A Program for Eliminating Syntactic Categories

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Future research could profitably explore the hypothesis that syntactic categories should be eliminated from linguistic theory and their work taken over largely by the independently motivated system of semantic types. This would be a notable gain in theoretical economy, provided that their elimination does not necessitate innovations of equivalent complexity elsewhere in the theory.

Keywords: syntactic categories, semantic types, autonomy of syntax, Minimalist Grammars

1 Introduction

My purpose in this article is to outline and to begin to explore the hypothesis that syntactic categories can be eliminated from linguistic theory. Their function, I will suggest, can be taken over by independently motivated and widely used semantic categories, and most prominently by semantic types. The main motivation for this exploration is conceptual: if we *can* eliminate syntactic categories from our theoretical postulates, then Occam's Razor and Minimalist methodology dictate that we *should*, provided that their elimination does not necessitate innovations of equivalent complexity elsewhere in the theory.

Since the beginning of generative syntax (Harris 1946, Chomsky 1957), syntactic categories like N and NP have played a central role in our grammars. Harris (1946:165) defined a syntactic category (although not under that name) as "a class of morpheme sequences" that were "substitutable for each other" without change of grammaticality; in terms of these, it was claimed to be possible to obtain "succinct statements for the sequences of morphemes which constitute the utterances of the language" (Harris 1946:183). The subsequent history of generative syntax, viewed

from a certain angle, has been a succession of different ways of spelling out this basic insight, whether syntactic categories were used in the substitutional analysis of Harris or as the objects manipulated by phrase structure grammars or to mark the targets of rules (Chomsky 1957, 1965, and rather a lot of subsequent literature). And of course Chomsky (1957:17) famously argued that "grammar is autonomous and independent of meaning."

How, then, do I propose to do away with syntactic categories? The answer lies primarily in the theory of semantic types, which was originated by Russell (1908) and first applied in detail to natural language by Lewis (1970) and Montague (1970a,b). Since these pioneering works, semantic types have become ubiquitous in theories of formal semantics. They are inherent characteristics of the functions and other objects that semanticists take to be the denotations of words and phrases. For current purposes, it is interesting to note that there is already a certain amount of redundancy between syntactic categories and semantic types, even in contemporary standard theories of the syntax-semantics interface that have not been designed with these considerations in view. Take DPs, for example. In a simple extensional semantics, such as that outlined in Heim and Kratzer 1998, DPs are of types $\langle$et,t$\rangle$ or e; and these types are exhibited by no other syntactic category. Similarly, determiners (and nothing else) are of types $\langle$et,ett$\rangle$ or $\langle$et,e$\rangle$. Already in the set-up of Heim and Kratzer 1998 and similar systems, then, we do not need the syntactic categories DP and D to pick out DPs and Ds; we could do the job perfectly well by means of semantic types. The basic strategy to be followed in the present article will be to explore to what extent this state of affairs can be extended to other syntactic categories, while always keeping the types posited as simple and as natural as possible.

Here is a toy example, illustrating the basic idea. Suppose we were constructing a grammar for a simple fragment of English that contained only three transitive verbs and six names:

(1) John saw Mary
Achilles resents Agamemnon
Krishna instructed Arjuna
Mary instructed Agamemnon
⋮

To make things easy for ourselves, let us abstract away from word order and concentrate on achieving the correct hierarchical relations; furthermore, we will treat

verbs as units, with no independent heads expressing tense or agreement. It is clear, with these idealizations in place, that we do not need syntactic categories to generate the set of sentences just informally sketched. We just need a nondirectional External Merge operation, a simple extensional semantics for the words in question, a principle of semantic composition, and something like Heim and Kratzer's (1998:49) Principle of Interpretability:

(2) *merge*$(\tau_1, \tau_2) =$ $\overset{\frown}{\tau_1 \quad \tau_2}$

(3) a. $[\![\text{John}]\!]$ = John (type e)

b. $[\![\text{saw}]\!] = \lambda x.\lambda y.\, y$ saw x (type $\langle$e,et$\rangle$)

(4) *Functional Application*

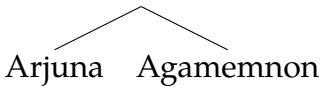
If α is a branching node and $\{\beta, \gamma\}$ is the set of its daughters, and $[\![\beta]\!]$ is a function whose domain contains $[\![\gamma]\!]$, then $[\![\alpha]\!] = [\![\beta]\!]([\![\gamma]\!])$.

(5) *Principle of Interpretability*

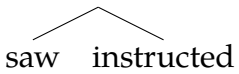
All nodes in a phrase structure tree must be in the domain of the interpretation function $[\![\ ]\!]$.

With these components in place, we can let Merge operate on whatever it likes, as it were, secure in the knowledge that trees like those in (6) will be filtered out by the Principle of Interpretability, since our only semantic composition rule, Functional Application, cannot interpret them.

(6) a.

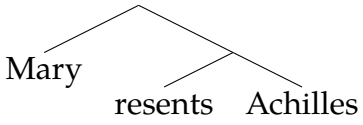


b.

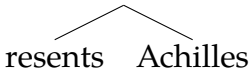


The only trees that escape the Principle of Interpretability are those that we want: full sentences like (7a) and grammatical subsentential constituents like (7b).

(7) a.



b.



The system to be developed in the current article, while naturally more complex, works on very much the same principles.

As far as I know, this idea has not been advocated before. It is inspired by, but goes beyond, the demonstration by Heim and Kratzer (1998:47–53) that their Principle of Interpretability should supplant the θ-Criterion as a mechanism for explaining the unacceptability of examples like (8).

(8) *It is not the case that greeted Ann.

It is related to but more radical than Collins's (2002) contention that we should eliminate the labels of phrasal categories, since Collins, although he dispenses with labels like "Noun Phrase" and "Verb Phrase," still maintains "Noun" and "Verb" as independent, purely syntactic, theoretical entities. Beyond these, we find occasional attempts in the literature to argue that semantic factors influence the ordering or selection of various phrases (Jackendoff 1972, Grimshaw 1979, Ernst 2002, Haider 2004, Adger 2018, Reuland 2022), but none of the authors concerned proposes eliminating syntactic categories altogether.

Another interesting possible precursor to the current approach is to be found in the "constructivist" tradition of Marantz (1997), Borer (2013, 2014), and Distributed Morphology (see Bobaljik 2017). These authors argue that lexical roots (as opposed to functional categories) do not have any syntactic categories in themselves. They maintain, however, that functional categories have "inherent categorial properties" (Borer 2014:115). And indeed categoriless lexical roots in these theories are typically combined with functional categories (C-functors in Borer's terminology, little n, little v, and little a in Distributed Morphology) and the combinations thus arrived at have normal lexical syntactic categories: a root plus little n is a Noun, a root plus little v is a Verb, and so on. So the constructivist tradition, while it prefigures the current approach in denying syntactic categories to lexical roots, is not truly eliminativist with regard to syntactic categories.

The same can be said, as far as I know, of Categorial Grammar, including its most recent incarnation Combinatory Categorial Grammar (CCG—see Steedman 2019 for

a recent survey). It is true that the Categorial Grammar tradition takes parallels between syntax and semantics very seriously. We have suggestive theoretical innovations such as complex syntactic "types" (i.e. categories) that seem to mirror or partially mirror semantic types (Ajdukiewicz 1935, Lambek 1958). For example, the syntactic type of transitive verbs is (S\NP)/NP (i.e. the type of things that combine with NPs to their right to yield things that combine with NPs to their left to yield sentences; Lambek 1958:157). This is almost irresistibly reminiscent of the semantic type ⟨e,et⟩ that standard extensional semantic theories give to those verbs. But as far as I know no-one in the Categorial Grammar literature ever suggests dispensing with syntactic categories. And there are explicit indications, in fact, that these theorists do *not* have anything like the current proposal in mind. Steedman (e.g. 2012, 2019), for example, generally operates with a simple extensional semantics of the kind just mentioned: this means that in his semantics nouns and intransitive verbs have the same semantic type (⟨e,t⟩), a state of affairs that is forbidden in a proposal like mine, of course. So, although Categorial Grammar sometimes seems to be teetering on the brink of saying what I say in this article, as far as I can see it never does.

Perhaps the closest parallel to the present proposal is to be found in the work of the generative semanticists. In opposition to the architecture of the grammar suggested in *Aspects* (Chomsky 1965), the generative semanticists proposed that the initial structure built in a syntactic derivation was the meaning, generally represented as a predicate logic formula in tree form, and that a set of rules derived the surface syntax from that (McCawley 1968, Lakoff 1972a,b, Postal 1972). The basic categories used in building the initial logical formula were, of course, logical or semantic. Lakoff's (1972b:628) logical trees, for example, were of category S and contained the subordinate categories Q (for "quantifier"), PRED, and ARG. The divergence between the undifferentiated, all-purpose predicates of logic and the variegated nouns, adjectives, and verbs of natural language did, it was acknowledged, raise a problem; but it was suggested that these latter categories were surface variants of the underlying predicate category, derived by rules that were implemented relatively late in the derivation (Bach 1968).

There is a certain amount of overlap between my program and that of generative semantics, then. So how does my proposal differ from this work? To start with, I do not advocate an architecture of the grammar whereby derivations start with representations of meaning. And I do not derive nouns, adjectives, and verbs from

one undifferentiated category of predicates; rather, I distinguish between them on semantic grounds at all stages of the derivation. In these respects, I am proposing a departure from current research trends that is much less radical than that proposed by the generative semanticists.

The rest of this article will be structured as follows. In section 2 I will lay out a new grammar that replaces syntactic categories with semantic types. In section 3 I broach the topic of the autonomy of syntax and explain why I think that the current system survives Chomsky's critique of the idea of basing syntax at least partly on semantics. And section 4 concludes.

2 A New Grammar

In this article, I will adopt and adapt Stabler's Minimalist Grammars syntactic framework (Stabler 1997, 2011, 2013, Elbourne 2016), which is a formalization of ideas laid out in Chomsky 1995b, 2001, 2008, and elsewhere.[1]

2.1 Syntax

I will adopt what Stabler calls a *directional minimalist grammar* (i.e. one that allows linear order to be read off from trees and taken into account in the formulation of Merge; Stabler 2011:635). It has become popular in recent literature, of course, to suppose that the core syntax does not pay attention to word order or other phonological exigencies and that such matters should be relegated to a separate module of the grammar, sometimes called EXT (for "externalization"). But Chomsky notes that this hypothesis still faces empirical difficulties and recommends that it be adopted only with a caveat (Chomsky 2014:8). Expanding on this theme, Chomsky et al. (2019:251–2) cite a wide range of recent literature that argues that word order and other phonological considerations must play a role in the core syntax; and they suggest no way of arguing against this literature. Moreover, Chomsky (2019:272) admits that there is "overwhelming evidence" in favor of the hypothesis that word order does feature in the syntactic computation. I am not aware of any formal theory of EXT that achieves the explicitness and empirical coverage of Stabler's directional

[1]This framework is chosen for the sake of concreteness; I see no obstacle to the exportation of the basic idea advocated here to other syntactic frameworks, and in fact I would welcome such developments.

minimalist grammars. So I adopt a theory along these latter lines. But nothing would prevent the directionality being removed in future work.

2.1.1 Features

We distinguish between three kinds of features: semantic, phonological, and syntactic. The following abbreviations will be adopted: (donkey) is the semantic value of the word *donkey*; a conventional spelling in phonological slashes, /donkey/, represents the phonological features; "donkey" alone, without quotation marks, summarizes the semantic and phonological features; a double colon separates the different kinds of features of one word in lexical entries and trees.

We distinguish between three kinds of syntactic features:

1. *Selector features*. A feature $\mathrm{E_L}$ indicates that a constituent needs to combine with another constituent to its left via external merge. Likewise, with the obvious change, for $\mathrm{E_R}$.

2. *Probe features*. Features written with various forms of the letter *i* are triggers of movement (internal merge). They include a subscript representation of the semantic type of the item to be moved: I_σ, i_σ, and $\mathcal{I}_\sigma$ for a type σ. They include the following varieties:

   (a) *Strong features* are written with capital letters: I_σ. They target constituents that have phonological features and produce overt movement, which is to say movement of all the features of the constituent concerned.

   (b) *Weak features* are written with lower-case letters: i_σ. They produce covert movement, which is to say movement of only the semantic and syntactic features of the constituent concerned.

   (c) *Reconstruction features* are written with calligraphic capitals: $\mathcal{I}_\sigma$. They target constituents that have phonological features and produce movement of phonological features only; syntactic and semantic features are left in the base position.

3. Features interpreted by syncategorematic rules, restricted in the current system to those that characterize λ-operators and traces.

I do not employ goal features in the current system. Selector features and probe features cannot be interpreted by the semantics and will sometimes be lumped together and referred to as *uninterpretable*. Features interpreted by syncategorematic rules are *interpretable*, of course.

It should be emphasized that the selector features and probe features posited here are direct descendants of features that are widely posited in Minimalist syntax. Their basic purpose is to ensure that Merge takes place when it should and that the right things are merged. These features are variously called selection features (Stabler 1997), c-selectional features (Adger 2003:96), edge features (Chomsky 2008:139), structure-building features and probe features (Müller 2010:38), selector features (Stabler 2011, Elbourne 2016), and trigger features (Collins and Stabler 2016:62), and probably other things besides.[2] Examples are Collins and Stabler's (2016:63) features [_vP] and EPP, which go on T and ensure that it takes a vP complement and a DP specifier.

As mentioned, previous selector features and probe features really do two things: first, they indicate that Merge is to take place; secondly, they indicate what kind of constituent, in terms of syntactic category, is meant to be merged. One of the innovations of the current article is to separate out these two functions and subject them to independent scrutiny: we still arguably need selector features and probe features to indicate that Merge has to take place, but we do not need them to include an indication of the syntactic category of the constituent that is to be merged. In the case of what I here call selector features, there is no indication of the category of the object to be merged, not even in terms of semantic type; in the case of what I here call probe features, syntactic category has been replaced by independently needed semantic types. This may very well turn out to be a gain in theoretical parsimony.[3]

[2] I am grateful to Collins and Stabler (2016:62) for assembling most of this bibliography, which I have shamelessly cribbed.

[3] One could in principle make an even bigger gain in theoretical parsimony by abolishing selector features and probe features altogether, of course, and letting External and Internal Merge operate freely (Chomsky 2019, Chomsky, Gallego, and Ott 2019). But I do not see how the resulting system would rule out structures that were semantically and phonologically unexceptionable but nonetheless ungrammatical. Examples include switching the first and second arguments of quantifiers (**Every barks dog*), recursively merging *not* to sentences or vPs, and EPP violations with the subject in vP-internal position. I deal with all of these examples and more in the present fragment by means of selector and probe features and related principles. To my knowledge, no-one has ever produced a detailed and explicit fragment of a natural language, not even a small fragment, on the basis of the doctrine of free Merge.

2.1.2 *Trees and sentences*

Projection, headedness, and the notion of specifier will not play a role in the new grammar as currently formulated. They could, of course, be added in again should they prove necessary to deal with a wider empirical database.

Stabler (1997) imposes a condition on well-formed trees for sentences to the effect that they should not contain any syntactic features except the categorial feature for the whole sentence (on its head) and interpretable syntactic features. The current system will impose the same condition, with two necessary emendations. First, we will not be able to maintain the categorial feature for the whole sentence, since such features have been abolished. Secondly, we cannot talk without reflection in the present theory about trees representing whole sentences, since one might suspect that "sentence" is a syntactic category label. What is the role of a sentence in previous syntactic theories? For one thing, it is the kind of object that a generative grammar is seen as trying to generate. I will use this idea. Let us continue to say that the current grammar is in the business of generating sentences but, for reasons that will be clear later, we will define a *sentence* for current purposes as a structure of type t that contains no uninterpretable syntactic features. It will be seen that these objects correspond well to the kinds of things designated by *S* and its theoretical successors in previous theories. Structures of type t that do contain uninterpretable features will be produced in the course of derivations of sentences, thus defined, and they are not, in that sense, illegitimate; but judged as candidates for the kinds of things that the grammar is supposed to generate they are deficient and will be declared ungrammatical.

The grammar is set up in such a way that any object produced by it in the course of a derivation will contain at most one node that bears uninterpretable syntactic features. This node will be called the *driver*, since the features on it determine the direction of the computation.

2.1.3 *Rules*

The following abbreviations will be used in the presentation of the rules. $\tau[\alpha]$ denotes a tree whose driver has a sequence of uninterpretable syntactic features whose first element is α. Given a structure $\tau[\alpha]$, τ denotes the result of erasing feature α. Given a tree τ_1 with subtree τ_2, $\tau_1\{\tau_2 \mapsto \tau_3\}$ is the result of replacing τ_2 with τ_3 in τ_1.

ϵ indicates an empty sequence. Given a tree τ, $|\tau|$ indicates the syntactic features of τ. τ_σ indicates a tree of semantic type σ.

1. *External Merge.* Since we are operating with a directional minimalist grammar, there are two cases:

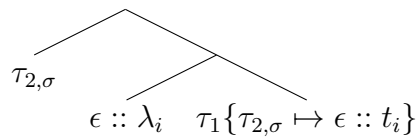
   (a) $\mathit{merge}(\tau_1[\mathrm{E_R}], \tau_2) = \overset{\wedge}{\tau_1 \quad \tau_2}$

   (b) $\mathit{merge}(\tau_1[\mathrm{E_L}], \tau_2) = \overset{\wedge}{\tau_2 \quad \tau_1}$

   External Merge is simplified as compared to the version given in earlier work on minimalist grammars: there is no matching of Selector and Categorial features, since the latter have been abolished; and there is no indication of headedness in the resulting structures, since this does not now play a role. All that Selector features do is indicate that some constituent or other must be merged in the specified position. The business of making sure that the right kind of constituent is merged is now left in large part to the semantics, and in particular to the Principle of Interpretability taken over from Heim and Kratzer 1998. A role will also be played by a principle called Argument Interpretability, to be introduced shortly. In a tree resulting from the application of a rule triggered by a Selector feature, the Selector feature in question is deleted.

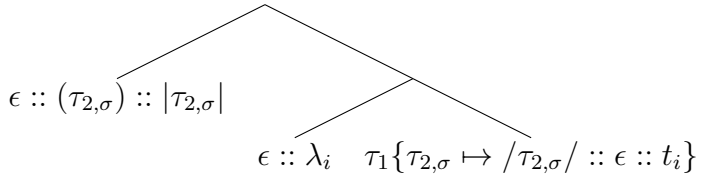
2. *Internal Merge*, or movement, takes place when an I_σ (strong), i_σ (weak), or $\mathcal{I}_\sigma$ (reconstruction) probe feature is contained in a tree and attracts to it a constituent of type σ. I will assume in this article that movement only takes place when there is exactly one constituent in the tree that is of the type and which has the features specified by the probe feature: so i_σ requires something of type σ with semantic features, and so on. This follows analogous ideas in Stabler 1997 but may ultimately be a simplification. If necessary, one could augment the current theory by formulating a version of the Attract Closest condition (Chomsky 1995b:296). Since there are three types of probe features, there are three cases:

   (a) Internal Merge applies to a tree $\tau_1[\mathrm{I}_\sigma]$ containing a subtree $\tau_{2,\sigma}$ as follows:



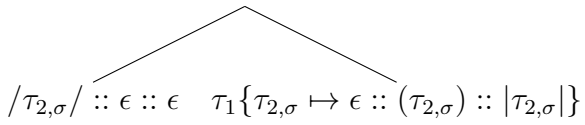
In this case, all the features of the subtree $\tau_{2,\sigma}$ are moved and a trace of type e is left in the base position.[4] The feature I_σ in τ_1 is deleted.

(b) Internal Merge applies to a tree $\tau_1[\mathrm{i}_\sigma]$ containing a subtree $\tau_{2,\sigma}$ as follows:



This is covert movement, since we are dealing with a weak (i_σ) probe feature. The semantic and syntactic features of the relevant constituent of type σ raise, leaving behind the phonological features and a trace. The i_σ feature in τ_1 is deleted.

(c) Internal Merge applies to a tree $\tau_1[\mathcal{I}_\sigma]$ containing a subtree $\tau_{2,\sigma}$ as follows:



This is movement with total reconstruction. The phonological features of the relevant constituent move, but the semantic and syntactic features remain in the base position. The $\mathcal{I}_\sigma$ feature in τ_1 is deleted.

The following principle will govern the operation of External Merge:

(9) *Argument Interpretability*
The constituent selected for by a selector feature must not contain any uninterpretable syntactic features.

[4] I have retained traditional traces despite the many misgivings that have been voiced about them by Minimalist theorists over the years. Collins and Stabler (2016:58), for example, point out that traces violate Chomsky's No Tampering Condition, which forbids removing or altering items already merged. There are two problems with this scepticism, however. First, it is still uncertain how a system that abolishes traces and replaces them with copies in the context of the copy theory of movement can distinguish between *the man saw the man* (no movement) and *the man arrived the man* (movement) (Chomsky et al. 2019:246–7). Secondly, it is not all clear how the lower copy in these cases gets interpreted correctly: the correct interpretation still seems to be something like a bound individual variable, as Chomsky (1976:101) saw long ago. I keep traces, then.

This will be seen in action later when we go through an example in detail in section 2.3. I see this principle as being derivable from other properties of the grammar: since the grammar is set up in such a way that any given tree contains at most one node that bears uninterpretable syntactic features, and since those features on that node play a crucial role in driving the computation, an operation that introduced another such node would risk creating a structure that contained two such nodes, which in turn would introduce uncertainty as to which node to turn to for features to trigger the further growth of the tree. It makes sense, then, that External Merge should be constrained in such a way as to prevent this eventuality.[5]

It should be noted that factors that affect previous versions of these rules may still affect the current ones. Internal Merge will be constrained by islands, for example. Covert movement in particular will be constrained by Fox's (2000:23) Scope Economy constraint:

(10) *Scope Economy*
Covert scope-shifting operations that are not forced for type considerations must have a semantic effect.

The covert movement rule above counts as a scope-shifting operation. (It is the analog in the current system of Quantifier Raising.) By "have a semantic effect" Fox means, roughly, 'have a truth-conditional effect'.

2.1.4 Lexical entries

In the representative listing in (11), optional syntactic features are given in angle brackets: $\langle\alpha\rangle$. The others are compulsory. In subscripted types, s is the type of events and i is the type of time intervals. The types of the various denotations are written on the right.

(11) /Mary/ :: $\lambda f_{\langle \mathrm{e,t}\rangle}.f(m)$ :: ϵ ⟨et,t⟩

/John/ :: $\lambda f_{\langle \mathrm{e,t}\rangle}.f(j)$ :: ϵ ⟨et,t⟩

/someone/ :: $\lambda f_{\langle \mathrm{e,t}\rangle}.\exists x(\mathrm{person}(x)\ \&\ f(x))$ :: ϵ ⟨et,t⟩

/everyone/ :: $\lambda f_{\langle \mathrm{e,t}\rangle}.\forall x(\mathrm{person}(x) \rightarrow f(x))$ :: ϵ ⟨et,t⟩

/every/ :: $\lambda f_{\langle \mathrm{e,t}\rangle}.\lambda g_{\langle \mathrm{e,t}\rangle}.\forall x(f(x) \rightarrow g(x))$ :: $\mathrm{E_R}$ ⟨et,ett⟩

[5]Collins and Stabler's (2016:64) Triggered Merge imposes the same condition.

/donkey/ :: $\lambda x.\text{donkey}(x) :: \epsilon$ ⟨e,t⟩

/cute/ :: $\lambda f_{\langle \text{e,t}\rangle}.\lambda x.f(x)$ & $\text{cute}(x) :: \text{E}_\text{R}$ ⟨et,et⟩

/dance/ :: $\lambda R_{\langle \text{s,it}\rangle}.\lambda e.\text{dance}(e)$ & $R(e, \textsc{now}) :: \text{E}_\text{R}$ ⟨sit,st⟩

/inspect/ :: $\lambda R_{\langle \text{s,it}\rangle}.\lambda x.\lambda e.\text{inspection}(e)$ & $\text{Theme}(e, x)$ & $R(e, \textsc{now}) :: \text{E}_\text{R}\ \text{E}_\text{R}$ ⟨sit,est⟩

/give/ :: $\lambda R_{\langle \text{s,it}\rangle}.\lambda x.\lambda y.\lambda e.\text{giving}(e)$ & $\text{Theme}(e, x)$ & $\text{Goal}(e, y)$ & $R(e, \textsc{now})$ $:: \text{E}_\text{R}\ \text{E}_\text{R}\ \text{E}_\text{L}\ \mathcal{I}_{\langle \text{e,est}\rangle}$ ⟨sit,eest⟩

/-ed/ :: $< :: \epsilon$ ⟨s,it⟩

/beautifully/ :: $\lambda F_{\langle \text{s,t}\rangle}.\lambda e.F(e)$ & $\text{beautiful}(e) :: \text{E}_\text{R}/\text{E}_\text{L}$ ⟨st,st⟩

$\epsilon :: \lambda F_{\langle \text{s,t}\rangle}.\lambda x.\exists e(F(e)$ & $\text{Agent}(e, x)) :: \text{E}_\text{R}\ \text{E}_\text{L}\ \langle \text{i}_{\langle \text{et,t}\rangle}\rangle\ \langle \text{i}_{\langle \text{et,t}\rangle}\rangle\ \langle \text{E}_\text{L}\ \mathcal{I}_{\langle \text{s,it}\rangle}\ \mathcal{I}_{\langle \text{et,t}\rangle}/\text{I}_{\langle \text{et,t}\rangle}\rangle$ ⟨st,et⟩

/not/ :: $\lambda p_t.\neg p :: \epsilon$ ⟨t,t⟩

In the lexical entry for little v[6] (second from the last in this list), the $\text{i}_{\langle \text{et,t}\rangle}$ features are to bring about compulsory covert movement of the object; they are optional so as to allow for intransitive verbs and there can be one or two of them to allow for verbs that take one or two internal arguments.[7] In the same feature list, the scope of the oblique slash (indicating exclusive disjunction) can be shown as follows: $\langle \text{E}_\text{L}\ \mathcal{I}_{\langle \text{s,it}\rangle}\ (\mathcal{I}_{\langle \text{et,t}\rangle}/\text{I}_{\langle \text{et,t}\rangle})\rangle$. The E_L feature and the $\mathcal{I}_{\langle \text{s,it}\rangle}$ feature must be followed by exactly one of $\mathcal{I}_{\langle \text{et,t}\rangle}$ and $\text{I}_{\langle \text{et,t}\rangle}$, when the whole optional raft of features $\langle \text{E}_\text{L}\ \mathcal{I}_{\langle \text{s,it}\rangle}\ \mathcal{I}_{\langle \text{et,t}\rangle}/\text{I}_{\langle \text{et,t}\rangle}\rangle$ is put into use. The optional raft of features is to allow for sentential negation and concomitant changes; the $\mathcal{I}_{\langle \text{et,t}\rangle}$ feature makes the subject have scope below negation and the $\text{I}_{\langle \text{et,t}\rangle}$ gives it scope above negation. One of these possibilities will be illustrated in section 2.3. Meanwhile the symbol "$<$" in the lexical entry of the past tense morpheme designates a function of type ⟨s,it⟩ such that $< (e, i)$ iff the temporal end point of the event e occurred before the start of i. (In the metalanguage I will write things like "$e < i$" to indicate that this kind of condition is fulfilled.) I will not attempt to go into the details of the semantics of tense.

[6] I will continue to call this item "little v" for convenience, in a purely informal designation, even though syntactic categories like v have no role to play in the current system. The same goes for other syntactic category names.

[7] The second $\text{i}_{\langle \text{et,t}\rangle}$ feature can also be used to give the subject scope over the object in sentences like *Someone inspected everyone*: the object will move covertly over the subject by means of the first and then the second will enable the subject to move covertly over the raised position of the object.

In accordance with the present research program, the above lexical items are all of different semantic types, with the exception of things that we want to be of the same type, like *John* and *Mary*. Of course having the lexical items be of different types is only part of the battle. We will also have to make sure that no unwelcome duplications of types arise in the course of derivations. Attention will be paid to this in the course of the sample derivation in section 2.3.

2.2 Semantics

2.2.1 Rules (after Heim and Kratzer 1998)

The grammar will contain the following semantic interpretation rules:

1. Functional Application
   If α is a branching node and $\{\beta, \gamma\}$ the set of its daughters, then, for any assignment g, α is in the domain of $[\![\ ]\!]^g$ if both β and γ are, and $[\![\beta]\!]^g$ is a function whose domain contains $[\![\gamma]\!]^g$. In that case, $[\![\alpha]\!]^g = [\![\beta]\!]^g([\![\gamma]\!]^g)$.

2. Predicate Abstraction
   For all indices i and assignments g, $[\![\epsilon :: \lambda_i\ \ \alpha]\!]^g = \lambda x.\, [\![\alpha]\!]^{g^{x/i}}$.

3. Traces
   If α is a trace, g is a variable assignment, and $i \in \mathrm{dom}(g)$, then $[\![\alpha_i]\!]^g = g(i)$.

4. Lexical Terminals
   If α is a terminal node occupied by a lexical item, then $[\![\alpha]\!]$ is given by the semantic features of α (i.e. $[\![\alpha]\!] = (\alpha)$).

Variable assignments are functions from the natural numbers to individuals, as usual. $g^{x/i}$ is the variable assignment that is just like g except that i is mapped to x.

The grammar will also make use of the following principle (Heim and Kratzer 1998):

(12) *Principle of Interpretability*
All nodes in a phrase structure tree must be in the domain of the interpretation function $[\![\ ]\!]$.

The interpretation of individual lexical items is given in section 2.1.4.

2.3 An example

I will give a derivation for the following sentence:

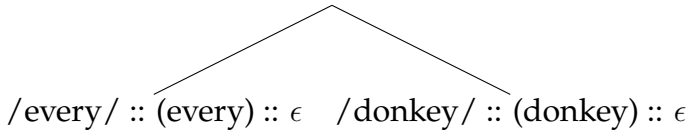
(13) Mary did not inspect every donkey.

In producing a syntactic and semantic analysis for (13), we will need to pay particular attention to the relative scope of negation and the existential quantifier over event variables that is inherent in a Davidsonian treatment of verbs. Champollion (2015) points out that many contemporary versions of event semantics produce analyses that would produce the following meaning for this sentence: 'Every donkey x is such that in the past there was an event e such that it is not the case that e is an inspection of x by Mary'. These truth conditions are incorrect: they are much too easy to satisfy. We will need to do better.

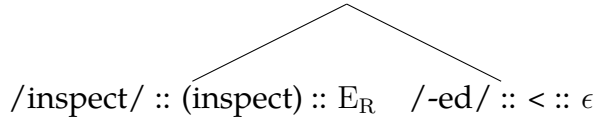
The creation of structure in this system will be regulated by the Principle of Interpretability and also by the requirement that any kind of Merge, whether external or internal, must be triggered by some kind of feature. The Principle of Interpretability will, strictly speaking, come into force after the syntactic derivation. It is not anticipated that semantic interpretation will take place in tandem with the building of structure, since that would prevent interpretation from taking place successfully in cases where something of type ⟨et,t⟩ is taken as argument by a verb that expects something of type e in the relevant position: we have to wait until the argument moves and leaves a trace in order to reach an interpretable structure in those cases. All the same, it is useful as a heuristic to apply the Principle of Interpretability as we go along, as it were, to see how this principle ultimately restricts the form that sentences can take (not forgetting, once again, the requirement for Merge to be triggered by features too). The Principle ensures that if an uninterpretable tree is built, it will be flagged as ill-formed.

Bearing these principles in mind, we look at the list of lexical entries in (11) and note that the only pairs of items that are capable of combining there, assuming that the verb *inspect* will be used, are *every* and *donkey*, *inspect* and *-ed*, and *cute* and *donkey*. In terms of types alone, *donkey* could combine with a word of type ⟨et,t⟩, such as *Mary*, but neither *donkey* nor any word of type ⟨et,t⟩ has any features to license the merger. To make things simpler, we will not include an adjective in this example. But we perform the other two instances of external Merge available and create the following structures:

(14)



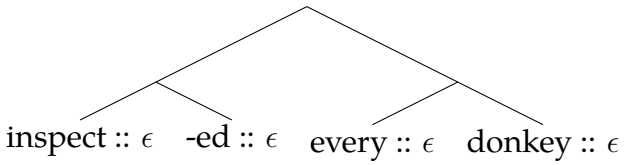
(15)



The structure in (14) is of type ⟨et,t⟩. It could combine with another instance of the word *donkey* as far as types are concerned (or, in a larger fragment, another noun), thus creating a problem; but neither (14) nor *donkey* have the syntactic features necessary to allow such an application of Merge. Later on we will encounter another constituent of type ⟨e,t⟩, created by merging little v and the constituent formerly known as VP. This will have a feature that will allow it to combine with *every donkey*, *Mary*, and other constituents of type ⟨et,t⟩; but this is a good thing, because we will be wanting to merge in the subject at that stage. Meanwhile (15) is of type ⟨e,st⟩. There is nothing in the current system that could take this as an argument. There is just one thing of type e that it could take as an argument, namely a trace.

In a move that will soon lead to this eventuality, we now merge (14) and (15) and erase the $\mathrm{E_R}$ feature of *inspect*:

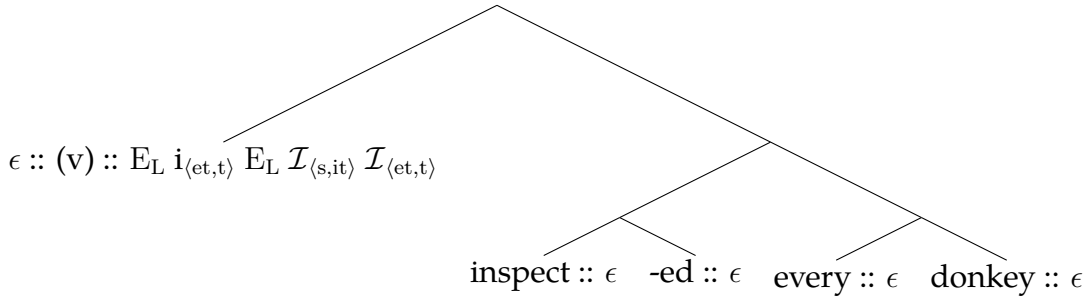
(16)



The resulting structure will be of type ⟨s,t⟩ when *every donkey* is replaced with a trace. Note that there are no syntactic features left on this structure, meaning that it cannot trigger any kind of Merge. Furthermore, there are no constituents of type s that it could possibly take as arguments.

There are two things that take ⟨s,t⟩ arguments in the current system: adverbs like *beautifully* and little v. An adverb could be added at this point, but let us ignore this possibility for now. So we merge little v and (16), deleting the $\mathrm{E_R}$ feature of little v:

(17)

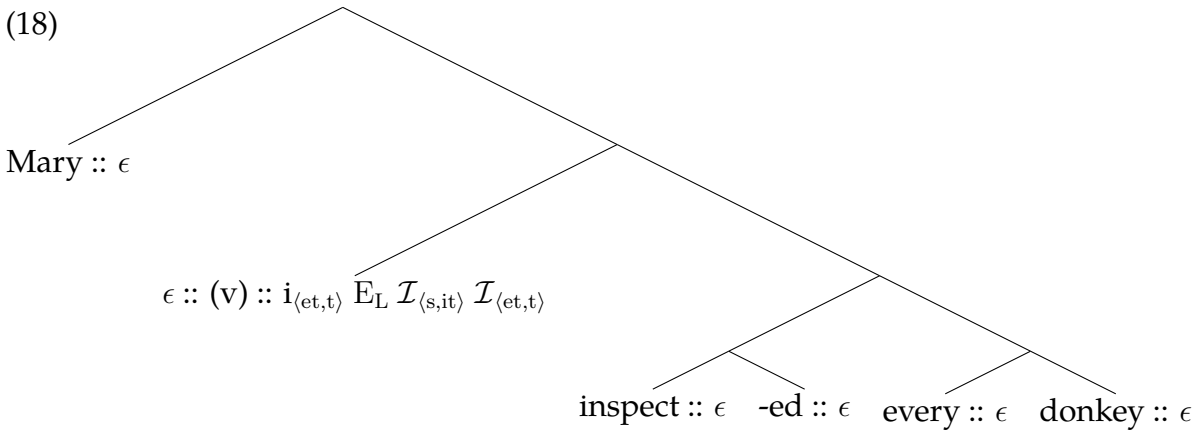


Note that little v bears the optional raft of features; this will enable the sentence to include negation.

This structure will be of type ⟨e,t⟩ when the trace is inserted. There is nothing of type e in this system that it could take as argument (apart from traces, which have to be created by movement). There are, however, three kinds of things that take constituents of type ⟨e,t⟩ as argument in the semantics: constituents of type ⟨et,t⟩, like *Mary* and *every donkey*; constituents of type ⟨et,et⟩, like *cute*; and constituents of type ⟨et,ett⟩, like *every*. What we want to happen is for *Mary*, a constituent of type ⟨et,t⟩ that has not yet entered the derivation, to be merged. What about the other apparent possibilities? To start with, we cannot raise the object and merge that in this position, even though the types would work out, because the first syntactic feature in the sequence on little v is $\mathrm{E_L}$; it specifies external merge, then. Nor can we merge *cute* or *every* at this juncture, since these words, as listed in the lexicon, bear uninterpretable syntactic features: to merge them, then, would violate (9) (Argument Interpretability).

The upshot is that we have to merge in something of type ⟨et,t⟩ from outside the existing structure, which we now do:

(18)



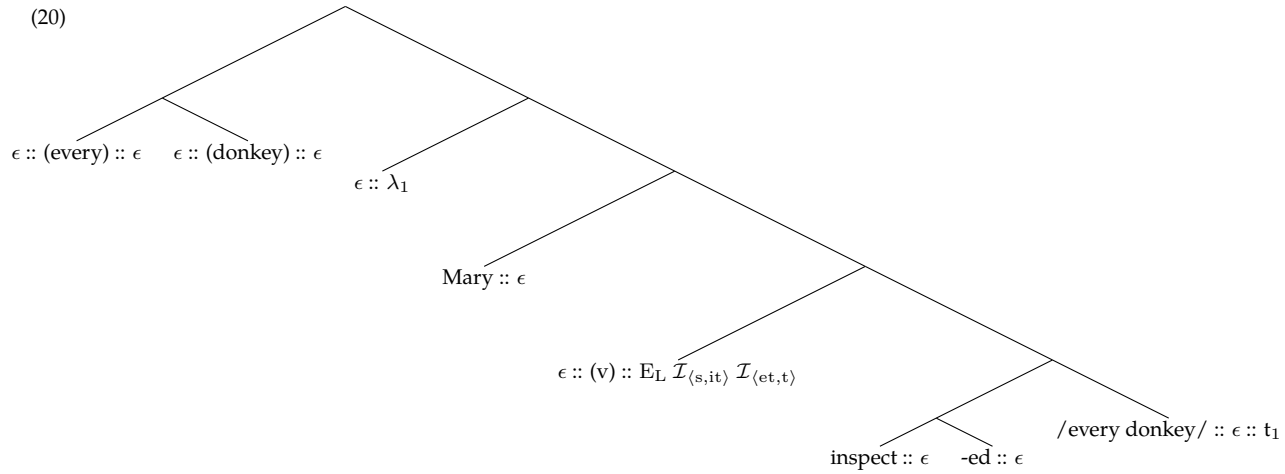
Little v is still the driver. The next in its sequence of syntactic features mandates covert movement of something of type ⟨et,t⟩. The question arises whether we move the subject or the object; we want to move the object, of course. The answer follows quickly and easily from (10) (Scope Economy): moving the subject at this juncture (which is not forced by type considerations) would be a trivial short-distance movement with no semantic effect. We have to move the object, then.

It is worth noting that we could also obtain the right result in this case solely by an appeal to the Principle of Interpretability: the word *Mary* is perfectly happy, in terms of interpretability, where it sits; but if *every donkey* is not replaced with a trace, the whole tree will be uninterpretable because of type clash; and none of the other features present will be able to replace this constituent with a trace. Why, then, do I include Scope Economy as a principle of grammar? For one thing, of course, it is extremely well motivated by Fox (2000). But it, or something like it, is also arguably motivated by the question that we are now considering of whether and when to move the object in derivations involving transitive verbs. If the optional raft of features were present on little v and had $\mathrm{I}_{\langle \mathrm{et,t} \rangle}$ as its last member (not $\mathcal{I}_{\langle \mathrm{et,t} \rangle}$, as presently), then we could use $\mathrm{I}_{\langle \mathrm{et,t} \rangle}$, when we got round to it, to raise the object and replace it with a trace. We could thus use $\mathrm{i}_{\langle \mathrm{et,t} \rangle}$ to raise the subject in a short-distance movement (if such movements were not forbidden by another principle) just after little v is merged, since this latter feature would not now be needed to ensure the interpretability of the object. Such a derivation, using the same lexical material that is present in the current one, would lead to an ungrammatical string that would be pronounced as follows (since the object is raised last):

(19) *Every donkey did not Mary inspect.

In order to prevent this, we can call on Fox's (2000) Scope Economy condition, as anticipated in section 2.1.3: since the short movement of *Mary* would not have any semantic effect in the sense explored by Fox, it is forbidden by this condition. This means that in the circumstances just outlined $\mathrm{i}_{\langle \mathrm{et,t} \rangle}$ must raise the object and $\mathrm{I}_{\langle \mathrm{et,t} \rangle}$ must raise the subject, since (after object raising has left a trace of type e associated with the phonological features of the object) the subject is the only item of type ⟨et,t⟩ that has phonological features. So (19) cannot be derived. For the purpose of deciding what to do with (18), the present considerations show that two principles independently rule out the contemplated short movement.

Returning to (18), then, we covertly move the object and produce (20).[8]



This tree has the following interesting property: the only syntactic features left on it that need to be eliminated, under the terms of section 2.1.2, are the three left on little v; and these were purely optional and did not have to be included. We predict, then, that the grammar produces a tree identical to (20) with the exception that the three syntactic features on little v are not present. Furthermore, as mentioned in section 2.1.2, a good definition of a sentence in the current system is that a sentence is a structure of type t that contains no uninterpretable syntactic features. (20) is the first time we have reached a structure of type t in the course of the derivation. We predict, then, that (20) so altered as to remove the syntactic features on little v is a grammatical sentence. And I welcome this prediction. The structure just described is my representation for (21). A straightforward calculation in the current system shows that it is predicted to have the truth conditions in (22).

(21) Mary inspected every donkey.

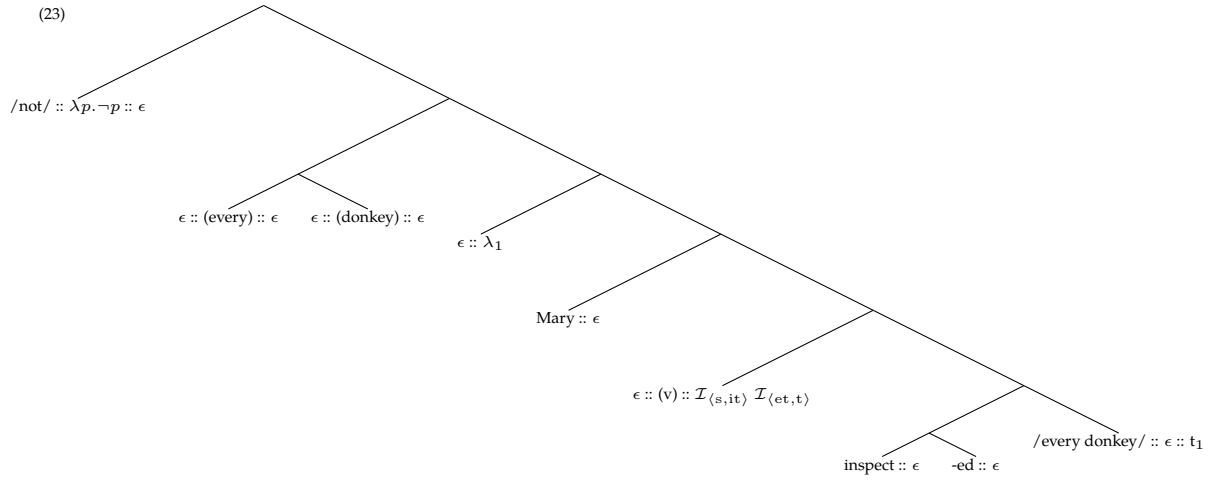
(22) $\forall x(\text{donkey}(x) \rightarrow \exists e(\text{inspection}(e) \;\&\; \text{Theme}(e, x) \;\&\; e < \textsc{now} \;\&\; \text{Agent}(e, m)))$

Compared to the kind of structure that would be given to this sentence by most broadly Minimalist frameworks, the current proposal is notably economical, in that it does not, for example, contain a T node above what we might think of in informal terms as vP. I take this to be a good thing, in that if there is no empirical or conceptual

[8] In (20), the mother of the node $\epsilon :: \lambda_1$ is of type ⟨e,t⟩ and thus could, as far as types as concerned, be taken as argument by items of type ⟨et,ett⟩ or ⟨et,et⟩, which we do not want. But the node $\epsilon :: \lambda_1$ is only formed as a result of movement and so its mother has a sister immediately given to it by that operation.

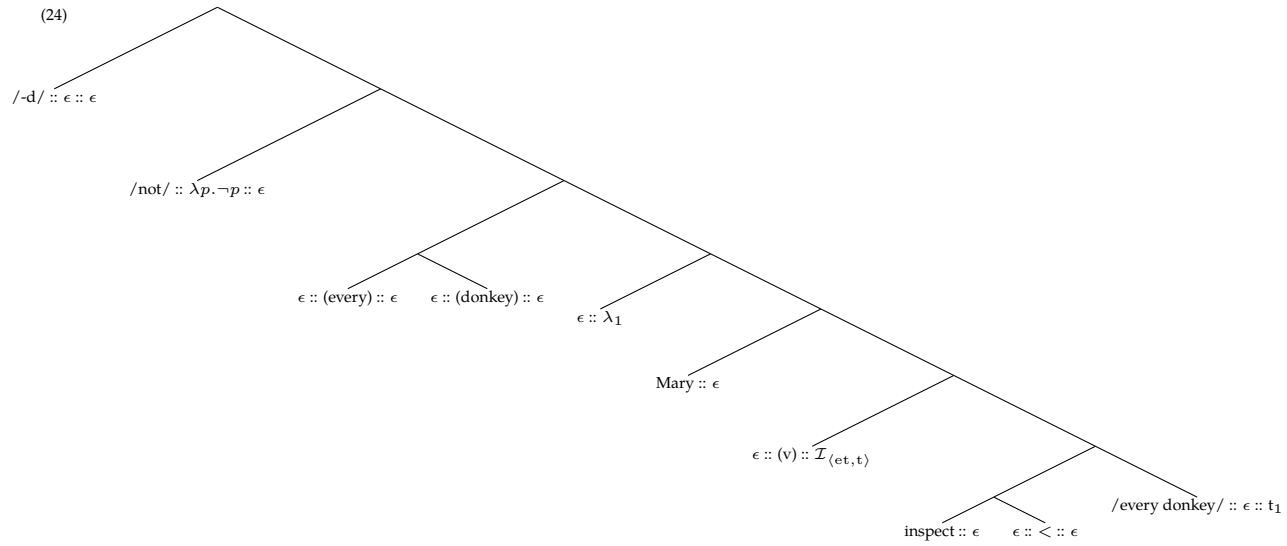
need for this extra structure we should not have it; and I see no need for it. It might be objected that sentences are not of one syntactic category in the current system; but strictly speaking, of course, they are not of any syntactic category at all in the current system, so this kind of concern no longer holds sway.

Returning to the derivation of (13), we note that (20) is of type t. Little v is still the driver. The next feature in its sequence of syntactic features is $\mathrm{E_L}$. There is only one item in our system that takes something of type t as an argument in the semantics and that is *not*. So we merge *not* and delete $\mathrm{E_L}$:



All the structure necessary for the meaning of the sentence is now in place. The remaining two features on little v are there to get the phonology right.[9] The first one brings about phonological movement of a constituent of type $\langle$s,it$\rangle$, of which there is only one in the structure, the tense morpheme *-d*:

[9]Note that it would not be possible to produce a structure that sounded like (23) would sound as a generated sentence in the current system. The only way to merge in negation is with the $\mathrm{E_L}$ feature that we have just seen in action; but that feature is compulsorily packaged with the other two features that affect the phonology.



The tense morpheme will now be spelled out in the right position, both in the current tree, where it is spelled out high with *do*-support, and in (20) (with the syntactic features on little v removed), construed as a representation of (21), where tense is spelled out low, with the verb. There is thus no need for the kind of lowering of the tense morpheme onto the verb that has often been assumed for sentences like (21) (e.g. by Chomsky (1981:256), Pollock (1989)); this was always an anomalous exception to the generalization that movement consists of raising.[10] I will not attempt in this article, however, to spell out the details of *do*-support, which I assume is implemented at a later level of the grammar.

There is just one more syntactic feature on little v to dispose of: $\mathcal{I}_{\langle et,t\rangle}$, which mandates phonological movement of a constituent of type ⟨et,t⟩. It is the equivalent in the current system of an EPP feature.[11] Unless we make a stipulation (which we could if necessary), we in principle leave open which such constituent will undergo this movement. In this case, in fact, there is no choice: there were two constituents of type ⟨et,t⟩ in the tree at the start; but one of them, *every donkey*, has undergone covert movement, in a quite general process that will apply to all such sentences; this means that its trace has phonological features but is not of the right type, since it is of type e; and the higher copy is the right type but does not have any phonological features.

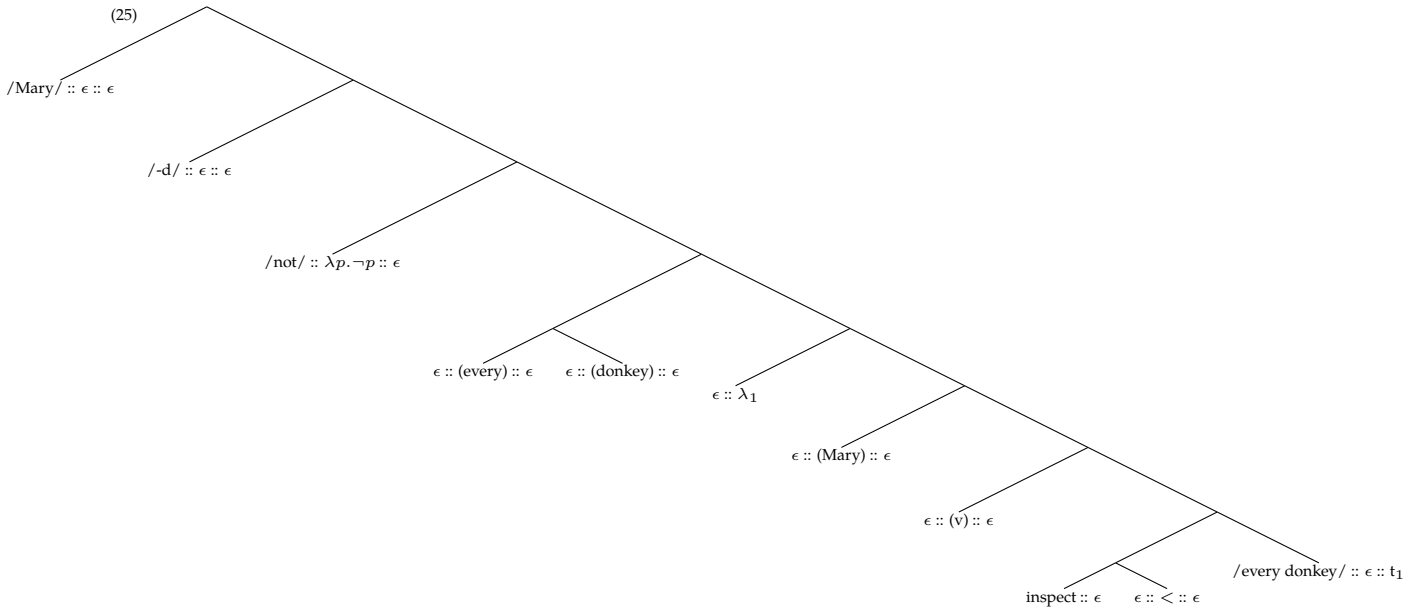
[10]Sauerland and I have argued against the other prominent alleged exception to that generalization, Quantifier Lowering (Sauerland and Elbourne 2002); indeed the kind of phonological movement just used is one way of avoiding this and is based on the mechanism that Sauerland and I advocated.

[11]It should be noted that we are also allowed to have an $I_{\langle et,t\rangle}$ feature, which produces regular movement without reconstruction, in the same place. This will be necessary when the subject scopes over negation. Items moved by this kind of feature have to have phonological features too.

So the only constituent that the relevant rule can apply to is the subject, *Mary*.

These observations might be taken to be an explanation of why objects cannot raise to satisfy EPP. The innovation whereby movement rules target things of particular types, rather than DPs, means that the current framework may be in a better position to explain why the object is not raised in EPP than at least some previous frameworks, as just explained. Note that the lower copy of the object in a more traditional derivation would have phonological features and would be the kind of thing targeted by EPP movement, namely a DP.[12]

The upshot of the above considerations is that at this point we have to raise the subject:



As is common in the Minimalist Grammars framework, all of the phonological and semantic features are laid out in their appropriate positions in this one representation, ready for interpretation by their respective interfaces. A straightforward calculation shows that this sentence has the following truth conditions according to the current system:

(26) $\neg\forall x(\text{donkey}(x) \rightarrow \exists e(\text{inspection}(e)\ \&\ \text{Theme}(e,x)\ \&\ e < \textsc{now}\ \&\ \text{Agent}(e,m)))$

[12] A reviewer questions the generality of this solution, asking whether proper names would also have to raise from object position, given that they do not "take scope" in the same manner as quantifier phrases. The answer is that they would. They have to do this for type-theoretic reasons: since proper names, like quantifier phrases, are of type ⟨et,t⟩ in this article (and in much previous work, going back at least to Montague 1973) they will have to raise from object position for type-theoretic reasons. Hence the treatment of EPP here would apply to names too.

These truth conditions are intuitively adequate. In particular, they incorporate the right result with respect to the scope of negation and '$\exists e$', which was laid down as a desideratum at the start of this section.

2.4 Further comments on the current system

2.4.1 Ditransitives and others

This fragment can, of course, be used to derive a large number of other sentences, such as *Someone inspected everyone* (both scopal readings), *Everyone did not dance* (both scopal readings), and *John gave Mary Fido*.

The first two examples are straightforward. (See footnote 7 for relevant discussion.) A few remarks are worth making about the third example. The word *give* is the driver at the start of the derivation. Recall its lexical entry:

(27) /give/ :: $\lambda R_{\langle \mathrm{s,it}\rangle}.\lambda x.\lambda y.\lambda e.\mathrm{giving}(e)\ \&\ \mathrm{Theme}(e,x)\ \&\ \mathrm{Goal}(e,y)\ \&\ R(e,\textsc{now})$
:: $\mathrm{E_R}\ \mathrm{E_R}\ \mathrm{E_L}\ \mathcal{I}_{\langle \mathrm{e,est}\rangle}$

Its syntactic features trigger merger of the tense morpheme, the direct object, and the indirect object. Next up is a feature triggering phonological movement of a constituent of type ⟨e,est⟩. The only constituent of that type in the tree is the combination of *give* and the tense morpheme; this constituent's phonological features duly move up, leaving the semantic features in the base position. (There are no more syntactic features.) In this way a shell structure is formed, of the kind whose virtues have been extolled by Larson (2014). This is taken as argument by little v, which in this derivation will have the following lexical entry:

(28) $\epsilon :: \lambda F_{\langle \mathrm{s,t}\rangle}.\lambda x.\exists e(F(e)\ \&\ \mathrm{Agent}(e,x)) :: \mathrm{E_R}\ \mathrm{E_L}\ \mathrm{i}_{\langle \mathrm{et,t}\rangle}\ \mathrm{i}_{\langle \mathrm{et,t}\rangle}$

The syntactic features on little v will then fold in the subject and trigger covert movement of both the objects. It does not matter in which order the objects covertly move, so the $\mathrm{i}_{\langle \mathrm{et,t}\rangle}$ features can be left to work freely, attracting the semantic features of *Mary* and *Fido* in either order. Once one of the objects has been raised it cannot undergo raising again, as explained earlier, since its base position will now be of type e and both objects have to raise eventually for interpretability.

2.4.2 *Adverbs*

The above example, in order to keep things simple, did not include any adverbs. A few remarks on these are now in order, with the proviso that only a superficial treatment will be possible in the current article.

The lexical entry for an adverb given above was the following:

(29) /beautifully/ :: $\lambda F_{\langle \mathrm{s,t} \rangle}.\lambda e.F(e)$ & beautiful(e) :: $\mathrm{E_R}/\mathrm{E_L}$

The word is of type ⟨st,st⟩, which is a unique type in the current system such that nothing takes items of this type as an argument. The only item of type ⟨s,t⟩ in the current system, which is to say the only item that the adverb could take as an argument, in semantic terms, is the analog in the current system of VP, as desired.

It is important to note that in the small fragment given in this article I only attempt to deal with manner adverbs. The $\mathrm{E_R}$ or $\mathrm{E_L}$ feature in the lexical entry will place them either side of VP, which seems right. It is well known, of course, that there are many different kinds of adverb (speech-act, evaluative, epistemic…) and that they seem to obey complex ordering constraints within the clause. This has led some researchers to see different classes of adverbs as hosted in the specifiers of different null syntactic heads, with a fairly rigid ordering imposed by the syntax (Cinque 1999, 2004). I will not be able to deal with this issue within the confines of the current article. But I am encouraged to note that there is another approach to this question that is remarkably congruent with the research program being advocated here, since it aims to explain the ordering of adverbs wholly or largely by means of semantic constraints (Jackendoff 1972, Ernst 2002, 2004, 2007, Haider 2004).

2.4.3 *A note on verbs and nouns*

One of the ideas behind the current project, of course, is that constituents that used to be identified by their syntactic category can now be identified by their semantic type: so DPs will officially be items of type ⟨et,t⟩, little v will officially be an item of type ⟨st,et⟩, and so on. Any rules or processes targeting particular syntactic categories (if such there be) can now be thought of as targeting items of the appropriate type.

This would appear to be feasible for a wide range of cases. But it looks like complications might arise in the case of verbs. Here, as a reminder, are abbreviated lexical entries for the intransitive, transitive, and ditransitive verbs in section 2.1.4, with their semantic types:

(30) /dance/ :: $\lambda R_{\langle \text{s,it} \rangle}.\lambda e.\text{dance}(e)\ \&\ R(e, \textsc{now})$ ⟨sit,st⟩

/inspect/ :: $\lambda R_{\langle \text{s,it} \rangle}.\lambda x.\lambda e.\text{inspection}(e)\ \&\ \text{Theme}(e, x)\ \&\ R(e, \textsc{now})$ ⟨sit,est⟩

/give/ :: $\lambda R_{\langle \text{s,it} \rangle}.\lambda x.\lambda y.\lambda e.\text{giving}(e)\ \&\ \text{Theme}(e, x)\ \&\ \text{Goal}(e, y)\ \&\ R(e, \textsc{now})$ ⟨sit,eest⟩

These are of different types. So if there were a rule targeting just verbs without their accompanying tense, how could we capture that in the current framework? It is not clear that there is such a thing. But if necessary we could say that the rule in question targeted items whose types began with ⟨s,it⟩: this picks out all and only the items that would be labeled verbs (without tense) in previous frameworks. Another possibility would be to say that the rule in question targeted lexical items whose types ended in ⟨s,t⟩; this would pick out a natural class of lexical items that were in some sense predicates of events. Both these possibilities use inherent properties of semantic types and would thus be more economical than reintroducing the bulky apparatus of autonomous syntactic categories.

Similar issues may arise for nouns. The challenge is as follows. As well as nouns like *donkey* (type ⟨e,t⟩) we also have nouns like *mother* and *enemy*, which are arguably of type ⟨e,et⟩ (Löbner 1985, Barker 1991). By the time these relational nouns get round to combining with determiners, they generally have their external argument slot filled, so there is no problem with determiners still targeting things of type ⟨e,t⟩. But if there are other processes that target nouns in isolation, as it were, then we will need some type-based way of picking them out. There are two possible responses to this challenge. The first would be to deny that relational nouns are of type ⟨e,et⟩: Cresswell (1994, 1996) has shown that *donkey* and *enemy* could be analyzed as being of the same semantic type by treating *enemy* as being context sensitive in a particular way; and Peters and Westerståhl (2006:257–8, 2013) have argued (successfully, in my opinion) that relational nouns are of type ⟨e,t⟩ in constructions like *John's mother* and elsewhere. Further research could profitably be carried out to explore this option. The second response would be to acknowledge that relational nouns are of type ⟨e,et⟩ and say that nouns in general are lexical items whose types begin with e, in the sense of denoting functions that map entities of type e to something.[13] Alternatively, but relatedly, one could simply say that nouns denote relations (including one-place re-

[13]This correctly excludes words of types ⟨et,t⟩, ⟨et,ett⟩, and ⟨et,et⟩, which denote functions that map entities of type ⟨e,t⟩ to something.

lations) over individuals. The point about economy at the end of the last paragraph holds here too.

3 The Autonomy of Syntax

It is evident that, under a certain interpretation, Chomsky's (1957:17) claim that "grammar is autonomous and independent of meaning" would be fatal to the current project, if true. For one thing, it does not square well with this claim to have the shapes of syntactic trees be determined at least in part by their conformity to a semantic principle (the Principle of Interpretability). Secondly, we should recall that movement in the current version of the theory is triggered by features that specify the semantic type of the items that are to be moved.

Before I go into issues surrounding the interpretation and truth of the claim, here is a reminder of the arguments that Chomsky (1957:15) advances for it. He spells them out very briefly. The first, and best known, points to the following pair:

(31) a. Colorless green ideas sleep furiously.

b. *Furiously sleep ideas green colorless.

About these sentences, Chomsky comments as follows:

> [...] the notion "grammatical" cannot be identified with "meaningful" or "significant" in any semantic sense. Sentences [(31a)] and [(31b)] are equally nonsensical, but any speaker of English will recognize that only the former is grammatical.

The second argument concerns the following pairs:

(32) a. Have you a book on modern music?

b. *Read you a book on modern music?

(33) a. The book seems interesting.

b. *The child seems sleeping.

About these, Chomsky comments as follows:

> Similarly, there is no semantic reason to prefer [(32a)] to [(32b)] or [(33a)] to [(33b)], but only [(32a)] and [(33a)] are grammatical sentences of English.

After this, Chomsky discusses models based on statistical approximation to English (Chomsky 1957:16) before ending with the conclusion I quoted about the independence of grammar from meaning; similarly pessimistic remarks are made about the prospects of statistical modeling.

The point about interpretation that I flagged above is the following. It is not obvious how Chomsky is conceiving of "meaning" and meaningfulness and significance "in a semantic sense" in the above passages. Chomsky is well known for advocating an internalist take on meaning, of course, whereby (roughly speaking) meanings are internal mental structures (Chomsky 1995a, 2000). But it is not clear that he held this view when he wrote *Syntactic Structures*. In fact Chomsky explicitly indicates his contemporaneous sympathy for the referential analysis of meaning (1957:103, footnote 10):

> Goodman has argued—to my mind, quite convincingly—that the notion of meaning of words can at least in part be reduced to that of reference of expressons containing those words. [...] Goodman's approach amounts to reformulating a part of the theory of meaning in the much clearer terms of the theory of reference [...]

And explaining meaning in terms of reference, of course, is an integral part of the externalist, truth-conditional approach to meaning that Chomsky later argued against.[14]

Understood in these terms, the doctrine that "grammar is autonomous and independent of meaning" is the doctrine that grammar (and syntax in particular) is independent of reference-based semantic considerations; that is, it is independent of word–world relations. With this doctrine I entirely agree. My own position on these matters aligns with that of Chomsky's later, internalist theorizing about meaning: I see all talk of functions and semantic types, and so on, in my semantics as being mathematical representation of internal mental realities. (There are issues here, but it is not the purpose of this article to explore them.) Since this is the only kind of meaning that I aim to deal with in this article, my contention that syntax relies partly on meaning does not challenge the autonomy of syntax understood in these terms.

[14]For a nuanced discussion of Goodman's (1949, 1953) theory in the context of Chomsky 1957, see Pietroski 2018. Pietroski shows that we should not automatically attribute to Goodman a denotational theory of the familiar Fregean kind; but he is clear, nonetheless, that Goodman was not engaging in any kind of "mentalistic" enterprise (Pietroski 2018:348). The crucial notion for Goodman was reference *conditions*.

But what if we give a broader interpretation of "meaning" and "semantic" in the relevant passages, as just gesturing at semantic phenomena understood in some intuitive way, without the theoretical restriction to a reference-based construal? Let us reexamine the arguments that Chomsky gives. The first one claims that the notion "grammatical" cannot be identified with the notion "meaningful" in any semantic sense. The argument seems to be that (31a) is not meaningful but is nevertheless grammatical; therefore grammaticality cannot be identified with meaningfulness.[15]

There are two ways in which one could challenge this argument, both of which seem to me to have merit. First, one could challenge the assertion that (31a) is not meaningful: it plausibly expresses the proposition that colorless green ideas sleep furiously. This is a rather odd proposition, which would not be true in any possible world, but that is no objection to considering it a proposition. Serious mathematical work has been done investigating some necessarily false propositions, such as the proposition that there is a highest prime number. The kind of semantic anomaly that we notice in (31a), which lends credence to Chomsky's claim that it is "nonsensical" or not meaningful, is very probably a mixture of category mistakes and copredication of contrary adjectives. Ideas are not the kinds of things that can be green or sleep; and sleeping is not the kind of thing that can be done furiously; so these collocations probably constitute category mistakes. And asserting or presupposing that anything could be both green and colorless (in the intended senses) seems to be copredication of contrary adjectives. But it is not necessarily the case that containing category mistakes and copredication of contrary adjectives makes a sentence not meaningful. Surely we need to work out the meanings of the relevant phrases in order to *detect* that there are category mistakes and copredication of contrary adjectives present. How else could we do it?[16]

Secondly, let us accept, for the sake of argument, that (31a) is not meaningful (but is grammatical). Assuming so, it is hard to see how this gets us to the conclusion that "grammar is autonomous and independent of meaning." The crucial

[15]Since "nonsensical" in the passage in question is opposed to "meaningful" and "significant," I take it that Chomsky is using this word as a synonym for "not meaningful." This is the most straightforward reconstruction of his argument. It is also relevant to note that "nonsense" and "nonsensical" were used in the contemporary philosophical literature to designate strings without meanings, for example by Chomsky's teacher Goodman (1953:93).

[16]See Magidor 2009, 2013 for arguments against the idea that category mistakes, in particular, are meaningless. Note also that in the main text I just had to specify "in the intended senses" when talking about the words *green* and *colorless*, in order to prevent the reader interpreting either of these words in a metaphorical way.

point is that there might be more than one way of failing to be meaningful. Example (31a) might fail to meaningful by means of some particular kind of semantic anomaly and not another kind; and Chomsky has done nothing to show us that the semantic notions in terms of which the example is not anomalous are not used by the syntax in the construction of the sentence. To be more concrete: I suggest that (31a) is semantically anomalous because it contains category mistakes and copredication of contrary adjectives, as just claimed, but that in certain other semantic respects it performs perfectly well. In particular, the semantic types of all the constituents involved are compatible with each other for the purposes of functional application. I do not attempt to deal with bare plurals (such as *ideas*) in this article, but if we alter the example slightly it is obvious that it would be dealt with perfectly easily by the fragment in section 2 (expanded to include the relevant lexical items):

(34) a. Every colorless green idea sleeps furiously.

b. *Furiously sleeps idea green colorless every.

Example (34a) would be constructed without a hitch and predicted to be grammatical by the current system. The same cannot be said, of course, for examples (31b) and (34b).

With respect to examples (32) and (33), the argument, in abstract form, is as follows. Chomsky presents us with two pairs of sentences, each pair containing one grammatical and one ungrammatical example. He then says that in each case there is no semantic reason to prefer the grammatical sentence to the ungrammatical sentence. He concludes that grammaticality is not based on semantic factors. But this ignores the possibility of grammaticality being *partially* based on semantic factors. Even if we accept, for the sake of argument, the contention that nothing semantic goes wrong with the ungrammatical sentences in each pair (although Chomsky does not argue this), this still leaves open the possibility that we construct sentences by means of an algorithm that makes use of both semantic and nonsemantic factors and that in those particular cases something nonsemantic goes wrong. It is exactly this kind of system, of course, that I am advocating in the current article.

We should not, then, be deterred from pursuing the current research program by Chomsky's (1957) arguments for the autonomy of syntax.

4 Conclusion

It is more explanatory to have the basic categories used in syntax be things that we need independently than it is to make up *sui generis* categories especially for that purpose. This is the point that I have tried to spell out in this article.

The exploratory and programmatic nature of this proposal scarcely needs to be emphasized. The example in section 2.3 arguably shows that the current system can deal with what Chomsky (2013:43) calls "the basic structure of TP": [T [(DP) [v [V (DP)]]]]. But even if we confine our attention to English, there are a number of questions that I have not, for reasons of space, been able to address in the current paper. I have dealt with adjectives only in attributive position, for example; there is an issue about how to deal with them in predicative position, given the semantic type I give them. (Heim and Kratzer (1998:67–8) explore some options.) I have not dealt with prepositional phrases. The fragment will need to be expanded at some point to deal with embedded sentences and, more generally, issues connected with intensionality. Perhaps most challengingly, it has long been common to treat some words (expletive *there*, many occurrences of *of*) as semantically vacuous. With meaning now playing a major role in constraining the syntax, it looks like there might be problems of overgeneration if some words have no meaning. Will it suffice to say that words like these denote suitable identity functions? Or should more substantive meanings be found for them? All these issues will have to be explored in future work.

What would evidence in favor of this proposal look like? To a large extent, it will have to be built up gradually through a perceived lack of need for syntactic categories: as more and more aspects of the grammars of more and more languages are analysed in the current framework, syntactic categories will be seen as otiose. The current article provides the first piece of evidence, then, since it gives an explicit grammar that can deal with a small but respectable fragment of English; but it cannot stand alone.

There may also be phenomena that provide more direct evidence in favor of the proposal, although here too some reasoning about economy will likely also be necessary. Suppose there were phenomena involving the distribution of various kinds of phrases for which no unified explanation in terms of syntactic categories could be given but which could be given a unified explanation in terms of semantic types. It seems likely, for example that constraints on coordination do not care about conven-

tional syntactic categories but about semantic type:

(35) Nietzsche is a philosopher, skeptical, and beyond Good and Evil.

The coordinated elements here would conventionally be classified as a DP, an AP, and a PP; but they are all plausibly predicates. Likewise, the verb *put* is "everyone's standard example of a verb that subcategorizes an obligatory PP," according to Jackendoff (1987:391), who repeats the claim himself. But it is false that *put* subcategorizes for an obligatory PP. As well as examples like (36a) we also have examples like (36b)–(36d).

(36) a. Mary put the box on the table.

b. Agamemnon put the staff here.

c. Agamemnon put the staff where he wanted.

d. Achilles put blood everywhere.

What really seems to be going on is that *put* subcategorizes for (certain kinds of) phrases that refer to, describe, or quantify over *locations* (a semantic type). Now conventional theories of the kind that I am looking to replace could presumably account for these facts by invoking semantic types themselves. But this would put them in the awkward and uneconomical situation of saying that syntactic distribution is determined by syntactic category in some cases and by semantic type in others, with no obvious factor determining which method will be used. The current approach, in offering a unified theory of syntactic distribution, would obviously be preferable. So phenomena like the ones just mentioned will plausibly put pressure on conventional theories.

Mature assessment of the current research proposal can only be carried out when it has grappled with a much wider array of facts than I analyze in the current paper, both for the reasons just given and for a reason mentioned at the very start of this paper: we will need to make sure that the ontological simplification it promises is not offset by increased complications elsewhere as more and more phenomena are analyzed. But in my view it will be worthwhile to make the attempt.

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