceive of the evolution of a syntactic system prior to the evolution of meaning.[3]

We could continue to maintain that Merge produces structures and that the latter are then filtered by an independent system of Conceptual Structure. But then what role does syntactic Merge itself play in this evolutionary story? Conceptual Structure is independently necessary to account for the evolution of primitive concepts and the capacity to form complex concepts not only for language but also for non-linguistic reasoning (Gallistel 2011; Jackendoff 2002; Sauerland and Alexiadou 2020). The essential evolutionary step does not appear to have been the emergence of uninterpreted syntactic structure through Merge, as in the MP, but the emergence of complex thought, that is, Conceptual Structure. If we accept the existence of

3 A reviewer notes that a nonsense determiner sequence like *the the* could be licensed as a generalized conjunction with the redundant, but not incoherent interpretation $\lambda P \lambda Q[Q(\iota[P]) \wedge Q(\iota[P])]$ (Partee and Rooth 1983). Granting this, the fact that such sequences do not exist only highlights the need to appeal to properties of the resulting meaning representations (e.g. redundancy), not to syntax or the interfaces per se.

Conceptual Structure (and it is hard not to), there must already be a 'syntax of thought' available prior to the evolution of language.

On this view, syntactic structure is parasitic on Conceptual Structure. The evolutionary steps essential for language are the recognition that thought and sound can correspond systematically, and that there is an adaptive pressure that drives humans to express thought through conventionalized sounds or gestures (Culicover 2021; Jackendoff 2002; Jackendoff and Wittenberg 2014, 2017).

3.2 Learnability

As with evolvability, the problem of learnability in the MP is not resolved, it is shunted off to the 'interfaces'. In contrast, in Simpler Syntax, the explicit task of the learner is to discover the constructional correspondences that account for the constructs encountered, and to generalize them to cover novel cases.

For a sketch of how such constructional learning might proceed, see Culicover (2021, Chapter 4). The essence of the constructional approach to learning is that it severely constrains the possible errors that learners can make to those that are correctable given sufficient evidence.[4] The errors are incorrect hypotheses about the correspondences between linear orders, syntactic constituents, and meanings. There are lexically headed phrasal correspondences relating syntactic structures to aspects of phonological form, and meanings. Lexically headed correspondences are local; thus, errors are locally detectable: e.g. if the learner hypothesizes the head-final correspondence (4a) on the basis of a misparsed example, the preponderance of constructs of exemplifying (4b) constitutes evidence for correcting this error.[5]

(4) a. $\begin{bmatrix} \textsc{phon} & 2\oplus 1 \\ \textsc{syn} & [_{\mathrm{VP}}\ \mathrm{V}_1,\ \mathrm{NP}_2] \end{bmatrix}$ b. $\begin{bmatrix} \textsc{phon} & 1\oplus 2 \\ \textsc{syn} & [_{\mathrm{VP}}\ \mathrm{V}_1,\ \mathrm{NP}_2] \end{bmatrix}$

Unbounded dependencies are not lexically headed, but by assumption do not involve movement. For wh-questions, for example, there are three things that need to be learned: (i) the meaning of the interrogative form (i.e. a set of possible answers), (ii) the linear adjacency between the wh-phrase and the auxiliary, and (iii) the fact that the interpretation of the wh-phrase in A′ position scopes over the property corresponding to the S that it is attached to and binds a variable corresponding to the gap

4 For an account of learnability of grammars that assume movement to produce linear orders, see Wexler and Culicover (1980).

5 Numerical indices notate correspondences between the levels. We also use these correspondence indices as variables over strings in PHON. The symbol '⊕' signals concatenation.

(Culicover 2021). The following is a simplified correspondence, where the $\mathcal{Q}$ operator maps a property *P* to the set of propositions that describe situations *s* where there exists a thing *x* such that *P* holds of *x* (Hamblin 1973):

(5)
$$\begin{bmatrix} \text{PHON} & \text{what}_1 \oplus \text{will}_2 \oplus \text{sue}_3 \oplus \text{eat}_4 \oplus \emptyset_5 \\ \text{SYN} & [_{\text{S}}\ \text{NP[WH]}_1,\ [_{\text{S}}\ \text{NP}_3,\ \text{Aux}_2,\ [_{\text{VP}}\ \text{V}_4,\ \text{NP}_5]]_6] \\ \text{CS} & \mathcal{Q}_1(\lambda x[\mathsf{eat}'_4(\text{AGENT}: \mathsf{sue}'_3, \text{PATIENT}: x_5, \text{TIME}: \mathsf{fut}'_2)]_6) \end{bmatrix}$$

The unboundedness of this A′ construction is a property of the binding relation between the operator $\mathcal{Q}$ and the variable *x* in CS. Crucially, all of the contingent properties of such a construction can be learned on the basis of simple input: (i) the fact that the wh-phrase must be initial in a direct question follows from the robust correspondence between initial wh-phrases and the operator $\mathcal{Q}$ in interrogative constructs; (ii) the fact that the auxiliary must be in second position is observable from the input;[6] (iii) the gap corresponding to the questioned argument is in complementary distribution with visible material in non-interrogative constructs.

4 Beyond Simpler Syntax

To conclude, let us consider the way forward. While we question some analyses that have been put forward for a considerable range of empirical phenomena in the MP, the phenomena are real, and the genuine generalizations that have been uncovered require explanation. If a minimalist theory along the lines of Simpler Syntax is on the right track, how should we proceed?

Obviously, we cannot attempt to answer this question here either in breadth or detail (see Culicover and Varaschin (in preparation) for some explicit proposals). But we can suggest strategies that might prove productive going forward.

6 In fact, the only counterevidence for this is the idiosyncratic construction *how come*. Not surprisingly, children produce errors in this case (Weinberg 1990), but eventually correct them, presumably on the basis of positive evidence for non-inverted structures. In cases *with* inversion, learners arguably do not have enough evidence to rule out a hypothesis that places a lower verb, as opposed to the main clause auxiliary, in initial position (Berwick et al. 2011, i.a.). One idea that would narrow the range of hypotheses is to constrain the formalism so that constructions are always confined to local trees, i.e. descriptions in SYN only refer to immediate daughters (Culicover et al. 2022; Sag 2010). On this approach, a linear order construction licensing a correspondence between SYN and PHON could not identify any auxiliary other than the sister of the subject as the target for inversion.

4.1 Structure and order

Linear order has to be specified for the canonical ordering relations in a language as well as for constructional variations on the basic ordering. Some typical examples of canonical ordering relations in different languages are:

1. In English, determiners are initial in a noun phrase.
2. In German, the verb is final in VP.
3. In Tagalog, the canonical order is VSO.
4. In Russian, constituent order is free.

Constructional variation is seen when the linear order corresponds to some semantic or information structure function. For example:

5. In English, wh-phrases with clausal scope are in initial position, regardless of the canonical position of corresponding non-interrogative phrases.
6. In German, the inflected verb is in second position in a main clause.
7. In Tagalog, a focused phrase precedes the verb.
8. In Russian, all wh-phrases appear in clause-initial position.

The two primary devices in MGG used to describe 1–8 are invisible heads and movement (Larson 1988; Pollock 1989, i.a.). Simpler Syntax assumes neither; these generalizations can be formulated as alternative correspondences between syntactic constituents and their relative linear ordering. We suggest the following general strategy for accounting for linear order in natural language.

Order

(i) There are no ordering relations in SYN.
(ii) Canonical and idiosyncratic constructional linear orderings are specified by alternative direct correspondences between SYN and PHON, as opposed to derivational mappings between different structures in SYN.
(iii) Invisible constituents (i.e. nodes in SYN that correspond to ∅ in PHON) are only posited when they can be inferred on the basis of language-internal evidence – e.g. when they systematically alternate with visible material.
(iv) If ordering is not constructionally specified, it is free, subject to constraints on information structure (Fanselow 2003; Uszkoreit 1986, i.a.).

4.2 The limits of syntax

The use of syntactic structure to model semantic relations has been largely abandoned in versions of the MP that assume that Merge is untriggered and derivations are not crash-proof (Chomsky et al. 2019, 243). This step places the burden of accounting for semantic phenomena on semantic theory:

> **Semantic theory**: Semantic relations (synonymy, entailments, contradictions, etc.) must be represented and accounted for by a semantic theory.

The situation is very different in morphology, which has taken the form of radical decomposition of complex morphological forms in terms of syntactic structures that reflect more or less synonymous sentences containing abstract verbs like CAUSE and GO (Hale and Keyser 1993). The formidable empirical and technical consequences of these approaches suggest that it would be profitable to pursue alternatives. In the context of the Parallel Architecture, the natural alternative is a constructional one. The constructional approach to morphology is developed in some detail by Jackendoff and Audring (2020), suggesting the following strategy.

Morphology

(i) Morphology is not reducible to syntax.
(ii) A constructional theory of morphology should explain the overlaps between syntax and morphology in terms of systematic relations between lexical items that share particular lexical and morphological forms, and meanings.

Finally, Culicover et al. (2022) make the case for prioritizing extragrammatical approaches to a wide range of phenomena that classically fall under the rubric of 'non-local constraints' (e.g. classical islands, weak crossover, freezing). Since the proposed constraints are associated largely with movement, they cannot be formulated in an approach that follows **Order** (ii) above. The phenomena still require explanation, of course. The strategy is the following:

Non-local syntactic constraints

(i) All constraints on syntactic structure are local well-formedness conditions.
(ii) They consist of licensed correspondences between SYN and PHON.
(iii) Explore processing or other extragrammatical factors to account for variation in acceptability when local constraints are satisfied.
(iv) Posit universal principles of grammar only if step (iii) is clearly unworkable.

This approach is relevant because non-local constraints have been a major source of learnability problems. The latter, in turn, have motivated rich hypotheses about UG which present serious challenges to evolvability (Hornstein 2009, 5–10).

For these reasons, we believe that a research program along the lines sketched out here offers some promise of explaining many of the problems that have engaged theoretical linguistics since its inception.

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