Formal versus Encyclopedic Properties of Vocabulary: Evidence from Nominalisations[1]

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0. Introduction

Ever since Chomsky (1957) discussed *Colorless green ideas sleep furiously*, it has been evident that grammatical well-formedness of expressions is distinct from their being appropriate for use in a normal speech situation. In this paper, we seek to clarify the dividing line between the formal properties underlying grammatical well-formedness and the encyclopedic (real-world) knowledge that informs attitudes about pragmatic anomaly. We adopt a radically anti-lexicalist approach to grammar, following proposals of Halle & Marantz (1993) and Marantz (1997a). We detail how formal and encyclopedic properties are differentiated in this theory, and more specifically how vocabulary items are formally licensed for use, irrespective of their meaning properties. We then illustrate the advantages of our preferred theory through an analysis of English derived nominalisations.

In the first part of the paper, we introduce this alternative theory of grammar, Distributed Morphology, in which the functions of the lexicon as it is commonly assumed are distributed among various components of the grammar. We differentiate between a *vocabulary*, which lists phonological expressions that can be inserted into syntactic structures, and an *encyclopedia*, which associates phonological expressions with meanings. Second, we propose formal properties for what we call *vocabulary items*, which determine their proper distribution in sentences; these properties are intended to replace the lexicalist mechanisms of "theta-roles" and "selection". Formal properties of vocabulary items determine (in part) whether a given expression is *grammatically well-formed*, but encyclopedic properties influence speakers' judgements about *appropriate use* of expressions.

Having made explicit how the distinction between grammatical well-formedness and appropriate use is to be captured formally, we go on to examine some of the classic arguments for lexicalism from Chomsky's (1970) study of English nominalisations. We build on a revisionist interpretation of Chomsky (1970) offered in Marantz (1997a), according to which the presumed arguments for an autonomous lexicon taken from Chomsky (1970) are not well-founded. We attribute the anomaly of the expression #*John's growth of tomatoes* not to syntax or to the formal properties of the vocabulary item *grow*, but rather to encyclopedic knowledge.[2] Given the syntactico-semantic structure of nominalisations and transitive clauses that we adopt, a

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[2] Throughout this paper, # is used to signal pragmatic anomaly. * is reserved for downright ungrammaticality.

subject of a transitive clause is interpreted as agentive, while a subject of a nominalisation *may be* construed as agentive provided the encyclopedic properties of the nominalisation permit this interpretation. Since the encyclopedia asserts that growing is a spontaneous activity (internally-caused in the sense of Levin & Rappaport Hovav 1995), the subject of the nominalisation of *grow* is neither entailed to be nor pragmatically construed as the agent. Hence we attribute this variety of anomaly to a combination of encyclopedic knowledge and the types of semantic entailments which certain syntactic structures provide. We then show that where ill-formedness of an expression is not due to formal properties but rather to pragmatic anomalies associated with encyclopedic knowledge, speakers' reactions to sentences containing nominalisations vary when the context of utterance is appropriately modified, and are best characterised as gradient. Finally, we briefly review how our proposed division between grammatical and encyclopedic knowledge might be extended to handle cases of structural "coercion" of meaning, in which sentence structure forces interpretations which are encyclopedically inappropriate.

1. Theoretical background

1.1 Lexicalism versus Distributed Morphology

Theories of syntax emerging from Chomsky (1981) and following work rely on a lexicon to construct morphophonologically complex objects (i.e. words) which form the atoms of syntactic representation. For example, the lexicon produces words like *the, barbarians, destroyed* and *city*, and each of these words has a categorial status and certain needs which must be met in order for the word to occur in a well-formed expression such as *The barbarians destroyed the city*. These needs are formalised in a variety of ways, but include the argument-taking properties (theta-roles) of items and their requirements regarding position in the clause (case-requirements). For example, *destroyed* requires both an agent subject and a patient object; phrases such as *the barbarians* or *the city* must occur in certain positions in the clause where they receive "case", licensing their appearance. In such theories, which we will call here *lexicalist,* rules occurring within the lexicon relate stems to words and words to words by modifying either their morphophonological form or their argument-taking properties, or both (Lieber 1980, Selkirk 1982, Di Sciullo & Williams 1987). Lexicalist approaches commonly assume that syntactic categories such as N, V, A are in a relatively simple relationship to morphological (form) categories *noun, verb, adjective*: put simply, syntax is defined as the constituent structure of strings of words.

Distributed Morphology (henceforth DM), a theory of the architecture of the language component outlined in Halle & Marantz (1993, 1994), Marantz (1995, 1997a) departs radically from the above. Syntax is not (solely) a theory of the constituent structure of word strings since words are not equated with syntactic terminals; neither are the types of syntactic terminals equated with morphological classes. Rather, phrase-markers are constructed freely out of abstract categories defined by universal features, including such "functional" features as tense, number, person, definiteness and so forth. Phonological expressions called *vocabulary items* (henceforth VIs) are inserted into syntactic structures at spell-out after syntactic operations. A phonologically annotated syntactic representation is then interpreted in consultation with the encyclopedia, along with universal semantic mechanisms. Encyclopedia entries give the interpretation of VIs, potentially in very specific contexts and in combinations. The encyclopedia may contain expressions of varying size (phrasal idioms, words, sub-words); accordingly, there is no commitment to any correlation between the size of constituents associated with specialised meanings and the size of constituents manipulated by syntax. An overview appears in figure 1.
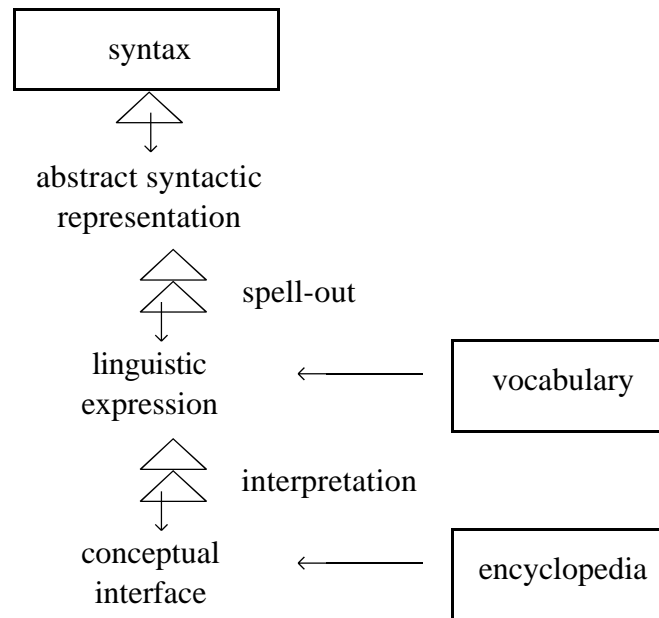

Figure 1

1.2. Structural meaning

The revised view of the grammar depicted in figure 1 requires a serious reconsideration of the theory of argument-structure alternations, since there no longer remains

any lexicon in which morphophonological expressions having related argument structures can be related. Consider a transitivity alternation verb such as *melt*:

(1a)   The sun melted the snow.

(1b)   The snow$_i$ melted t$_i$.

In a lexicalist theory, the lexicon produces two verbs, viz. *melt$_1$*, which is intransitive, and *melt$_2$*, which is transitive. Each has distinct role-assigning abilities and hence projects distinct syntactic structures. The lexicon is responsible for creating both verbs and relating the two.

In DM however, there is no lexicon, and there exists only a single VI *melt*. Whether *melt* is interpreted transitively or intransitively depends on the syntactic structure into which it is inserted: when *melt* is inserted into the structure in (1a), the interpretation is transitive; inserted into (1b), *melt* is intransitive.

Following Marantz (1997a) and along the lines of Construction Grammar (Goldberg 1995 and references therein), we assume that a syntactic structural description imposes a particular canonical meaning. For example, the transitive structure of (1a) forces an interpretation in which the sun is doing whatever is being done, while the snow is what is undergoing whatever is being done. The unaccusative structure in (1b) forces an interpretation according to which the snow is again undergoing what is being done. We call this aspect of the meaning of a sentence its *structural semantics*. The addition of VIs fills out the meaning of the sentence by detailing the nature of the arguments and predicates involved, but, we assume, such a 'filling out' must always remain consistent with the structural semantics imposed by the syntactic construction itself.

Gleitman (1990) and colleagues (Naigles et al. 1993, Gleitman et al. 1996) have proposed that children begin to acquire the meaning of verbs by attending to the "frames" or syntactic contexts in which these verbs occur. As Gleitman shows, the syntactic context or "frame" is much more informative to the child for the purposes of learning novel forms than the speech-situation.

1.3. Structural coercion and its limitations

Not every VI may be inserted into any structure. Compare (2) with (3):[3]

(2a)   Chris thought the book to Martha.

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[3] In order not to pre-empt the discussion which follows, we abstain for the moment from using the anomaly (#) and ungrammaticality (*) markers introduced a moment ago.

(2b)   The bridge exploded the engineers.

(3a)   The red under did not five lunch.

(3b)   James put yesterday.

The ditransitive structure in (2a) has a canonical interpretation: the subject (*Chris*) is an agent, the direct object (*the book*) is a theme and the indirect object (*to Martha*) refers to a goal. Although a verb such as *think* does not normally appear in this type of ditransitive structure, interpretation remains possible, provided it respects the various role assignments. In other words, interpretation is subject to the *structural coercion* of the meaning of the verb *think*. To the extent that the sentence has any meaning, Chris must be engaging in teleportation or telepathic dictation and Martha is the recipient of a book, as information or as object. Other interpretations may be possible, but in any of them, Chris is doing the thinking and Martha is getting the book. In (2b), the interpretation that must be given is that the bridge is causing the exploding (a thing bridges do not normally do), while the engineers are being blown to bits. While both sentences in (2) require a bit of imagination for a felicitous inter-pretation, it is only our knowledge (or expectations) about real-world events that render them peculiar.

The sentences in (3), however, are different in an important respect. (3a) would make sense only if *the red under* were somehow capable of being a subject and if *five* were somehow capable of being a verb. However, this is not the case. (3b) would only be possible if *put* denoted an action whose expression *does not* require both a theme and a location. It is the precise nature of this difference that we are concerned with in this paper. Specifically, we propose a theory of *licensing* which states the grammatical conditions under which VIs can be inserted into syntactic structures. According to this proposal, the sentences in (3) are marked by the grammar as ill-formed (*) and uninterpretable under any circumstance because the VIs *under, five* and *put* are not appropriately licensed. Their underlying syntactic structures are however unobjectionable: they are the same structures that occur in perfectly ordi-nary sentences such as *The tall man did not eat lunch* or *James swam yesterday*.[4] In contrast, the sentences in (2) are not ill-formed: they are merely pragmatically an-omalous (#).

Exploring the nature of the licensing conditions will allow us to propose a clear di-viding line between sentences which are ungrammatical for structural reasons (be-

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[4] Obviously, if there was no recognisable underlying syntactic structure (as in *Red not the under did lunch five*), the result would be ungrammatical as well.

cause their VIs are unlicensed) and sentences which, while grammatical, are deviant only owing to the real-world (encyclopedic) knowledge that speakers possess about the felicitous use of VIs. In recent experiments, Lidz (1997) has shown that children's "frame-compliance", i.e. their ability to adapt to structural coercion of meaning, has specific limitations. In particular, Lidz shows that utterances which contain the appropriate frame for a verb like *think* (which takes a CP complement) are not interpretable if, instead of *think*, an unaccusative motion verb like *fall* (which normally takes a DP internal argument) is inserted (cf. **The giraffe falls that the zebra jumps*). That is, the licensing conditions of *fall* are not met in such a frame, and no interpretive coercion is possible. We interpret these data as supporting our proposed division. Where licensing conditions are met, structural coercion is possible with pragmatic anomaly; where licensing conditions are not met, the result is outright ill-formedness.

2. Formal properties of Syntactic Categories and Vocabulary Items

2.1 Two kinds of syntactic category: f-nodes and l-nodes

We adopt the view that syntactic terminals fall into two classes. The first class, which we call *f-nodes*, consists of feature bundles for which the speaker normally has no choice as regards vocabulary insertion; the VIs which fill them are *f-morphemes*. For the second class, which we call *l-nodes*, a speaker's choice of VI (*l-morpheme)* is not determined in advance and has truth-conditional force.[5] For example, in (4), the VIs *the, -ed,* and *a*, are completely determined by the grammar for the speaker, given a syntactic structure containing appropriate f-nodes with such features as [definite], [past] and [indefinite]. The choice of the VIs *cat* and *mouse* is not so constrained; the speaker might equally have chosen *shark* and *fish*.

> (4a)   The cat chased a mouse.
>
> (4b)   The shark chased a fish.
>
> (4c)   The fish chased a shark.

It is clear that there are different flavours of functional projections: these projections are composed of different features (representing, for example, different tenses or

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[5] The reader should not scan too deeply into the significance of the names *f-node* and *l-node*, although it is not unreasonable to assign a rough implication of 'functional' to f-node and a rough implication of 'licensed' to l-node.

numbers etc.) which are selected from a fixed class provided by Universal Grammar. The difference between a number node representing 'singular' and one representing 'plural' is visible to the syntax throughout the derivation. Similarly, the node representing the functional category ("little") v will have a set of UG-provided light verbs which may fill it, including (but not necessarily limited to) CAUSE, BECOME, and BE; these light verbs will be present as syntactic features from the beginning of the derivation (*Merged* in the terminology of Chomsky 1995) and they will be visible throughout.

The first question which we explore in this paper is whether or not there are also different flavours of l-nodes: whether there are l-nodes specified, for example, for transitivity or category. We will argue that in fact no l-node is ever specified for category: there is only one type of l-node, whose categorial status is defined by its syntactic context. This we refer to as the l-node hypothesis.

(5)   *The l-node hypothesis:*

Categories for which spell-out is not deterministic are not distinguished in syntax.

Corollary: Syntax does not manipulate categories such as N, V or A.

The view that certain linguistic entities acquire their "noun" or "verb" status by their context rather than through inherent specification is hardly new, and can be found originally in Sapir (1923), as well as in Chomsky (1971) and elsewhere. What we hope to accomplish here is to lay out the logical consequences of this view within a particular approach.

Although we suppose that there is only one l-node type, the VIs which may be inserted at a given l-node have licensing conditions associated with them specifying the syntactic environment in which they may appear. Thus there is no such thing as a fundamentally transitive l-node, or a fundamentally nominal or verbal l-node. L-nodes appear in whatever syntactic context the derivation creates for them, and then VIs are inserted which are compatible with this context.
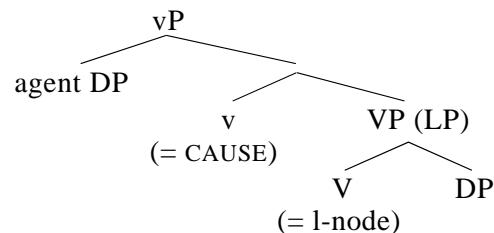
There is thus a fundamental difference between the insertion of VIs at l-nodes and insertion at f-nodes. The f-nodes are fully specified for features and hence the VIs which may fill them are in *competition*, in the sense of Panini, as discussed in Halle & Marantz (1993, 1994) and Noyer (1997). The l-nodes, however, are not so specified, and the VIs which may fill them are not in competition. Rather, we propose that a given VI is *licensed* by appearing in a syntactic context compatible with its requirements. As we will see, licensing environments are necessarily local, in a strict sense,

preventing conditioning of an l-morpheme's insertion by f-nodes which are not in the immediate morphosyntactic environment.

2.2. L-nodes and their environments

As an example of the type of entity which an l-node must be, let us consider the composition of some fairly straightforward verbs under a split-VP approach to verbal formation like that adopted in Travis (1994), Kratzer (1996), Harley (1995), Chomsky (1995) and (in a slightly different sense) Hale & Keyser (1993). In this type of VP syntax, (agentive) external arguments are generated in the specifier of a light verbal head which is projected separately from a lower, basic verbal head. In the current illustration, the two heads project vP and VP, respectively. The light verbal head of the vP is a functional projection with a very limited inventory of meanings.[6] When the verb is a simple agentive transitive, like *kiss* or *destroy*, the little v which selects the external argument is clearly something realising the UG feature CAUSE. Consider the necessary meaning which the lower V must have in order to combine with the CAUSE morpheme and produce the meaning *destroy*:

(6)   *destroy* - CAUSE = "destroyed"   (resultant state)

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                    vP
                   /  \
          agent DP     \
                      /  \
                     v    VP (LP)
                 (= CAUSE)  /  \
                          V     DP
                      (= l-node)
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The lower V, denoting the resultant state of the action identified by the composite overt verbal form, is in fact an l-node. The verbal character of the combined form results from the combination of an l-node which is a functional projection of v and its attendant meaning. From now on, we will notate VP as LP to emphasise that it derives its verbal character by appearing in a vP context, rather than from any inherent categorial specification.[7]

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[6] Indeed, Harley (1995) maintains that v may only mean three different things, BE (stative), and CAUSE and BECOME (both eventive and configurationally determined). It is not crucial for our purposes here whether or not this is in fact the entire inventory of possible feature specifications for v or if there are a few more; there is general agreement in the literature that at least CAUSE and BECOME are possible realisations of v, whatever other possibilities exist. See, however, the discussion of suppletion in section 4.2 below.

[7] LP will later be seen appearing in a nominal context.

Similarly, verbs such as *grow* or *explode* in their transitive uses must have l-nodes denoting something like 'resultant state' which combine with the CAUSE morpheme to produce the transitive verb in sentences like those in (7):

> (7a)   John grows tomatoes.
>
> [$_{vP}$ [$_{DP}$John] [$_{v'}$ CAUSE [$_{LP}$ grown [$_{DP}$tomatoes]]]]

> (7b)   The demolition team exploded the casino.
>
> [$_{vP}$ [$_{DP}$The demolition team] [$_{v'}$ CAUSE [$_{LP}$ exploded [$_{DP}$the casino]]]]

On their intransitive uses, as in (8), the light verb morpheme heading little v must be something like HAPPEN or BECOME, with no agentive argument in its specifier:

> (8a)   Tomatoes grow.
>
> [$_{vP}$ BECOME [$_{LP}$ grown [$_{DP}$tomatoes]]]

> (8b)   The balloon exploded.
>
> [$_{vP}$ BECOME [$_{LP}$ exploded [$_{DP}$the balloon]]]

The same l-node as in the transitive cases, designating the resultant 'grown' or 'exploded' state, combines with the little v morpheme to produce the final verbal form. Essentially, l-nodes can freely appear in any verbal environment: below any vP, with or without a specifier, with or without a complement. The syntax generates any syntactically well-formed structure, and when vocabulary insertion takes place at PF any VI which is compatible with the generated structure may be inserted at the l-node. We term this the 'prix fixe' approach to argument structure: from a given "Numeration" (i.e. collection) of initial bundles of features and l-nodes, the syntax creates legitimate structures, which then are filled with appropriate VIs.

To make this notion clearer, consider the "menu" in (9). Each structural position corresponds, so to speak, to a course; one item from a list of possibilities may be chosen to fill each structural position. Some slots have the possibility of not being filled or realised at all, reflected in {Ø} being a possible "selection" for that slot.[8]

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[8] There does not seem to be a possible verb class which takes *no* arguments at all, although this is a logical possibility, given that examples of verbs with empty complement slots, empty internal subject slots (Spec,VP) and empty external argument slots (spec,vP) exist. Some other syntactic requirement must force the appearance of at least one argument, and cause derivations consisting only of an l-node combining with vP to crash. A plausible candidate for such a requirement is the Extended Projection Principle, which must be satisfied higher in the functional projections of the sentence by some argument. Of course, as elsewhere expletives are inserted to satisfy the EPP, one could imagine

(9)   Prix Fixe Verbal Argument Structure

    a. Specifier of vP: one of the following:

           i)   Ø

           ii)   DP (including empty categories)

    b. v head: one of the following:[9]

           i)   HAPPEN/BECOME

           ii)   CAUSE

           iii)   BE

    c. Specifier of LP: one of the following:

           i)   Ø

           ii)   DP

    d. L head: l-node

    e. Complement of LP: one of the following:

           i)   Ø

           ii)   DP

There will also of course be choices for filling the Tense head, for example, {past, present} or an Aspectual head {perfective}, etc.; we abstract away from the higher functional projections for the present discussion.

Table 1 below displays the various choices for the slots in the above schema and a suggestion for an example of a Vocabulary Item which could appear in each configuration. This is *not* intended to be a definitive characterisation of English verb classes; rather, it should be viewed as an illustration of how this type of system might function; we will leave specific problems of class membership for future work.

Note that choosing BE or BECOME as v head will preclude the possibility of having an argument in Spec,vP (since neither BE nor BECOME selects an external argument), while CAUSE will force the appearance of an agent/initiator DP in Spec,VP: this is the only genuine sense in which argument selection plays a role in this system. Note further that since linear relations play no role in the syntax, there can be no distinction between an LP with just a complement and an LP with just a specifier, as the sister-

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that such a verb class could exist with expletive subjects. Possibly, weather verbs are an example. On the other hand, it is entirely conceivable that the correct theory of expletives will entail that every true expletive must have an associated argument which will replace the expletive at LF, and that the weather verb expletives are not true expletives at all. The current proposal is compatible with either result.

[9] There may be other v nodes as well; see section 4.2 for some speculations.

hood relation between the head and its single argument will be identical in both cases after Merge has applied. Here, for convenience, we have noted all such examples as having just a complement, leaving the Spec,LP position empty.

Verb	Spec,vP	v	Spec,LP	L	Comp,LP
give	DP	CAUSE	DP	l	DP
destroy *grow* (tr)	DP	CAUSE	Ø	l	DP
jump	DP	CAUSE	Ø	l	Ø
learn	Ø	BECOME	DP	l	DP
grow (intr) *arrive*	Ø	BECOME	Ø	l	DP
know	Ø	BE	DP	l	DP
tall (?)	Ø	BE	Ø	l	DP

Table 1

Granted this sort of approach is desirable, in that it allows the syntax to freely generate structures, the question arises how to constrain the insertion of VIs in a principled way, so that they are not permitted to appear in inappropriate syntactic contexts, e.g. *John knew Mary the book*. We explore the solution to this problem in section 2.3 below. Further, if we wish to extend the process of free generation of structures, followed by insertion of appropriate VIs to non-verbal contexts, and thus maintain our non-lexicalist stance, we must account for the facts of the nominalisation paradigm addressed by Chomsky (1970). Why is it possible to say *John grows tomatoes* and *Tomatoes grow*, but not #*John's growth of tomatoes*? Similarly, why is it possible to have both *The city's destruction* and *The army's destruction of the city* but not #*The city destroys*? This is addressed in section 3.

2.3. Licensing of Vocabulary Items

To capture the restrictions on insertion contexts for VIs realising the l-node, we propose that each VI is listed with a set of licensing requirements. These licensing requirements effectively replace the standard notion of "category". If a VI is listed as [+cause], for example, then it will be well-formed only if inserted in the complement to the CAUSE "flavour" of v. We say that the VI "needs" CAUSE. If a VI is listed as

[–cause], then it is *not* well-formed when occuring under CAUSE: we then say that the VI "shuns" CAUSE. Because a [+cause] VI appears only in the context of CAUSE, it will necessarily have an external argument, following the discussion of selection of external arguments above. Note, however, that this selection is only *indirect*; the VI may not specify directly that it requires a specifier of little v, only that it requires a particular type of little v to raise to.

A VI may be *underspecified* for a given syntactic possibility, permitting it to appear with or without that particular syntactic element. An item which is specified as [±v], for example, may appear in the context of v or in some other context: it may, for instance, appear in an l-node which is sister to a determiner or some other nominal element. When that happens, it will be realised as a noun rather than as a verb. Such a VI neither needs nor shuns v. Similarly, a VI may be specified as appearing in the context of one or more DPs (that is, selecting one or more internal arguments).

We suggest that a VI may be specified for [±v], [±be], [±cause], [±DP$_1$] and [±DP$_2$], at least.[10] Eventive v types are divided into BECOME and CAUSE, distinguished by a [±cause] feature. The [±be] feature can be interpreted as expressing stativity vs. eventiveness, that is, a [–be] VI may be further specified for type of event with [±cause], while a [+be] VI is necessarily non-eventive, hence [–cause]. Other implications between features are more straightforward; if a VI is specified for [–v], then obviously it may not be specified for [+cause], etc. In table 2, we provide examples of VIs with their licensing information and associated encyclopedic content.[11]

	Phonology	*Licensing environment*	*Encyclopedia*
a.	*sink*[12]	[±v],[+DP],[±cause]	what we mean by *sink*
b.	*big*	[–v],[+DP]	what we mean by *big*
c.	*open*	[±v],[+DP],[±cause]	what we mean by *open*
d.	*destroy*	[+v],[+DP],[+cause]	what we mean by *destroy*

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[10] As discusssed in section 4.2 below, there may in fact be a large number of possible realisations of v (GO, APPL, etc.) . If so, it is perhaps necessary to posit specifications for each one, such as [±go].

[11] Of course this is not intended to be an exhaustive characterisation of English verb classes, but rather an illustration of the mechanisms necessary to make this approach feasible.

[12] The question of how *sink* and *open* differ such that in the non-verbal environment *open* is realised as an adjective (requiring nominalising morphology to become nominal) and *sink* is realised as a noun (requiring participle morphology to become adjectival) is a thorny one. For the moment, we will assume that they do *not* differ, and the realisation or not of overt morphology in these other environments does not reflect on their fundamental structure. This seems intuitively wrong, but we will adopt it as a temporary position for the purposes of this discussion.

| e. | *arrive* | [+v],[+DP],[–cause] | what we mean by *arrive* |
| f. | *grow* | [+v],[+DP],[±cause] | what we mean by *grow* |

Table 2

So far, then, we have concluded that it is feasible to permit the syntax to generate any possible verbal structure, given the constraints of Merge. The insertion of VIs at appropriate terminal nodes will be conditioned by the information listed under "licensing environment" with each VI. Now we address the question of how we can characterise the behaviour of particular VIs in non-verbal syntactic environments.

3. Nominalisations and argument structure

How does this approach to argument structure and lexical insertion permit an account of the nominalisations discussed in Chomsky (1970) and alluded to above? Does the difference encoded above between *grow* and *destroy* permit a characterisation of the fact that the possessor of nominalised *grow* cannot be interpreted as an agent, while the possesor of nominalised *destroy* may be so interpreted? Below, we argue that in fact, in nominal contexts, the interpretation of the possessor as agent or theme is not in fact determined by the subcategorisation information we encode above, but by our real-world (encyclopedic) knowledge about the meaning of the roots in question. The pragmatic anomaly of #*John's growth of tomatoes* is the result of the interaction of our real-world knowledge about growing with our knowledge of the possible interpretations for an argument in Spec,DP.

3.1. "Derived" nominalisations

Let us consider yet again the empirical issue raised by the data in (10) below:[13]

    (10a) Tomatoes grow.

            The growth of the tomatoes

            The tomatoes' growth

    (10b) John grows tomatoes.

            #John's growth of tomatoes

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[13] The discussion in this section is based largely on that of Marantz (1997).

#The tomatoes' growth by John

(10c)   #The crop destroyed.

The crop's destruction

(10d)   The insects destroyed the crop.

The insects' destruction of the crop

The crop's destruction by the insects

Let us assume (following Marantz 1997a) that nominalisations are created by inserting VIs into a terminal node governed by D, exactly as verbs are created by inserting VIs into a terminal node governed by v. This structure is illustrated in (11) below.

(11)

DP
├── DP
│   (John)
└── ── D   LP
       ('s)   ├── l-node   DP
              ('destr-')   (the city)
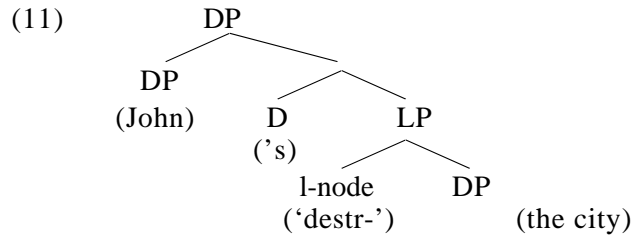
The VI will be inserted into the l-node, exactly as for the verbal context illustrated above, and morphological allomorphy/readjustment rules will spell out DESTROY as *destruct* and add the nominalising suffix *-ion.*

In the verbal context, whether or not a VI may appear in the unaccusative environment or the causative environment is determined by its licensing feature [±cause]. GROW is indifferent to whether the v to which it raises is [+cause] or [–cause], hence it may appear in either environment (10a,b). DESTROY, however, requires that its licensing v be [+cause], and hence it has no intransitive variant (10c). Exactly the reverse situation obtains in the nominal context. DESTROY may appear with either its agent or its theme in the specifier position of the nominalised form (10d), while GROW may appear only with its theme in the specifier position of the nominalised form (10a,b). Do we then need to posit a similar feature for the nominal form? That is, do we assume that D has flavours, like v, which select for agents or themes in its specifier, and assign subcategorisation features to roots in the same fashion as for the verbal environment?

It is clear that this cannot be the correct approach. The specifier of D may certainly contain an agent or theme, but it may also contain possessors or other associated arguments, e.g. locations. This is never true of the specifier of v, which may only contain agents. Further, if the argument structure of nominalised forms was arbitrarily

feature-determined in this way, we would expect that the appearance of agents in the verbal form would vary independently of the appearance of agents, themes or other arguments in the specifier of the nominal form. The fact that the grouping of properties correlates with particular encyclopedic/semantic characteristics, as we shall show below, would be unexpected on such an approach.

Marantz (1997a), following Levin & Rappaport Hovav (1995), notes that there is an essential difference between the type of causation in transitive verbal GROW and that which occurs in verbal DESTROY. Growing is an activity which must be internally caused; in *John grows tomatoes*, John is merely facilitating the growth of tomatoes which occurs spontaneously. Destruction, on the other hand, must be externally caused; things do not destroy spontaneously. In *The insects destroyed the crops*, the insects are acting directly to bring about a result that would not occur by itself. Roots like DESTROY require a direct causer to initiate the event in question.

If, Marantz suggests, the interpretation of arguments in the specifier of D is left open, defaulting, perhaps, to something like 'possession' but able to take on shades of meaning according to the encyclopedic content of the complement of D, the possible interpretations of the specifier of D in the examples in (10) above can be argued to fall out purely from the nature of the roots DESTROY and GROW, rather than from some structural or featural aspect of these roots. That is, if a VI denotes an event which requires the action of an external causer to occur, like DESTROY, the specifier of D in a nominalisation containing DESTROY may be interpreted as that external causer. If a VI denotes an event which requires no external causer to occur, e.g. a spontaneous or internally caused event like GROW, then the external causer interpretation is not available for the element in the specifier of DP; only the internal causer argument (which of necessity is also the theme) may appear in that position.

The question still arises, of course, as to why the "facilitator" role present in transitive verbal GROW is not a possible interpretation for the specifier of D. We will consider and dismiss one explanation of this phenomenon in the following section.

3.2. Variable-behaviour roots

Where do the "shades of meaning" which determine the interpretation of the Spec,DP argument come from? Two possible sources are imaginable. The first is the licensing or subcategorisation information that each VI brings along, specifying the optionality or necessity of CAUSE when in the verbal context. The other possibility is that it is our real-world knowledge about whether or not an event can occur spontaneously that determines our ability to interpret Spec,DP as an external causer.

The first solution is by far the simplest. If the specification [+cause] exists in the licensing information of a given VI, then the external causer reading is available for the specifier of DP: the [+cause] requirement entails that the action cannot occur spontaneously and hence an external causer is necessary for the initiation of the event. Further, this would provide an explanation for the unavailability of the 'facilitator' interpretation in the GROW case: any verb which does not have the [+cause] specification, as is the case for verbs of the GROW class, will not have any causer interpretation, facilitator or otherwise, licensed for the specifier of DP; only the universally available theme interpretation is possible in these cases. However, as we show below, the existence of a class of variable behaviour verbs casts doubt on this approach to the availability of an external causer interpretation. Rather, we will argue that real-world, encyclopedic information must license the interpretation of Spec,DP.

In (12), we give examples of roots that participate in the inchoative/causative alternation, yet allow an external causer interpretation for the Spec,DP argument in a transitive nominalisation as well as the internal, spontaneous interpretation in the intransitive nominalisation. That is, these verbs behave both like GROW and like DESTROY.

(12a)   The balloon exploded.

The balloon's explosion

(12b)   The army exploded the bridge.

The army's explosion of the bridge

(12c)   Wealth accumulated.

The wealth's accumulation

(12d)   John accumulated wealth.

John's accumulation of wealth

(12e)   Jim and Tammy Faye separated.

Jim and Tammy Faye's separation

(12f)   The teacher separated the children.

The teacher's separation of the children

(12g)   The German principalities unified in the 19th century.

The principalities' unification in the 19th century

(12h)   Bismarck unified the German principalities.

Bismarck's unification of the German principalities

Since these VIs undergo the inchoative/transitive alternation, it must be the case that they are marked [±cause] in their subcategorisation information for the verbal environment, just like GROW. Yet, unlike GROW, they allow a transitive nominalisation. The suggestion above, that the availability of a transitive nominalisation depends upon a [+cause] marking on the VI, cannot therefore be maintained for these roots. It is conceivable that we could posit for this class two homophonous roots, one marked [±cause] which is spontaneous, and the other marked [+cause] which is of necessity externally caused, but this duplication of effort seems unattractive, to say the least. Part of the goal of the morphosyntactic enterprise undertaken here and in other DM-inspired work is to shift the burden of interpretation as much as possible from the syntax to the general conceptual/semantic interface; multiple homophonous semantically distinct VIs would fly directly in the face of that enterprise.

All the information that the speaker needs to know regarding the fact that these verbs can behave like members of both the GROW class and the DESTROY class is available in the Encyclopedia. That is, the speaker knows that these roots denote events that may occur spontaneously, like growing, or that may be truly externally caused, like destroying. GROW, in its current usage, may never be truly externally caused, and hence it may not participate in a transitive nominalisation, but UNIFY, as of German principalities, may either be spontaneous or truly externally caused, hence its variable behaviour. This knowledge is part of the real-world knowledge of the speaker about the meaning of the root, not part of the grammaticised subcategorisation information needed to ensure that the VI does not appear in an inappropriate syntactic context.

The fact that a root's behaviour may be conditioned by the particular theme which is inserted confirms the correctness of this observation. Our real-world knowledge tells us that there are some things, like dust, which are much more likely to accumulate spontaneously than to be accumulated on purpose by some external causer. When we choose such a theme, ACCUMULATE behaves like a spontaneous VI of the GROW class, losing its ambiguity, as in (13). It is not that the syntactic subcategorisation requirements of the VI have changed, but simply that our knowledge about the accumulation of dust tells us that it is wildly unlikely for an external causer to initiate that action.

(13a)   Dust accumulated on the table.

(13b)   The accumulation of dust on the table

(13c)   #John's accumulation of dust on the table

A similar point can be made when the causer in the verbal form cannot be a true external cause, but rather plays a facilitator's role like the subject of the transitive *John grows tomatoes*. If it is pragmatically clear that the causer in the verbal structure may not be a true external causer, it may not appear as the subject of a transitive nominalisation, as illustrated in (14).

    (14a)   Adultery separated Jim and Tammy Faye.

                #Adultery's separation of Jim and Tammy Faye

    (14b)   The Cold War separated E. and W. Germany.

                #The Cold War's separation of E. and W. Germany

    (14c)   The 19th century unified the principalities.

                #The 19th century's unification of the principalities

These judgements are somewhat variable from speaker to speaker. Since we argue that the licensing of the transitive nominalisation depends on encyclopedic or real-world knowledge, this is hardly surprising: it is reasonable to assume that one speaker might think the Cold War could truly externally cause something, and that another speaker might think the opposite. It would, however, be surprising under the conjecture that the interpretation of these sentences depended upon the syntactic specifications of the roots, which presumably do not vary between two speakers who agree that these roots do participate in the inchoative/causative alternation.[14]

Essentially, then, we argue that these structures are not ungrammatical, in the sense of being syntactically ill-formed. Rather, for a majority of speakers, they are pragmatically anomalous: nothing that they know about the meaning of these VIs allows them to construct a "normal", i.e. agentive, interpretation. An ungrammatical sentence would be one in which a VI was not licensed by the syntactic context in which it found itself, e.g. **John grows tomatoes the garden*. In such a sentence, the insertion of a dyadic verb into a triadic context produces a truly ungrammatical structure.

We have argued that the behaviour of a VI when nominalised depends on the encyclopedic information associated with that VI, not on its syntactic specifications. Al-

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[14] The editor of this volume, Bert Peeters, feels there is a difference between (14a), on the one hand, and (14b,c) on the other hand, which may well impact on the judgements made by individual native speakers. The Cold War and the 19th century refer to the time frame during which East and West Germany were separated, and the German principalities unified, respectively. Nothing of the sort applies in the case of (14a), where adultery is not a time frame. It must also be pointed out that (14b,c) are fully acceptable once the *'s* is dropped (cf. *the Cold War separation of E. and W. Germany*, *the 19th century unification of the principalities*). (14a), however, appears to balance from pragmatic anomaly into syntactic ill-formedness (**adultery separation of Jim and Tammy Faye*).

though it is possible to categorise verbs as in (15) below, these categorisations do not follow from syntactic considerations, and are therefore predicted to be subject to gradience and variation. Nevertheless, this rough classification does inform speaker judgements regarding appropriate use and interpretation of vocabulary.

(15)   *Three classes of verbs*

  a. Internal Causation: the action is always dependent on the argument undergoing the change of state. (Also called spontaneous)

  b. External Causation: The action must be instigated by an argument other than the one undergoing the action.

  c. Underspecified: The action may causally originate either with the object of the action or with another argument.

4. Further issues

In section 2.3, it was proposed that VIs may be specified as requiring certain f-nodes in their local environment in order to be licensed for insertion: this is a strictly grammatical property of a VI. In addition, in section 3.2 it was claimed that the encyclopedic (extragrammatical) meaning of a VI also imposes certain restrictions on the readings which speakers can associate with a given syntax. We now consider the extent to which these distinct devices overlap in their function.

To a certain extent, the licensing restrictions represent the grammatical analogues of certain meaning properties of VIs. VIs representing end states of externally caused events (DESTROY) require CAUSE for insertion when verbal; but VIs representing end states of spontaneously occurring events (GROW) do not necessarily forbid CAUSE. While certain encyclopedic properties of a VI are sometimes correlated with certain formal licensing properties in this way, their relationship is not necessarily a direct one. Understanding the nature of this mismatch is crucial, we believe, to understanding the contribution of encyclopedic knowledge versus structural semantics in the interpretation of expressions.

Indirect relations between licensing requirements of VIs and their encyclopedic properties is not limited to verbs. We consider here several further examples.

4.1. Some further cases of structural coercion

First, consider the distinction between mass and count nouns. Under normal circumstances, embedding under a number word makes mass readings of nouns unavailable:

(16)   #I had three cheeses for breakfast.

Since the encyclopedia entry for *cheese* includes the information that cheese does not typically come in discrete countable chunks or types, the structural meaning in (16) and the encyclopedic information are in conflict. Structural coercion forces the reading in which three types or pieces of cheese are involved.

To the extent that a VI denotes a necessarily uniform and indivisible substance, count noun syntax leads to severe anomaly:

(17)   #I saw three oxygens in the kitchen.

Encyclopedic knowledge of the meaning of *oxygen* prevents any *reasonable* interpretation of (18). We propose then that (17) has the same status as:

(18)   #John's growth of tomatoes

Both (17) and (18) are grammatically well-formed. (17) can mean only that I saw three 'pieces' of oxygen, or three entities meeting the description 'oxygen'. (18) can mean only that John is in some relationship to an event of tomato growing, for example the event of tomato-growth that John was just speaking about.[15] But what counts as a potential relationship is heavily influenced, if not in actual practice constrained, by encyclopedic properties. Put differently, *to the extent that* the Encyclopedia says that growing is an event which occurs spontaneously and without an agent, *John* cannot receive the agent interpretation in (18). Similarly, *to the extent that* oxygen is a uniform and indivisible substance, there can be no count interpretation in (17).

A similar example can be drawn from stage-level and individual-level predication.[16]

(19)   #Mary sometimes has green eyes.

The example in (19) is anomalous because the predicate *have green eyes* is normally an individual-level predicate (barring use of coloured contacts, etc.). The cooccurrence of such a predicate with a modifier like *sometimes* forces the stage-level reading. On our view, there is no reason to localise the stage-level or individual-level difference in a particular formal feature present in syntax or in the licensing conditions

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[15] We ignore here noneventive readings of the nominalisation, such as one in which John is literally sprouting a growth of tomatoes from his body.

[16] We thank Mimi Lipson for pointing out the relevance of this phenomenon.

for VIs. Speakers judge (19) anomalous owing to encyclopedic knowledge only, and (19), like (17) and (18), is grammatically well-formed.

4.2. Aplastic Vocabulary Items and suppletion

Like the verbs discussed earlier, certain "nominal" VIs must be licensed by local f-nodes. For example, pluralia tantum such as *scissor(s), measle(s), blue(s), trouser(s),* or *Olympic(s),* when governed by D (i.e. nominal), can be inserted only when in a local relation with a [plural] f-node.

(20)   *measle* ⟷ l-node / governed by D, ___ + [plural]

Following Embick (1997), we can call such VIs *aplastic* (unbendable) because they refuse to adapt to syntactic environments which others of their morphological form class normally do. Can licensing statements such as those in (20) be used to express the distribution of suppletive allomorphs such as *wen(t), worse,* or *bett(er)*? As we show below, suppletive alternants cannot be considered aplastic in this sense, given our earlier assumptions.

Following Halle & Marantz (1993), we assume that *destroy*, for example, is changed to *destruct-ion* in the nominal context in a post-syntactic "readjustment component". The readjustment component performs a variety of functions including the partial modification of the phonological forms of stems, as well as the insertion of morphemes which are not present in syntax.[17]

(21)   *destroy* _ *destruct* / when governed by D

Such readjustment rules, proposed in Chomsky & Halle (1968), have always been problematic inasmuch as no clear criteria were available to separate rule-related pseudo-suppletive morpheme alternants such as (*destroy ~ destruct*) from truly suppletive pairs such as *bad ~ worse*, for which no rule was postulated. No interesting theory of readjustments could be proposed, since any theory that permitted / b@d / to be respelled as / w{rs / could presumably do anything.

In the framework adopted here, pseudo-suppletive pairs like *destroy ~ destruct-* reflect single VIs which are related by readjustment rules. Truly suppletive pairs however reflect distinct VIs which are not related by readjustment.

In recent work, Marantz (1997b) notes that if truly suppletive alternants are distinct VIs, then they must be f-morphemes in the sense defined earlier. Suppose, for exam-

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[17] On post-syntactic morpheme-insertion rules, see Embick (1997).

ple, that *worse* and *bad* are two distinct l-morphemes with the following licensing conditions (we leave aside the precise specification of an adjectival environment):

(22a) *worse* ⟷ l-node / ___ + [comparative]

(22b) *bad* ⟷ l-node

Worse will have the correct distribution, since it will be licensed only in the comparative environment. *Bad* however will also be available in this environment, since the licensing conditions on *bad* cannot specify 'not in the environment of [comparative].' Nothing then will prevent the grammar from freely generating **badder* as an alternative to *worse,* just as the grammar will generate *shark* as an alternative to *cat.*

Given our assumptions, for truly suppletive pairs to be in a relation of competition, they must be competing for f-nodes. If in turn f-nodes are defined by universal features, it follows that there must be an f-node for every truly suppletive pair, and that truly suppletive pairs must therefore reflect the spell-out of universal syntactico-semantic primes. In (23), the prime which in English we spell as *bad ~ worse* is represented as BAD:

(23a) *worse* ⟷ BAD / ___ + [comparative]

(23b) *bad* ⟷ BAD

Marantz argues that *it* is no accident, then, that true suppletion is limited to general concepts, and never occurs in VIs reflecting specific cultural artifacts.[18]

If Marantz's hypothesis is correct we have two significant results. First, a theory of readjustment rules becomes a possibility, since any pair of morpheme alternants that reflects a cultural artifact must be pseudo-suppletive and not truly suppletive. Second, the class of f-nodes must be larger and more extensive than previously assumed. If *go ~ wen(t)* realises an f-node, then this f-node GO can presumably be mentioned as a licenser for some class of l-morphemes, for example, certain verbs of motion. Just as we have seen transitivity alternations depending on the underspecification of [±cause], so we might expect more subtle alternations involving [±GO] and other such f-nodes implicated by suppletive pairs. We feel that a reappraisal of lexical verb classes along these lines is an urgent topic for future research.

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[18] This of course remains an empirical question. In terms of learnability, as Marantz suggests, given a space of universal conceptual primes, the child can associate two phonologically unrelated VIs with some cell in that space. But without this pre-given structure, the child has no way of determining that two phonologically unrelated alternants do not in fact denote two different sorts of objects (or predicates).

5. Conclusion

In the l-node hypothesis, we proposed that there is in fact only one l-node, whose syntactic status is always determined by its local relation with f-nodes.[19] It follows from this that notions such as "noun" and "verb" are purely derivative in syntax, although potentially significant morphophonologically. We provided a "menu" of simple syntactic structures which may be generated from a small inventory of syntactic primes, providing a fragment of the space of syntactic possibilities relevant for vocabulary insertion.

Second, we argued that the distinction between l-nodes and f-nodes derives from different conditions on the insertion of VIs at these nodes. Insertion at f-nodes is subject to *competition*: the most highly specified VI available is inserted in an f-node (Halle & Marantz 1993, 1994). Insertion at an l-node, however, is subject to conditions of *licensing*: any VI which meets certain conditions can be inserted in the structure.

If there is but one type of l-node and vocabulary insertion at l-nodes is constrained by licensing, it follows that argument structure alternations arise when VIs may be licensed in more than one syntactic structure, that is to say, when a VI's licensing conditions are underspecified. For example, the verb *sink* is licensed both in a transitive and in an unaccusative syntax. Section 2 provided a preliminary list of verbal VIs typed according to their licensing privileges.

In section 3 we reconsidered the argument that the behaviour of nominalisations demands a lexicon, as many researchers have assumed since Chomsky (1970). Following Marantz (1997a), we argued that pairs such as *growth ~ grow* involve the same VI GROW but in different syntactic contexts. We further argued that expressions such as #*John's growth of tomatoes* are not strictly speaking ungrammatical, since all VIs are licensed. We attribute the anomaly to semantics alone: the encyclopedic meaning of GROW is not *by itself* capable of assigning a causer role to *John*, and, because the syntax of nominalisations contains no CAUSE projection, the "desired" (i.e. agentive) reading cannot be obtained. #*John's growth of tomatoes* is thus on a par with *#Sincerity admires John*: both expressions are equally grammatical and equally (un)usable under normal conversational circumstances.

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[19] It is conceivable that l-nodes are subcategorised by syntactico-semantic properties such as event/entity, animacy etc., which are eventually matched up with specific VIs at Insertion. While the possibility that such information is syntactically represented on l-nodes exists, it is beyond the scope of the present discussion, so we do not examine this question here.

Finally, we considered implications and extensions of our proposals. First, we argued that #*John's growth of tomatoes* has the same status as #*I saw three oxygens in the kitchen* or #*Mary sometimes has green eyes*. In each case, encyclopedic properties conflict with structural meanings, introducing interpretive anomalies. Following Marantz (1997a), we also suggested that truly suppletive allomorphy occurs only for f-morphemes. If correct, the class of f-nodes is considerably enlarged and includes such elements as BAD, GOOD and GO, among others. Insofar as argument structure alternations depend on the specification of licensing f-nodes, we predict that there should exist further classes of alternations dependent on this expanded inventory. Confirmation of this hypothesis awaits further study.

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