

Chapter 2

On Argument Structure and the Lexical Expression of Syntactic Relations

Kenneth Hale and
Samuel Jay Keyser

1 Introduction

For a number of years we have been investigating the relation between lexical items, particularly verbs, and the syntactic structures into which they enter. This is one part of a general program that seeks to explore and understand the implications of the thesis that syntax is projected from the lexicon (see, among other works, Chomsky 1981).

During the course of our investigations, we have become persuaded that the proper representation of predicate argument structure is itself a syntax. That is to say, as a matter of strictly lexical representation, each lexical head projects its category to a phrasal level and determines within that projection an unambiguous system of structural relations holding between the head, its categorial projections, and its arguments (specifier, if present, and complement). We will refer to these projections sometimes as lexical argument structures and sometimes as lexical relational structures (LRSs), and we will use the now conventional tree diagrams to represent them in our discussions here. The diagrams will also make use of the conventional labels for the lexical categories V, N, P, A, and their phrasal projections V', VP, and so on, but these are to be understood in terms of a particular theory of lexical categories, to be introduced below.

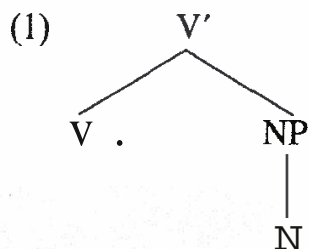
We have been led to this syntactic view of lexical argument structure in large part through an investigation of denominal verbs of the type represented by *calve*, *lamb*, *shelve*, *bottle*, *saddle*, *hobble*, and the like. See Clark and Clark 1979 for an impressive array of denominal verb types, and see Talmy 1985 for a discussion of a wide range of lexicalization patterns, including so-called *conflation*, a term we sometimes use to refer to derivation of denominal verbs of the type under consideration here.

Assuming that these verbs are in fact derived from nouns, the process involved in their derivation is almost certainly lexical, in the widely ac-

cepted sense of that term (see Chomsky 1970). But, we argue, this is quite independent of the question of whether the process is syntactic in some equally accepted sense. Thus, for example, if established principles of syntax function to constrain denominal verb derivations, then the simplest assumption to make is that these derivations are in fact syntactic in nature.

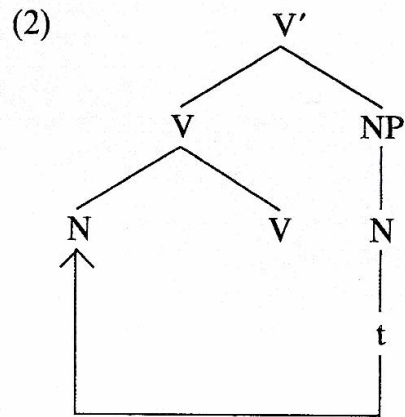
The evidence we hint at in the foregoing paragraph only makes sense, of course, within a particular theory of denominal verb formation. We assume that verbs like *shelve* and *saddle* are formed by means of the "head movement" variant of Move *a*—more specifically, by means of the process known as incorporation, whose theoretical properties have been studied in detail by Baker (1988). If denominal verb formation takes place by means of incorporation, then it is to be expected that it would be subject to syntactic principles that govern the application of incorporation (e.g., those identified in Baker 1988 and in Baker and Hale 1990). This would be the "evidence" in favor of the syntactic theory (cf. Walinska de Hackbeil 1986, 1989, for a conception of denominal verb formation closely similar to ours).

The so-called unergative verbs (see Perlmutter 1978, Pullum 1988), all called simply (true) intransitive verbs (Burzio 1981), represent by far the simplest class of denominal verbs derived by incorporation. For English, these include, among many others, the verbs *laugh*, *sneeze*, *neigh*, *dance*, *calve*. As shown in (1), their initial lexical projection is simply that of a verb and a nominal complement.



This structure is the same as that projected by verbs such as *make* (as in *make trouble*), *have* (as in *have puppies*), and *do* (as in *do a jig*). The difference is that the lexical structure representation of an unergative verb, like *laugh*, involves incorporation, into an abstract V, of the nominal head N of its NP complement. We assume, with Baker (1988) and others, that this process is as depicted in (2); that is, the head N of the NP governed by the V is moved and adjoined to the latter. The resulting "compound," of which only the N component is phonologically realized, corresponds to the denominal verb.'

Argument Structure



The derivation depicted in (2) conforms to the principles that constrain the syntactic process of incorporation. In particular, it conforms to the Head Movement Constraint in (3) (from Travis 1984; also see Baker 1988).

(3) The Head.Movement Constraint

An X^0 may only move into the Y^0 that properly governs it.

To this extent at least, we are justified in our assumption that unergative verbs have an initial lexical structure of the simple transitive type. This position is strengthened by the observation that the unergatives of one language are matched in other languages either (i) by the simple transitive VP structure without incorporation (e.g., Basque *lo egin* (sleep do) 'sleep') or (ii) by the transitive VP modified by "visible" incorporation (e.g., Jemez *-záae-'a* (song-do) 'sing').

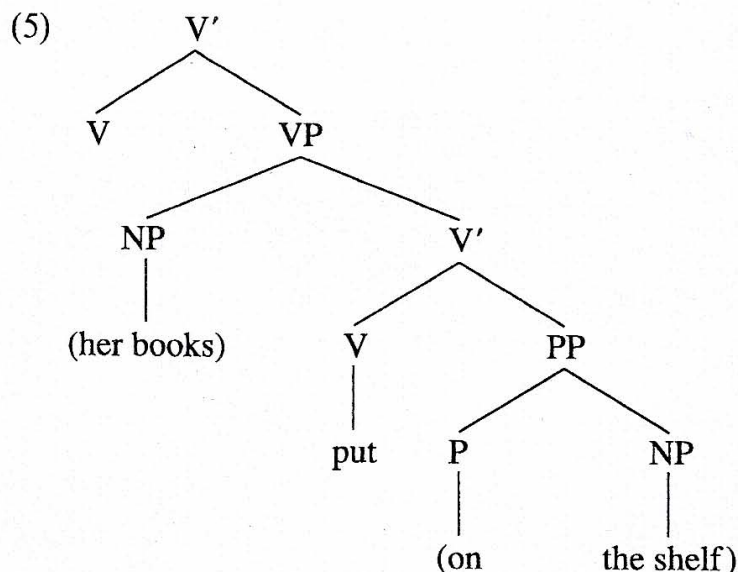
The relation between the simple transitive structure (1) and the incorporation structure (2) belongs to the class of phenomena sometimes known as lexical alternations, whose study has been so revealing in relation to the lexical representations of argument structure (see, for example, Levin 1991). If we are correct in our belief that derivations of the type represented by (2) involve a syntactic process, defined over syntactic objects, then this has clear implications in relation to the nature of argument structure. Argument structure is syntactic, necessarily, since it is to be identified with the syntactic structures projected by lexical heads.

A somewhat more complex class of denominal verbs is that represented by "location" verbs, like *shelve* (as in *shelve the books*), *corral* (as in *corral the horses*), *box* (as in *box the apples*), and "locatum" verbs, like *saddle* (as in *saddle the horse*), *hobble* (as in *hobble the mule*). We will assume that these also, like verbs of the simpler unergative type, are formed by incorporation.

We suppose that, abstractly speaking, the LRS representation of location verbs is identical to that of the English verb *put*, as used in such sentences as (4).

(4) She put her books on the shelf.

And we assign to *put* the structure set out in (5).

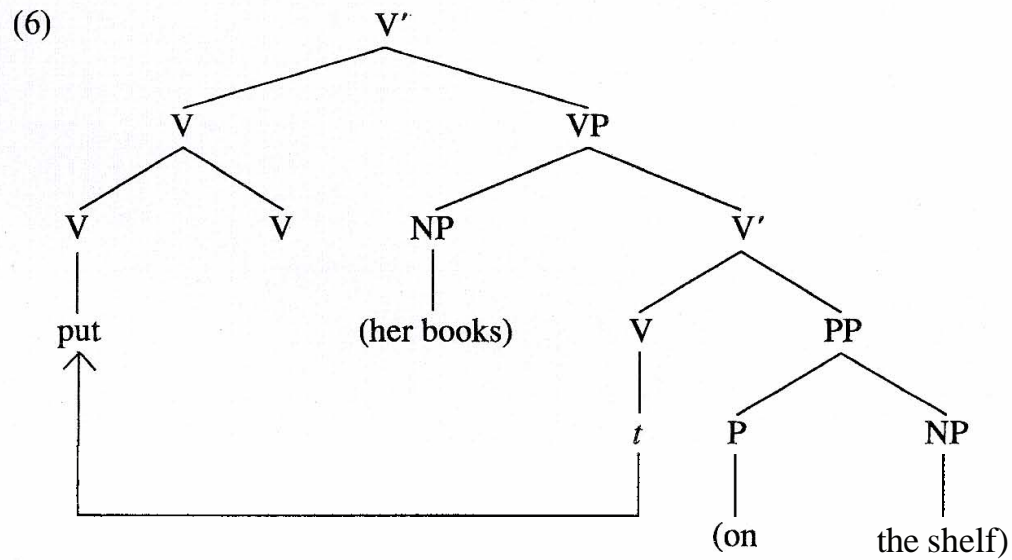


This is the structure that Larson (1988) assigns to verbs of the type represented by *put*, as well as to "double object" or "dative" verbs like *give*. For Larson, this is the D-Structure representation of these verbs. For us, this is their Lexical Argument Structure representation (which, of course, determines the D-Structure representation). In both cases the representations are fundamentally syntactic in the sense that they are structures over which fundamental syntactic relations and principles are defined.²

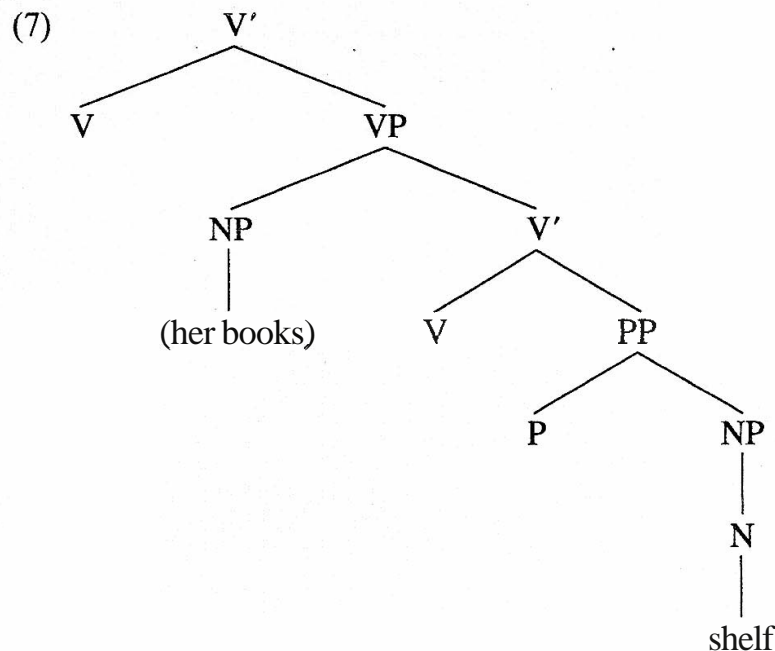
The complex structure (5) is the initial lexical representation of English *put*. The form that appears in the D-Structure representations of sentences containing this verb is derived by head movement, or incorporation, which, in this instance, moves the lower *V* up into the matrix "clause" and adjoins it to the matrix verb, as depicted in (6).

Like the noun incorporation process involved in (2), the verb incorporation of (6) is in conformity with the Head Movement Constraint, since the matrix verb properly governs the lower verb. Our reasons for assuming the structures (5) and (6) will be explicated in part later in this paper, but they are essentially the reasons found in Larson 1988, Hale 1989, and Hale and Keyser 1991.

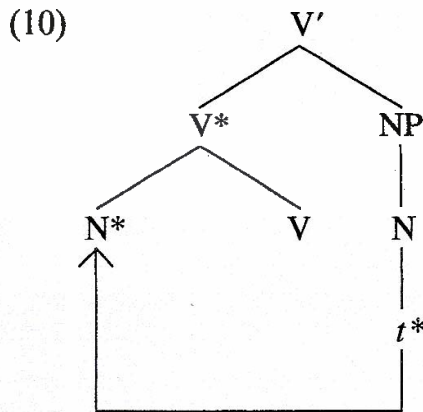
It is a fundamental assumption of our account that English verbs like *shelve*, and other location verbs, are "denominal" precisely in the sense



that they are derived by head movement. Their initial **LRS** representations share their essential relational structure with verbs like *put*, with the exception that the morphological "constant" (i.e., the phonologically overt morpheme ultimately realized in the matrix verb position) is not a verb but a noun, heading the complement of the PP in the LRS representation. This is shown in (7).



As shown in (8), the surface form of the verb is derived by three applications of head movement, the first of which incorporates the lower N (*shelf*) into the P that governs it. The compound so formed is then moved into the verb that governs it, there forming a compound that makes the final move to incorporate into the matrix verb.



We assume that this condition is met here and in other cases we have examined. The c-command requirement is met under the assumption that the adjunction node (e.g., the upper V-node in (10)) immediately dominating the incorporated element does not count as the first branching node relevant in defining the c-command relation (see Baker 1988: 54–55), a circumstance that will follow automatically if, as we will suppose, a zero-level adjunction node acquires the index (or indices, symbolized *) of the adjunct it dominates. In effect, the indexed adjunction node functions as the required antecedent, satisfying the government requirement of the ECP. And the locality requirement for government is met by virtue of the fact that no barrier intervenes between the antecedent and the trace.

Similarly, in more complex derivations (e.g., that of *shelve* depicted in (8), each instance of incorporation results in an antecedent-trace relation that satisfies the ECP. This follows, since each trace in a well-formed derivation is governed by a local c-commanding head that is coindexed with it, given our assumptions.

Let us imagine that the unergative and location verbs briefly examined here are in fact derived by incorporation, or head movement, in the manner indicated. Head movement is a process that is constrained by syntactic principles, and it is expected therefore to limit the range of theoretically possible incorporations. If this is empirically the case, then to that extent we are justified in our belief that these **lexical** processes are syntactic in nature. And, most important, since the lexical processes we are examining affect the argument structures of lexical items, we are justified in our belief that argument structures are themselves syntactic objects.

To put this another way, if denominal verb formation were not constrained by syntactic principles—if it were simply a process of category change, say—then the range of possible denominal verb types would be expected to include verbs of the sort exemplified in (11). But English

simply does not have verbs of this type—transitive verbs that take an expletive subject and have meanings corresponding more or less to the parenthetical paraphrases given here.⁴

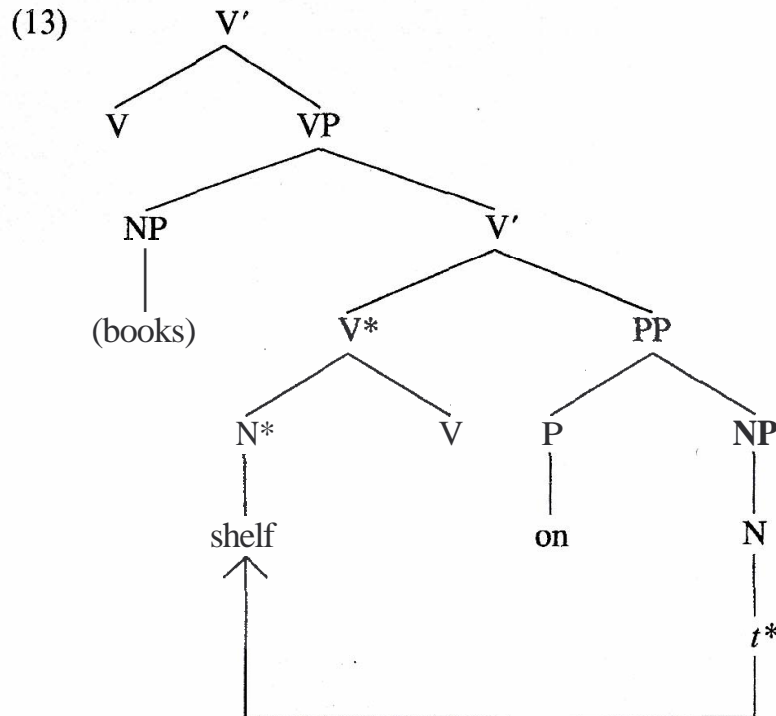
- (11) a. *It cowed a calf.
 (cf. A cow had a calf. A cow calved.)
 b. *It mared a foal.
 (cf. A mare had a foal. A mare foaled.)
 c. *It dusted the horses blind.
 (cf. The dust made the horses blind. The dust blinded the horses.)
 d. *It machined the wine into bottles.
 (cf. A machine got the wine into bottles. A machine bottled the wine.)

This gap in the English verbal lexicon can be explained within the incorporation theory of denominal verb formation under the natural assumption that the hypothetical verbs of (11) are formed by incorporation of a subject, rather than of a complement. It is well known that a subject (i.e., a subject that originates as an external argument) cannot incorporate into the verb that heads its predicate (see Baker 1988, Mithun 1984). Presumably, incorporation from the subject position, external to VP, would violate the ECP. The question may in fact be academic. We will argue later that the subject of verbs of the type represented in (11) is external in the sense that it is not present at all in Lexical Relational Structure. Lexical incorporation would therefore be impossible. In any event, the incorporation theory of denominal verb formation, a theory determined by syntactic principles, accounts for the nonexistence of the verbs of (11), and of their counterparts in other languages.

English has many lexical items of the form [V ... P], where P is a prepositional particle, such as *take (the business) over*, *take (a stray cat) in*, *turn (the stove) on*, *plow (the corn) under*. Whatever the source and proper analysis of these items, there are no such [V ... P] items that correspond to the hypothetical verbs of the sentences in (12).

- (12) a. *He shelved the books on.
 (cf. He put the books on a shelf. He shelved the books.)
 b. *He corralled the horses in.
 (cf. He put the horses in a corral. He corralled the horses.)
 c. *He bottled the wine in.
 (cf. He put the wine in bottles. He bottled the wine.)

Each of these hypothetical items, *shelve* (books) *on*, *corral* (horses) *in*, *bottle* (*wine*) *in*, is derived by incorporation of the noun that heads the complement of the preposition, as shown in (13). The trace of incorporation is thus "too far" from its antecedent and is therefore not properly governed, violating the ECP.



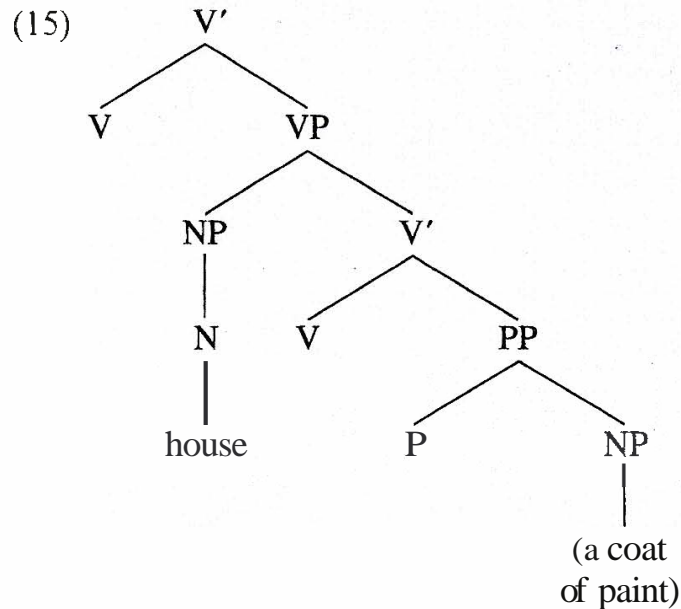
Although the trace is coindexed with the verb to which its antecedent is adjoined (as indicated by the asterisk notation), this verb does not govern the trace. The preposition is a "closer governor," defining PP as the minimal governing domain for the trace (see Chomsky 1986a). By Minimality, therefore, PP is a barrier to government from the more distant verb.

Minimality is also at issue in explaining why English lacks verbs of the hypothetical type in (14).

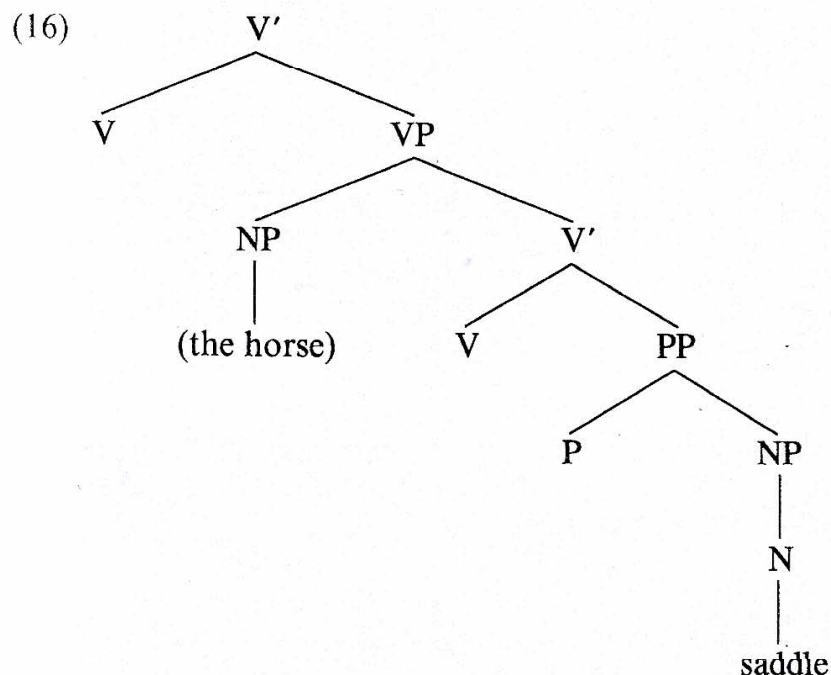
- (14) a. *She churched her money.
 (cf. She gave a church her money.)
 b. *He bushed a trim.
 (cf. He gave a bush a trim.)
 c. *They housed a coat of paint.
 (cf. They gave a house a coat of paint.)

While *church*, *bush*, *house*, and many others exist as denominal verbs, they do not exist as denominal verbs having meanings comparable to those of the parenthetical sentences. While the verbs here may be impossible for a variety of reasons, there is a clear structural reason for their non-

existence, on the assumption that their **LRS** representations would correspond to that depicted in (15) for the hypothetical *house* of (14c).



The abstract P here would be a nonovert variant of the category 'appearing overtly in the expression *provide a house with a coat of paint*. This structure is in fact widely used in English—as (16) shows, it is the **LRS** representation for the large class of iocatum verbs, like *saddle*, *blindfold*, *harness*, *shoe*.



Thus, the verb *saddle* has a structure closely parallel to that of *provide* in *provide the horse with a saddle*. Here, the overt noun *saddle* may incorpo-

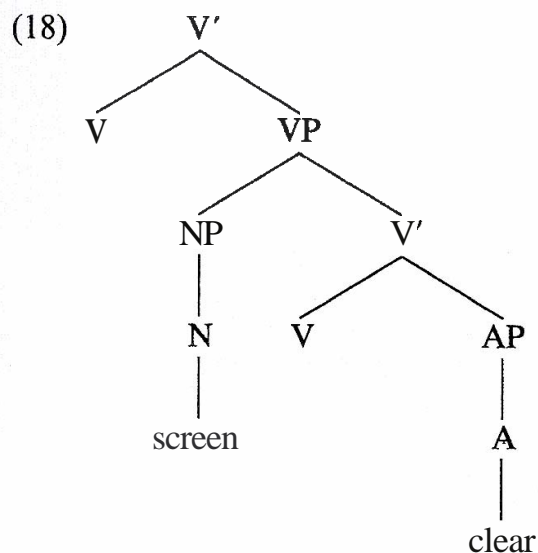
rate in cyclic fashion into each governing head in complete accordance with the principles of syntax.

But this structure cannot legitimately give rise to verbs of the type represented in (14). These would require incorporation from the "internal subject" position, that is, from *Spec(ifier)* of VP [(Spec, VP)]. Such incorporation would violate the ECP. Since the inner VP contains a governor (the V that heads it), that VP counts as the immediate governing domain in relation to the NP in its Spec. By Minimality, therefore, the inner VP is a barrier to government from the higher V. Movement of N from Spec position in the inner VP thus violates the ECP (see Baker and Hale 1990).

The same reasoning might explain why English also lacks verbs like those in (17).⁵

- (17) a. *She metaled flat.
 (cf. She flattened some metal.)
 b. *He speared straight.
 (cf. He straightened a spear.)
 c. *They screened clear.
 (cf. They cleared a screen.)

Again, these verbs exist, but not in the meanings indicated. Like the verbs of (14), those of (17) are ruled out by virtue of the ECP, on the view that their hypothetical lexical structures would correspond to that assigned to *screen in (18).



This is essentially the structure of the analytic expressions *make a screen clear*, *get a screen clear*, and it is the source, by hypothesis, of the well-

formed incorporation structure *clear a screen*, formed by successive-cyclic incorporation of the adjective *clear* in conformity with the principles of syntax. But this structure cannot be used to derive the verb of (17c), since that would require incorporation from the Spec position of the inner VP, violating the minimality requirement of the ECP.

In this discussion, we have maintained that certain verbal lexical items of English are derived through the operation of the head movement variant of Move α , that is, by incorporation. We have maintained that this is so because certain gaps in the lexicon can, we think, be explained on the assumption that the formation of the lexical items in question is subject to principles known to be operative in syntax. If this is true, it follows that the structures over which lexical derivations are defined are true syntactic structures, over which syntactic relations are defined. The final step in developing our position in regard to lexical representation is one we must simply assert. But we assert it with the belief that it is well supported by the kinds of linguistic material we have been considering. It is this: the notion "argument structure" is to be identified with the notion "lexical relational structure." Thus, the representation of the argument structure of a verb is a syntactic representation of the usual sort.

This brings us to the main discussion of this paper, namely, a theory of argument structures and the proper characterization of limitations on them.

2 Argument Structure

We take the work we are doing here to be part of a general program of study implied by the Projection Principle (Chomsky 1981) and the notion that syntax is projected from the lexicon. An understanding of argument structure is central to this program. For us, argument structure is to be identified with the syntactic structures defined in Lexical Relational Structure (LRS), as characterized in section 1. In this section we will attempt to be more explicit about the principal features of this conception of argument structure. We begin with an aside, a discussion of the concept "thematic role" (also called θ -role or semantic role) and its relationship to the syntactic projections that we identify with argument structure.

A number of investigators have noted that thematic roles are assigned in a manner corresponding to a hierarchical organization within which certain arguments (associated with certain thematic roles) are "higher" than others (e.g., Bresnan and Kanerva 1989, Carrier-Duncan 1985, Grim-

shaw 1990, Larson 1988). While there is some disagreement about the exact hierarchical arrangement, particularly in the "middle" and "lower" ranges of the hierarchy, the results of careful and detailed investigations on a number of languages converge to a remarkable degree. The hierarchy of roles set out by Grimshaw (1990:8), depicted in (19), where the most deeply embedded role is the lowest in the hierarchy, exemplifies a system utilized in a fully worked-out theory of argument structure. Other published hierarchies differ from this one in the positioning of the theme role (above GOAL, typically).

- (19) (AGENT (EXPERIENCER (GOAL/SOURCE/LOCATION
(THEME))))

Among the observable correlates of the hierarchy, for example, is the association of thematic roles with the subject function in syntax (agent, otherwise experiencer, and so on). Moreover, assuming the correct hierarchy, the correlations are universal—that is, they conform to Baker's *Uniformity of Theta Assignment Hypothesis* (UTAH), according to which, for any two natural languages, or for any two items within a single language, the relation in (20) holds.

- (20) Identical thematic relationships between items are represented by identical structural relationships between those items at the level of D-Structure.
(Baker 1988:46)

While we feel that the grammatical effects commonly attributed to the thematic hierarchy are genuine, we are not committed to the idea that the hierarchy itself has any status in the theory of grammar—as an autonomous linguistic system, that is. And we are sympathetic with the view (expressed by a number of scholars, often tacitly or indirectly) that questions the autonomous existence of thematic roles as well.

In what follows, we would like to address two questions these matters suggest to us.

- (21) a. Why are there so few thematic roles?
b. Why the UTAH?

The number of thematic roles suggested in the literature is rather small—the total does not exceed by much the number found in (19). Moreover, it seems correct that the inventory is so small. If so, why? Why aren't there twenty thematic roles, or a hundred? Surely, if thematic roles exist, there could in theory be any learnable number of them. And why are thematic

roles "assigned" according to a universal hierarchy and in conformity with the UTAH? Why isn't the assignment random? Or, at least, why isn't it as nearly random as would be allowed by limitations relating to **learnability**? This is the content of our questions, and we will be concerned to suggest partial answers to them.

2.1 Categories and Projections

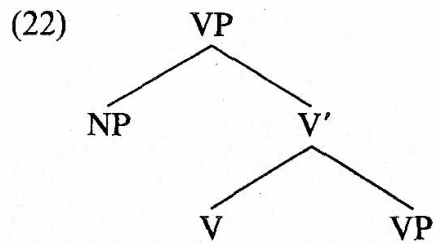
The linguistic elements that we believe to be fundamental in answering the questions in (21) are nothing new. They are (i) the lexical categories, or parts of speech, and (ii) the projection of syntactic structure (*i.e.*, phrase structure, or X-bar structure) from lexical items.

For our purposes, we will assume the traditional categories V, N, A, P (see Chomsky 1970), and we will continue to employ this traditional alphabetic notation for **them**.⁶ Furthermore, we assume here that this exhausts the inventory of major lexical categories. The fact that the inventory of categories is restricted in this way is relevant, we will claim, to understanding why the inventory of "thematic roles" is also small. In part, the answer to the first of the questions posed above will reduce to another question—namely, assuming it to be (approximately) true, why are the lexical categories just V, N, A, P? We do not pretend to have an answer to this question, guessing simply that it has something to do with how certain basic "notional" categories (*e.g.*, event, instance or entity, state, and relation) are expressed in linguistic form. But given this restricted inventory, we are interested in the possibility that there is a relationship between that and the similarly impoverished inventory of thematic roles.

Our understanding of the second of the two factors we have taken to be directly relevant to our questions—projection of syntactic **structure**—is due in some measure to Kayne's discussion of Unambiguous Paths (Kayne 1984) and to Larson's related proposal, the Single Complement Hypothesis, which requires that the head-complement relation be biunique (Larson 1988).

In particular, we suggest that the questions in (21) find their answer in part in the fundamental nature of the syntactic projections that define LRS representations (and therefore also the syntactic structures dominating lexical heads at D-Structure). Each lexical head X determines an unambiguous projection of its category—to a phrasal level, XP—and an unambiguous arrangement of its arguments, as specifier and complement, as depicted in (22).

Argument Structure



This structure is "unambiguous" in the sense we intend. Thus, for example, the sister relation holds unambiguously between V and VP and between NP and V'. Moreover, the relation is asymmetrical in each case, since just one member in the relation is a maximal projection. The c-command relation is likewise unambiguous, in the relevant sense: the "subject" or "specifier" (NP in this instance) asymmetrically c-commands the "internal argument" or "complement" (lower VP in this case).

(22) is unambiguous in part because branching is binary at all non-terminal nodes, and in part because it conforms to the X-bar theory of "types," according to which the levels in a given categorial projection (i.e., the lexical, intermediate, and phrasal levels) are distinct from one another (and are so indicated notationally in various ways, here as X, X', and XP). Our belief is that these aspects of the syntax of LRS representations are not stipulated, but follow directly from the notion unambiguous projection. That is to say, the theory of grammar does not include a stipulation to the effect that all branching must be binary, or that the projection of types (lexical, intermediate, and phrasal) must conform to the distinctness criterion. The theory of grammar requires merely that projections be unambiguous. And we suppose that it simply follows from this that the syntactic structures initially projected from the lexicon must have the (branching and type) properties we have identified.

We will speculate further that the unambiguous structure requirement will yield an additional limitation on the projection of categories to types: to wit, the requirement that "intermediate" types (X') be restricted to just one for any given projection. Thus, the structure depicted in (22) represents a full projection of the category V: it includes a specifier (NP), a complement (VP), as well as the lexical (X), intermediate (X'), and phrasal (XP) type-projections. The limitation on types follows, we wager, from the assumption that multiple "intermediate" types would be linguistically (though perhaps not notationally) indistinct. This is pure speculation at this point, but we will assume it in what follows.

Given Unambiguous Projection, and given the four lexical categories traditionally assumed (V, N, A, P), we can propose an answer to the questions posed in (21).

2.2 Thematic Relations and Thematic Role Assignment

Our basic answer to question (21a)—why there are so few thematic roles—is that, in an important sense, there *are* no thematic roles. Instead, there are just the relations determined by the categories and their projections, and these are limited by the small inventory of lexical categories and by Unambiguous Projection.

While we might assign a particular thematic label—say, "agent"—to the NP in (22), its grammatical status is determined entirely by the relation(\sim) it bears in the relational structure projected by the lexical head V. Specifically, the NP of (22) bears the "specifier" relation within a VP whose head takes a complement that is also a projection of the category V. It is not without reason that the term *agent* is associated with the subjects of verbs—like *cut, break, drop, send, give, tighten, put, shelve, saddle*—that share the LRS representation of (22). But we would like to suggest that the thematic terminology typically applied in this case simply reflects the *relational* status of the NP in the upper Spec position.

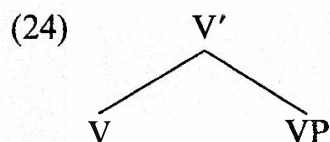
The use of the term *agent*, we imagine, is appropriate here simply because of the elementary semantic relations associated with (22) by virtue of the elements that enter into the structure. Each of the lexical categories is identified with a particular notional "type," and the relational structures they project define an associated system of semantic relations, an "elementary meaning," so to speak. Thus, for example, the category V is associated with the elementary notional type "event" (or perhaps, "dynamic event"), which we can symbolize *e* (see the usage in Higginbotham 1985, and in references cited there). The LRS representation depicted in (22) contains a V heading the structure as a whole, and another (implicit in the tree) heading the complement VP. The structural relation of complementation involves an asymmetrical c-command relation between the two verbs: the matrix V asymmetrically c-commands the subordinate V (head of the complement VP).

The structural relations of c-command and complementation are unambiguous in (22), as required. Since the lexical items involved there have elementary notional content, it seems reasonable to suppose that, in addition to the structural relations associated with the projection, there are elementary semantic relations associated with (22) as well. And further, the semantic relations associated with (22) are unambiguous and fully determined by the LRS projections of categories. The matrix V of (22) governs another V, the head of its complement. Corresponding to this syntactic relation, there is a similarly asymmetric (semantic) relation between two events, a relation we will take to be that of *implication*. Accord-

ingly, the matrix event "implicates" the subordinate event as in (23), a relation that makes perfect sense if the syntactic embedding corresponds to a "semantic" composite in which the subordinate event is a proper part of the event denoted by the structure projected by the main verb.

(23) $e_1 \rightarrow e_2$

Let us assume that (23) is the "semantic" relation associated uniformly with the complementation structure (24), in which a lexical V takes VP as its complement in LRS representations.



The syntactic structure (24) and the associated semantic relation (23) comprise the LRS expression of what is commonly called the causal relation (see Lombard 1985 for relevant discussion of relations among events and for an appropriate formal semantic representation of the causal relation). In this light, it is with some justification that the NP in (22) is typically associated with the thematic role term agent—inasmuch as it bears the specifier relation in the structure projected by the "causative" verb. This NP bears a syntactically unambiguous relation to the V' of (22), and, by hypothesis, its semantic relation within the structure is likewise unambiguous and fully determined by the LRS. Suppose we symbolize this relation as $>$ and devise a composite elementary "semantic" representation for the entirety of (22), as in (25).

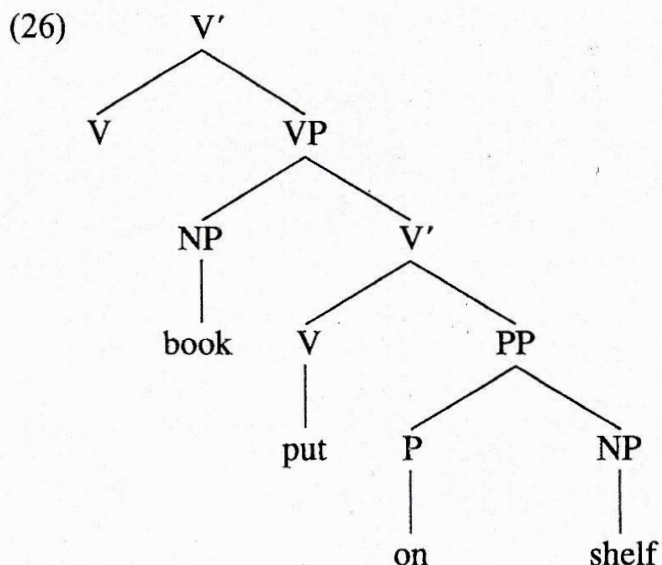
(25) $n > (e_1 \rightarrow e_2)$

In (25) we express the notional type of the category N as n , representing the notional type of nouns, whatever that is in fact. We can choose to use the expression agent d to refer to the relation borne by n in (25), but this, like (25) itself, is entirely derivative under the assumptions we hold here.

Similar remarks are appropriate to the syntactic and semantic characterizations of the relations inherent in other LRS projections determined by lexical items. And a survey of plausible LRS representations suggests ready candidates for association with the standard thematic terminology. That the list of thematic role terms is not endless or even large follows, we claim, from the fact (if it is a fact) that the roles are derivative of lexical syntactic relations, and these are limited in the manner we have described.

Consider now the "inner VP" of (24). One possible system of projections dominated by that node is the structure we have associated with

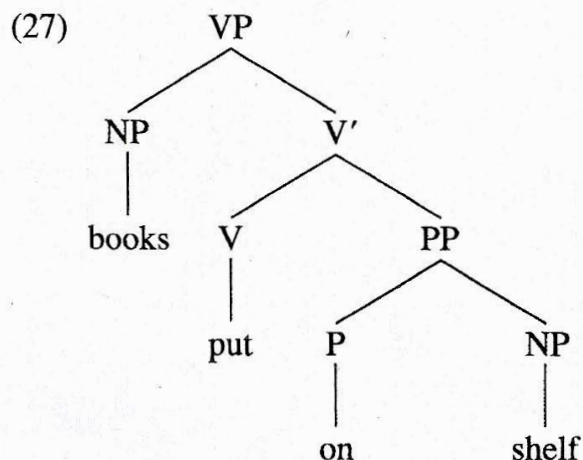
the English verb *put* (following Larson 1988; also see Hale and Keyser 1991, 1992), as in *She put the book on the shelf* (26).



This LRS representation is shared by a vast number of English verbs, including a large number of denominal location and locatum verbs, putatively formed by incorporation of a nominal into an abstract P and thence successively into the abstract Vs (see above and Hale and Keyser, 1991, 1992).⁷

By hypothesis, the syntactic relation between the matrix V and the inner VP corresponds uniformly to the "causal" relation, by virtue of the syntactic relation itself and by virtue of the elementary notional type associated with the V category. The external argument of the matrix verb bears an unambiguous syntactic relation to it, and, by hypothesis, its elementary semantic connection to the structure is likewise unambiguous—following accepted usage, it is the "agent."

Now let us turn to the inner VP itself, depicted in (27).



Argument Structure

In this structure the head-complement relation involves the categories V and P, the latter subordinate to the former. We will continue to assume that the notional type of V is "(dynamic) event" e , and we will suggest that the notional type of P is "interrelation" (symbolized by r). The r -relation includes, but is not to be strictly identified with, relations commonly thought of as spatial or locational (see Kipka 1990 for detailed criticism of the "locationist" conception of adpositions). If these basic semantic notions combine to assign an elementary semantic value to the syntactic structure in which they appear, then they will do so unambiguously, since the syntax is itself unambiguous. We suppose that the semantics of the relation embodied in V' of (27) is that according to which a (dynamic) event "implicates" an interrelation, as expressed in (28), utilizing the elementary notation we have adopted.

$$(28) e \rightarrow r$$

The most salient "meaning" attached to this structure is "change." Thus, the elementary semantic expression embodied in (28) corresponds to the situation in which some entity, represented by the subject, comes to be involved in an interrelation with an entity corresponding to the NP object of the P.

An interrelation involves at least two entities, of course. Thus, the preposition *on*, for example, relates some entity (typically functioning as a place) and some other entity (typically a thing, substance, or the like), as in sentences like *A fly got in the soup* or *Mud got on the wall*. However, given Unambiguous Projection, the syntax of V' in (27) has just one expression (NP object of P) corresponding to an entity entering into the interrelation r established by P. Therefore, a "subject" ([Spec, VP]) is required in VP as an absolute necessity in the lexical syntactic projection of V here. We continue to use the symbol $>$ to represent the semantic relation that the subject bears in relation to the V' expression, but this is nothing more than a notational filler at this point—more will be said presently about the syntax and semantics of the subject relation in LRS representations.

The subject NP in (27) corresponds to an entity that completes the interrelation r . It is the subject of a "predicate of change" and therefore, as in the syntax, it is external to the semantic expression assigned to V', as in (29).

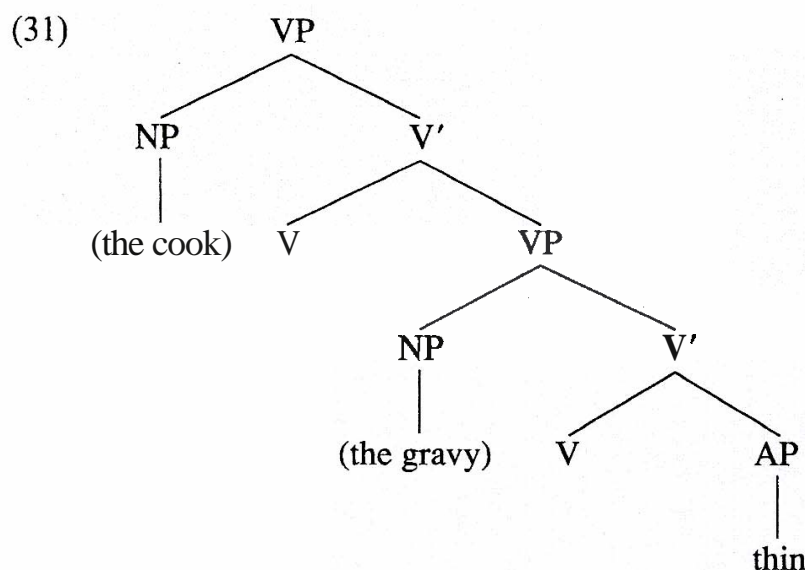
$$(29) n > (e \rightarrow r)$$

The subject of a change predicate is sometimes called a "theme" (Gruber 1965, Jackendoff 1972) or an "affected patient" (Anderson 1977, Pesetsky 1990). Again, however, these semantic roles, like the elementary semantic interpretations in general, are derivative of the lexical syntactic relations.

In an accepted view of thematic relations, the "theme" role, and the associated elementary semantic relation "change," extend to predicates of the type represented in (30).

- (30) a. The oven browned the roast.
 b. The storm cleared the air.
 c. The cook thinned the gravy.
 d. This narrows our options.

We assume that verbs of this type, like the others we have examined here, are derived by head movement. In this case, however, the incorporating elements are adjectival. The LRS representation of the verb in (30c) is depicted in (31).



The upper V in (31) projects the LRS associated with the "causal" relation represented in (24). The lower V projects a structure that is parallel to the VP displayed in (27), but with the PP of the latter replaced by AP, the phrasal projection of the adjectival category A.

The lexical category A is associated with the notional type "state" (*s*), and the elementary semantic relation associated with the V' projection is presumably as shown in (32).

- (32) $e \rightarrow s$

That is to say, an action or dynamic event "implicates" a state. Or to put it another way, a state is achieved as an integral, or defining, part of a

Argument Structure

dynamic event. This corresponds, we suggest, to the notion of a "change resulting in a state."

It is a fundamental semantic requirement of AP that it be attributed of something, for example, of an entity. Thus, just as in the case of PP complements, so also in the case of AP complements, a "subject" necessarily appears in [Spec, VP] (i.e., *the gravy* in (31)). And this subject is integrated into the associated semantic representation in the usual way, as shown in (33).

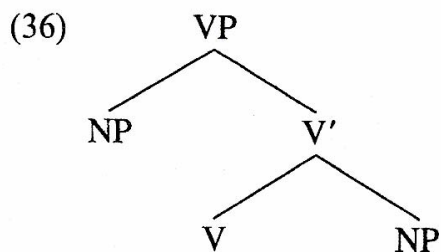
(33) $n > (e \rightarrow s)$

Again, the subject can be thought of as the "theme," inasmuch as it corresponds to an entity undergoing change.

We have examined three of the complement types available in LRS representations, namely, those projected by the categories V, P, and A. The fourth type, that projected by the category N, is exemplified by the unergative verbs of (34) and the simple transitives of (35).

- (34) a. The child laughed.
b. The colt sneezed.
c. Petronella sang.
d. The ewes lambed.
- (35) a. We had a good laugh.
b. She did her new song.
c. The ewe had twins.
d. This mare does a nice trot.

In both cases the abstract relational structures here involve a verbal head projecting a V' structure containing an NP in complement position, as shown in (36).



In the case of (35), of course, the complement NP is a categorial variable in the LRS representation of the various verbal lexical items; it is realized as an NP argument in s-syntax, through lexical insertion in the usual manner.' In the case of (34), on the other hand, the complement NP dominates a constant: the nominal source, through incorporation, of the denominal verb (see above and Hale and Keyser 1991).

If it is appropriate to assume that the elementary semantic structures are associated with syntactic structures in the unambiguous manner suggested so far, then the semantic structure associated with the V' of (36) is as in (37).

(37) $e \rightarrow n$

Here, an action or dynamic event "implicates" an entity, assuming that to be the notional type (n) associated with the noun category. This corresponds to the notion that the implicating event is completed, or perfected, by virtue of the "creation," "production," or "realization" of the relevant entity.

If (36) is the correct relational structure for unergatives, and for the "simple transitive" (light verb, cognate object, and creation predicate constructions), then full expression of the associated semantic structure is as shown in (38), integrating the "subject" into the interpretation in the customary manner.

(38) $n > (e \rightarrow n)$

This correctly reflects the fact that the sentences of (34) and (35) clearly have subjects at S-Structure. In fact, all members of the category V that we have examined here project structures that, at some point or other, have subjects. It is nevertheless legitimate to ask whether the LRS representations of verbs necessarily express the specifier relation. We will turn to this question in the following subsection.

2.3 Categories and Specifiers

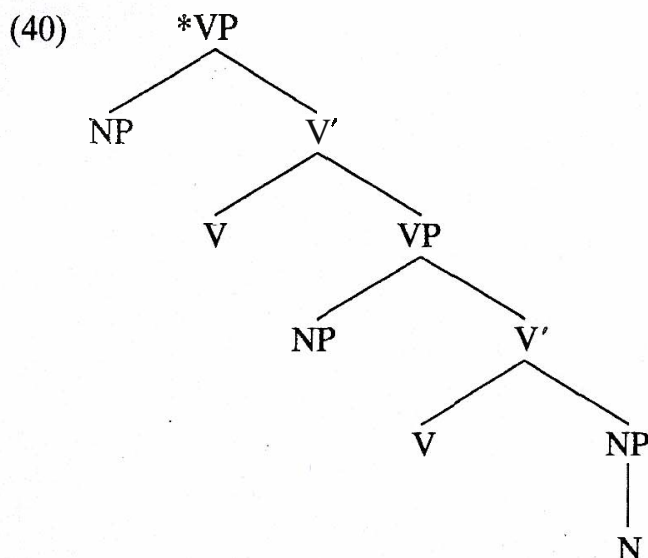
We have been considering a conception of lexical syntactic projections according to which any appropriate VP may "embed" as the complement of a verb. Structures (26) and (31) represent projections of just this type. And verbs projecting both these structures are energetically **represented** in the verbal vocabulary of English, for example.

But there are some gaps, and the theory of argument structure that we are considering must have an explanation for them. Consider the ill-formed usages in (39).

- (39) a. *The clown laughed the child. (i.e., got the child to laugh)
 b. *The alfalfa sneezed the colt. (i.e., made the colt sneeze)
 c. *We'll sing Loretta this evening. (i.e., have Loretta sing)
 d. *Good feed calved the cows early. (i.e., got the cows to calve)

These sentences represent an extremely large and coherent class of impossible structures in English. In particular, unergative **VPs** cannot appear as

complements of V in LRS representations — that is, an unergative may not appear in the lexical syntactic "causative" construction, as depicted in (40).⁹



This structure, the putative source of the verbs in (39), satisfies all conditions we have considered to this point. So far no principle precludes it. But the structure is consistently absent, as far as we can tell, from the English vocabulary of denominal verbs. Why should this be?

The answer, we think, lies in the LRS representation of unergative verbs. The verbs of (39) are a problem only under the assumption that they have the relational structure (36)—in particular, that they have VP-internal subjects. If we assume instead that unergatives do not have a subject in I-syntax, then the problem disappears, since the structure depicted in (40) cannot exist and, therefore, the verbs of (39) cannot exist either.

This is our answer. Unergatives have no subjects in their LRS representations. But for this to be a solution of any interest, it must be something other than a stipulation to the effect that some verbs have a subject in LRS and others do not. Which verbs are allowed not to have VP-internal subjects in I-syntax? Which verbs must have a subject, as the inner VP of *shelve* and *clear* surely must? If these questions have no answer, our suggested explanation for (39) is no more than an observation.

In the relational structures of the location and locatum verbs studied in earlier sections (and in Hale and Keyser 1991) and, likewise, in the relational structures of change-of-state verbs of the type represented by (30), the appearance of a subject in the inner VP is "forced," being required by the complement within that inner VP. In essence, since the complement in the inner VP is a predicate in the LRS representation of those verbs, "full

~nterpretation'(see below) of the inner VP requires that a subject appear, internal to the VP, so that predication can be realized locally, as required (see Williams 1980, Rothstein 1983), thereby correctly relating the complement of the inner VP to the subject of that VP.

We will assume that the Spec position of VP in the LRS representation of a lexical verb is filled only when that is forced by some principle. In the case of the change-of-state or location verbs just considered, we suggest that the appearance of a subject is forced by predication.

For verbs of the class now commonly termed "unergative," nothing forces the appearance of a subject. This follows, since the complement in the LRS representations of such verbs is not a predicate. We can assume, then, that the subject is in fact excluded from the LRS representations of unergatives.

In our attempt to answer the questions formulated in (21), we suggested that argument structures, or LRS projections, are constrained in their variety by (i) the relative paucity of lexical categories, and (ii) the unambiguous nature of lexical syntactic projections. If what we have suggested here for unergative verbs is correct, then we must consider an additional limit on the variety of possible argument structures—specifically, we must also determine what it is that forces the appearance, or absence, of a subject.

We believe that nothing new need be added to achieve the correct result. This result is in fact given by the general principle according to which linguistic structures must be "fully interpreted" (Chomsky 1986b). The principle of Full Interpretation will guarantee that verbs of change of location or state *have* a subject in the inner VP; absence of the subject would leave the complement of the inner VP uninterpreted (see Rothstein 1983, which we take to be the true origin of this idea). The same principle will also guarantee that unergative verbs *lack* a subject in their LRS representations; a subject, if present in an unergative LRS representation, would itself be uninterpreted for lack of a predicate in the complement position.¹⁰ The D-Structure or S-Structure subject of an unergative verb is therefore a "true external argument," appearing in the Spec position of the functional projection IP (or, in the case of small clause constructions, in the adjoined position assumed by the subject).

Of course, these remarks on LRS internal subjects do not only apply to verbs that involve conflation; they also apply to "analytic" constructions in which the main verb appears with an overt complement. Thus, for example, various constructions employing the relatively abstract English verb *get* exhibit the predicted range of acceptability in the causative: *get*

drunk and get into the Peace Corps, with complements that are inherently predicative; not only permit the intransitive form (e.g., My friend got drunk, My friend got into the army), but *also* appear freely in the causative form (We got my *friend* drunk, We got my *friend* into the Peace Corps). By contrast, expressions like get the measles and get smallpox, with nominal or verbal (hence nonpredicative) complements, cannot appear in the causative, as expected by hypothesis (e.g., *get my friend the measles, get my friend smallpox, in the relevant sense, and *We got my friend leave early). Alternative proposals exist that might explain this contrast, but we would like to suggest that a more straightforward lexical syntactic explanation also exists, accounting not only for these examples but also for the ill-formedness of *laugh my friend, where a Case Theory account, for example, is not plausible (given laugh my friend *off* the stage, in which laugh apparently does assign Case; see Burzio 1981). Branigan (1992) suggests that make John leave involves a subjunctive, rather than the bare VP, as the complement of make. Hence the contrast with get, which cannot form *get John leave. There is a serious question about the latter case, however, given the analysis suggested in section 4.2 for overt causative morphology. Specifically, why does the Case-marking capability of transitive get fail to "save" the structure in question?

Given these considerations, we can assume that the structures that express the relations among the arguments of a verb are characterized by the operation of two fundamental defining principles, (41a) and (41b).

(41) Lexical Relational Structure (Argument Structure)

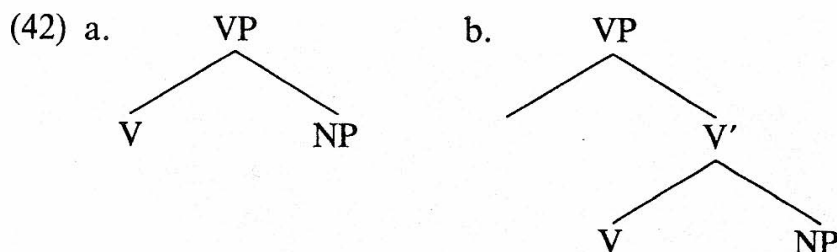
- a. Unambiguous Projection
- b. Full Interpretation

To the extent that they are correct, these principles, in conjunction with the restricted set of lexical categories (V, N, A, P), determine the limits on the range of relations into which arguments can enter. This effectively answers question (21a), concerning the paucity of so-called thematic roles. The principles also define a precise class of relational structures. To that extent, they answer question (21b) as well, since the LRS representations embody biunique structural-semantic (i.e., structural-thematic) relationships for all lexical items.

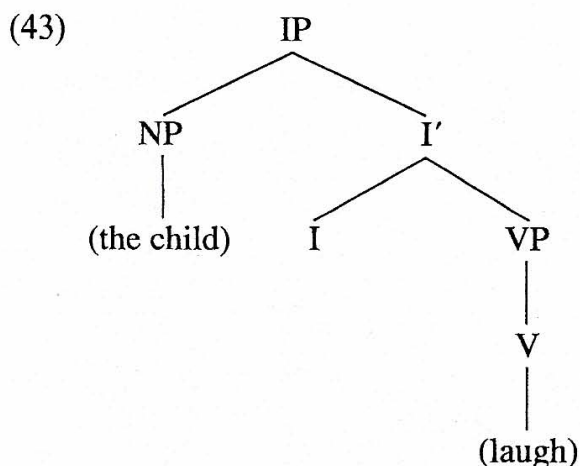
2.4 The Specifier Position and the Depth of Embedding in Lexical Relational Structure Representations

If the Spec position for so-called unergative verbs, like those in (34), is excluded by virtue of Full Interpretation, then their expressed subjects

must be "external," as we have said. The LRS representation of a verb like *laugh* cannot be (36). Rather, it must be something on the order of (42a) or (42b). For the sake of expository simplicity, we will assume the former, since it is not clear to us what a truly "empty" Spec position means in our framework (though it may well be necessary to posit such a position; Unambiguous Projection is satisfied in either case).



The precise sense in which the subject of an unergative verb is external can be left vague for the moment (see section 4.2 for discussion), but it will involve at least the assumption that the subject is not present in the LRS projection of the predicator, that is, the lexical VP. In English, at least, S-Structure subjects in general are in the Spec position of the functional category IP. Thus, omitting some irrelevant details, the S-Structure representation of (34a), *The child laughed*, is essentially as in (43).

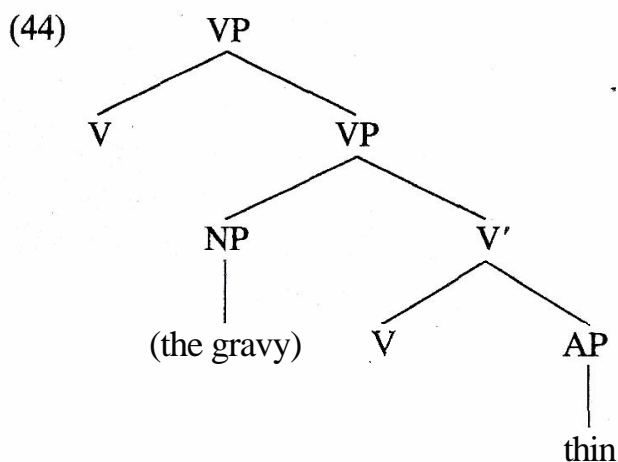


By hypothesis, the verb is the result of incorporation—specifically of the LRS object *laugh* into the abstract V that heads the lexical item as a whole. The expressed subject is external to VP.¹¹ If we adopt the accepted view according to which the VP in (43) is a predicate at D-Structure, we must also assume that it requires a subject at some s-syntactic level, by the Extended Projection Principle (Chomsky 1982, Rothstein 1983), presumably a corollary of the general principle of Full Interpretation. The required s-syntactic subject must at least appear in [Spec, IP] at S-structure. Its D-Structure position is another question, and the VP-internal subject

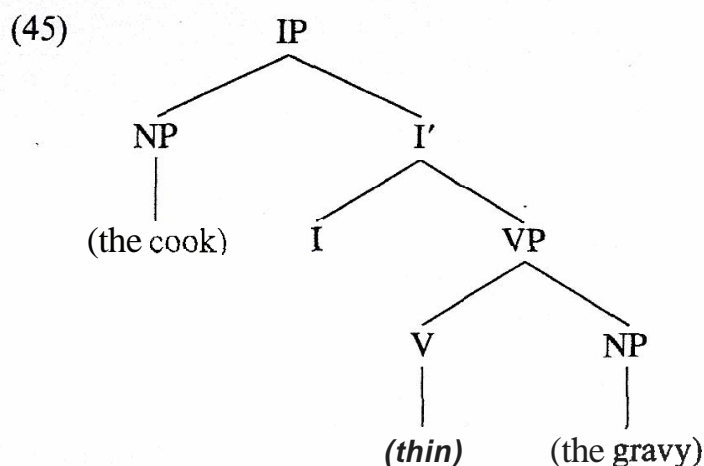
Argument Structure

hypothesis, according to which the subject is dominated by the VP node in s-syntax, is not in conflict with our claim that the subjects of unergative verbs are external to VP in LRS representations.

If this reasoning is correct, then it must apply equally to the LRS representations of verbs associated with the "causal semantics" informally expressed in (25)—that is, to location verbs (like *put*, *shelve*), to locatum verbs (like *saddle*, *blindfold*), and to verbs of change of state (like *thin*, *lengthen*, *break*). This follows, since the inner VP, being "complete" and therefore not a predicate, cannot force the appearance of a subject in the matrix VP. Accordingly, the structure presented in (31), for the verb *to thin* (as of *gravy*, *paint*), must be corrected to (44), omitting the matrix subject.

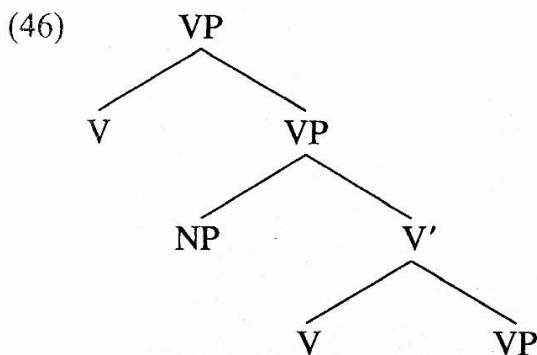


Thus, in a sentence employing this verb, like *The cook thinned the gravy*, the expressed subject (the cook) must be external to the lexical VP projection, as is the subject of an unergative verb. Further, as in the case of unergatives, predication in s-syntax is the means by which the expressed subject is interpreted. This subject occupies [Spec, IP] in the s-syntax of a tensed clause, as in the abbreviated D-Structure representation (45).

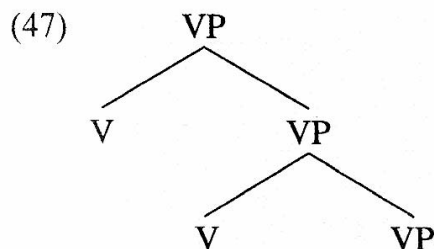


The verb of (45) is derived (in 1-syntax) by successive incorporation of the adjective *thin* into the abstract verbs of (44), in conformity with the provisions of the head movement process.

Our analysis of unergative and causative verbs depends on the notion that a **VP** is not a predicate in 1-syntax. We extend this to all VP projections: none is an 1-syntactic predicate in the relevant sense, that is, a maximal projection forcing the appearance of a subject internal to **LRS** (see Hale and Keyser 1991 for fuller discussion of this). If this notion is correct, then we can explain—in part, at least—why there is a limit on recursion in **LRS** representations. Empirically, the **LRS** representation for a verb generally has at most one VP embedding. Thus, so far as we know, no verb corresponds to the hypothetical **LRS** representation (46), because that structure fails to satisfy the requirement of full interpretation. The most deeply embedded **VP** is not a predicate; so, by that hypothesis, the inner subject is not licensed.



But if this structure is illicit because of a failure of predication, then what if the **NP** is simply omitted? This would give (47), also nonexistent, so far as we know.



We assume that the same general principle precludes this structure as well. The "double causative structure" cannot be interpreted, since only one causative can be predicated of a subject in s-syntax. Again, this is a failure of predication (of the inner **VP** in this case) and hence a failure to achieve full interpretation. Thus, unrestricted recursion of the **VP** category—although similar in character to the s-syntactic recursion freely permitted,

for example, by clausal complementation — is impossible in the syntax of LRS representations, precisely because of the full interpretation requirement. To be sure, full interpretation is a requirement of s-syntactic structures as well, but its effect there is different, due, among other things, to the properties of the various functional categories, which define a Spec position for external arguments.

2.5 External and Internal "Subjects"

If the s-syntactic subjects of transitives and unergatives are "external subjects," how are they in fact related to their verbs? In a sense, the answer is simple: they are related to their verbs through predication. Relative to the VP, they appear in an s-syntactic position appropriate for predication (see Williams 1980, Rothstein 1983, Rapoport 1987).

We will assume that this answer is correct. But of course there is a deeper question. Is this external subject a part of the argument structure of the verb that heads the VP predicated of it? Is the external subject an argument, in any sense, in the l-syntactic representation of the verb? Does it, so to speak, receive its thematic role from the verb?

We believe the answer to this question is **negative**. The external subject is not present in the LRS representation of the verbs under consideration here. At least, it is not present in the sense of this framework — for example, in the sense in which an object is present as a point in the LRS projection defined by the verb. It therefore cannot "receive its thematic role" from the verb, since the concept "thematic role," to the extent that it can be understood in the context of LRS representations, corresponds precisely to the notion "lexical relation," defined over the LRS projection. If the subject is absent from the LRS representation of a verb, then clearly it cannot "receive its thematic role" from the verb.

How, then, do we account for the fact that the external subjects of unergative and causative verbs, say, are understood as "agents" in relation to the events named by those verbs? How is the "agent role" assigned?

We assume that it is correct to say that the subjects in question are associated with a semantic role, typically the role termed "agent," and we will adhere to the traditional usage in saying that these subjects are "assigned the agent role." However, we assume that this assignment is "constructional," in the sense that it is effected in a syntactic configuration defined in s-syntax. This manner of assignment, we contend, is to be distinguished entirely from that associated with the semantic roles (theme, patient, goal, etc.) corresponding to the l-syntactic relations defined by LRS projections. The agent role is a function of s-syntactic predication.

Insofar as it concerns the agent role, this view is essentially that developed by Chomsky (1981) and Marantz (1984), according to which the subject receives its semantic role from VP, not from the V itself.

Not all subjects are "external" in this sense. And, accordingly, not all subjects are "agents." Verbs of the type represented by *thin* (the gravy), *tighten* (the cinch), *loosen* (the girth)—that is, members of the class of "ergative verbs" (Burzio 1981, Keyser and Roeper 1984)—have the property that they may project both transitive and intransitive s-syntactic verb phrases. In the latter case the internal NP undergoes movement to subject position—that is, to [Spec, I] in (48a–c).

- (48) a. The gravy is thinning nicely.
 b. The cinch finally tightened.
 c. The girth loosened.

Here, the s-syntactic subject is "internal" in the sense that it is an argument internal to the LRS representation of the verbs. We maintain that it is exactly this internal subject that is to be identified with the "affected argument" of the Affectedness Condition, which has played an important role in lexical and syntactic studies since Anderson's work on passive nominals (Anderson 1977; and for relevant recent studies of the role of the affectedness property, see Jaeggli 1986 and Pesetsky 1990). If the affected argument is an internal subject in 1-syntax, as we believe, the semantic notion "affected" is correlated with a structural position in the 1-syntactic representations of verbs.

The verbs of (48) belong to the class of so-called ergative verbs, exhibiting an "uncompromised" transitivity alternation along the ergative pattern—that is, with object of transitive and subject of intransitive the stable argument in the alternation. But to this class of verbs must be added those that enter into the middle construction of English. These exhibit the same transitivity alternation, "compromised" by various well-known requirements that must be met for full acceptability (e.g., use of the generic, a modal, or an adverb like *easily*, as in (49)).

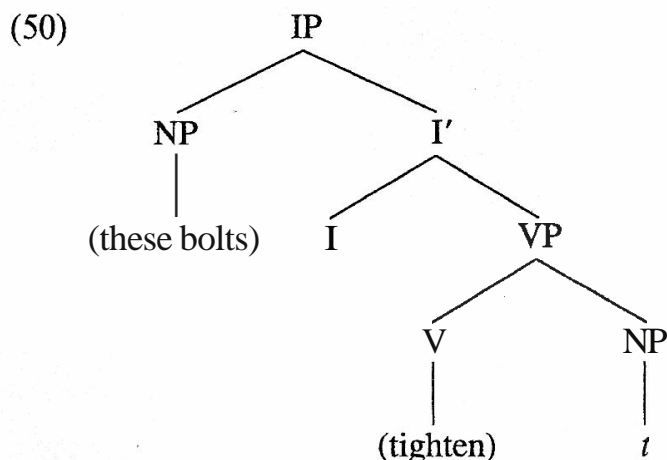
- (49) a. Rye bread cuts easily.
 b. These bolts tighten easily.
 c. Limestone crushes easily.

Of course, all ergative verbs can be used in the middle construction; (49b) is a good example. Like the inchoative (i.e., the intransitive use of ergatives, as in (48)), the middle involves s-syntactic movement of an argument bearing the internal subject relation (in the case of the middle, this is an object in s-syntax). Transitive verbs that can undergo middle

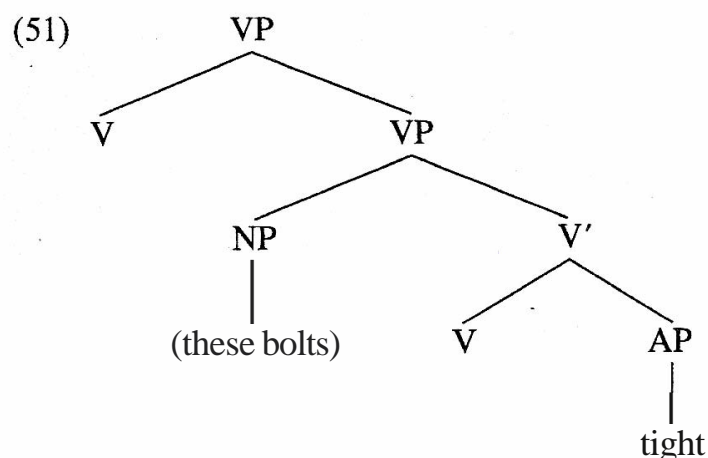
Argument Structure

formation are just those whose s-syntactic object is an "affected argument"—that is, those whose s-syntactic object corresponds to an internal subject in LRS.

Under these assumptions, it is perhaps not sufficient to assume that the relevant portion of the S-Structure representation of the middle sentence (49b) is simply that depicted in (50), in which the derived subject heads a chain with the trace (of NP-movement) in s-syntactic object position.



This assumption is insufficient, since the VP here is indistinguishable from that of expressions like *make trouble*, *have a baby*, *do a job*, whose l-syntactic and s-syntactic representations alike correspond to the simple transitive type $[_{VP} V NP]$ (i.e., the same as that projected by unergative verbs). The latter do not enter into the middle construction—predictably, by hypothesis, since they do not involve an "affected" argument in the relevant sense. By contrast, the l-syntactic counterpart of the VP of (49b) is that depicted in (51), in which the argument at issue (*these bolts*) is an internal subject.



The middle construction of English appears to be restricted to verbs that have an internal subject in this sense. This implies that transitive verbs like

cut, *break*, *crush* partake of the complex I-syntactic causative structures assumed here for the conflated denominal *location/locatum* verbs and for deadjectival verbs of the type represented in (49b). And if the English middle construction is formed in s-syntax, then the relevant aspects of these structures must be “visible” at that level.

Although we speculate that this account of the English verbs under discussion is essentially correct, there are a number of serious problems that must eventually be dealt with. Here we will deal with only one. It concerns an asymmetry in the transitivity alternations exhibited by ergative and *location/locatum* verbs, reflected by (among other things) an asymmetry within the class in the distribution of the middle and inchoative forms.

3 Transitives, Inchoatives, Middles, and Verbal Modifiers

The difference between inchoatives and middles is an old issue, and it is the focus of an extensive literature (e.g., Van Oosten 1977, Lakoff 1977, Keyser and Roeper 1984, Jaeggli 1984, Hale and Keyser 1986, 1987, 1988, Condoravdi 1989). Why is the acceptability of the middle conditional? Why does the middle, unlike the inchoative, require some *modification*—such as modal, aspectual, an adverb—to achieve acceptability? In the following discussion we will be concerned, not with this time-honored problem, but with a problem defined by our own system: the *distribution*, across verbs, of the inchoative and the middle constructions.

The problem is this. As shown in (52), ergative verbs, like *narrow*, *clear*, and *tighten*, all have an inchoative use in addition to their transitive and related middle uses.

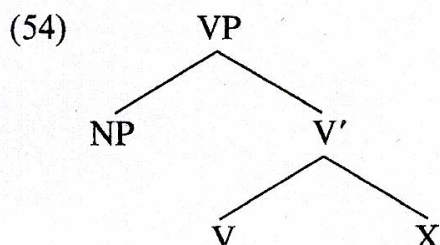
- (52) a. The screen cleared.
 b. I cleared the screen.
 c. This screen clears easily.

We have assumed that such verbs, in their transitive uses at least, all have the structure depicted in (51). Further, we have assumed that this structure is, in the relevant respects, the same as that associated with *location* and *locatum* verbs. However, these verbs lack the inchoative, as shown in (53).

- (53) a. *The books shelved.
 b. I shelved the books.
 c. These books shelve easily.

Thus, although both the middle and the inchoative, by hypothesis, involve s-syntactic movement of an internal argument, the two processes are not coextensive: the inchoative is more restricted than the middle. Why is there this difference?

To this point we have assumed that both ergative verbs and location/location verbs involve an inner VP of the form shown in (54).



The head of XP belongs to a category that forces the appearance of a subject, hence the NP in [Spec, VP]—in other words, XP is either PP or AP. Since the two verb classes involve essentially the same structure, there is no obvious reason for the difference they exhibit in relation to the inchoative. It is possible, of course, that the assumption embodied in (54) is in error and that the two verb classes are structurally distinct, the structural difference accounting for the difference in behavior. In earlier work (Hale and Keyser 1991) we entertained this possibility and attempted to develop it. Here, however, we will consider an alternative proposal (adapted from Hale and Rapoport, in progress), and we will attribute the structure depicted in (54) to ergative verbs and location/location verbs alike.

The proposal we will consider here does not actually solve the problem we have identified. We suspect, however, that the solution lies in the direction indicated by the observations we will make. The observations in question have to do with semantic components of manner or means present in the lexical representations of verbs, and, whatever their relevance to the present problem, their grammatical properties are properly part of a full account of the verbal lexicon (see Levin and Rapoport 1988 for a promising proposal in this regard).

3.1 The Transitivity Alternation

In the following discussion we will momentarily turn away from the denominal verbs themselves to the more general phenomenon of transitivity alternations and observed asymmetries in their distribution.

Basically, we will be concerned with members of two large classes of verbs. The members of one class participate in the simple transitivity alternation shown in (55).

- (55) a. The pigs got mud on the wall.
 b. Mud got on the wall.

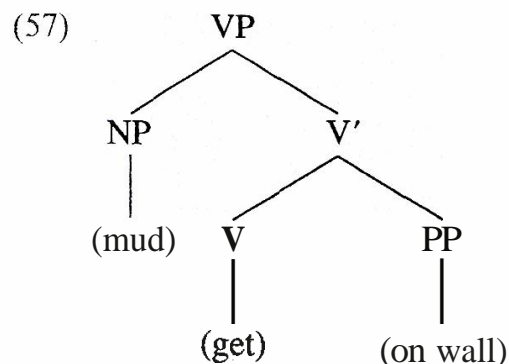
In contrast, the members of the other class fail to occur in pairs of this type, as shown in (56), taking only the transitive form.

- (56) a. We put mud on the wall.
 b. *Mud put on the wall.

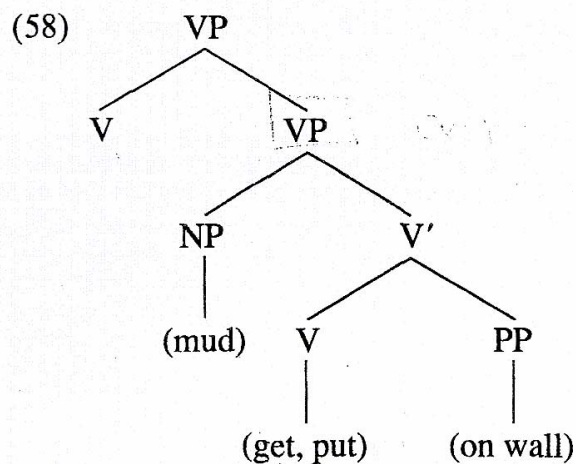
In these uses, both *get* and *put*, like other members of the classes they represent, depict events in which some entity or material (in this instance, *mud*) undergoes a change of location, so that it "comes to be located" at a place corresponding to the nominal expression in the prepositional phrase (in this instance, the wall). In accepted parlance of semantic and thematic roles, the moving entity or material is called the theme (Gruber 1965, Jackendoff 1972); and in syntactic terms, it corresponds to the grammatical object in the transitive uses of *get* and *put*, and to the grammatical subject in the intransitive use of *get*.

The issue here, of course, is the transitivity asymmetry exhibited by these two verb classes. Continuing our earlier usage, we will refer to the transitive sentences of (55)–(56) as the causative alternant; the intransitive sentences represent the inchoative alternant. The question here is the same as the one formulated in relation to the denominal verbs of (52) and (53): Why does (55) admit an inchoative alternant, while (56) does not?

By assumption, the lexical argument structure of intransitive *get*, as in (55b), is as shown in (57).

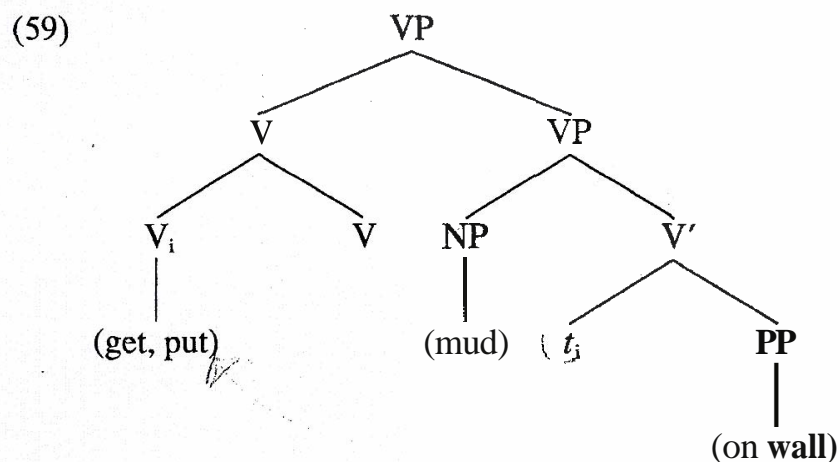


By contrast, the transitive use exemplified in (55a) involves a more complex structure. Whereas (55b) involves a simple and single event, that of a change in location (e.g., *mud comes to be on the wall*), the transitive (55a) depicts a complex situation consisting of two subevents: a cause and an effect. The lexical argument structure of transitive *get*, as used in (55a), is the correspondingly more complex (58); of course, the same structure is shared by English *put*.



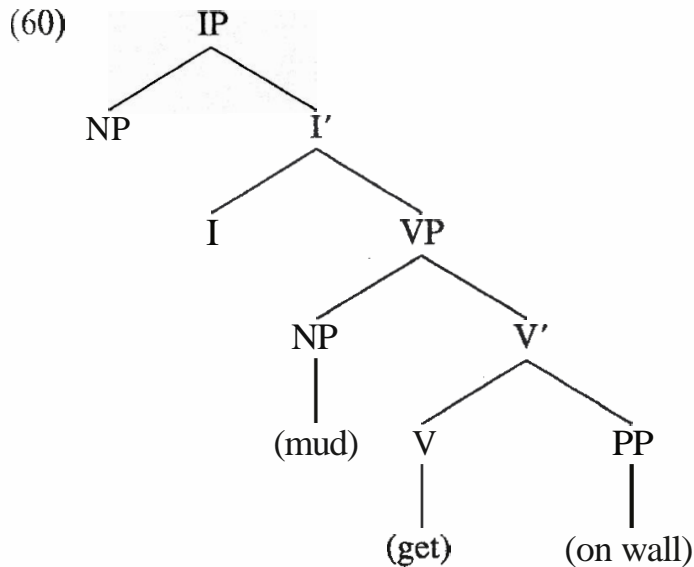
By Full Interpretation, the agent of causation (*The pigs* in (55a), *we* in (56a)) is, necessarily an *external* argument. The VP complement of the matrix (causative) V in (58), being fully evaluated, is not a predicate and therefore cannot license the appearance of a subject NP in the Spec position of the LRS projection defined by the causative verb. From this it follows that "further causativization" of *get* is impossible in lexical structure (hence, **we got the pigs mud on the wall*, in the sense *We brought it about that the pigs got mud on the wall*).

Structures of the type represented by (58) are of course subject to incorporation, as depicted in (59).



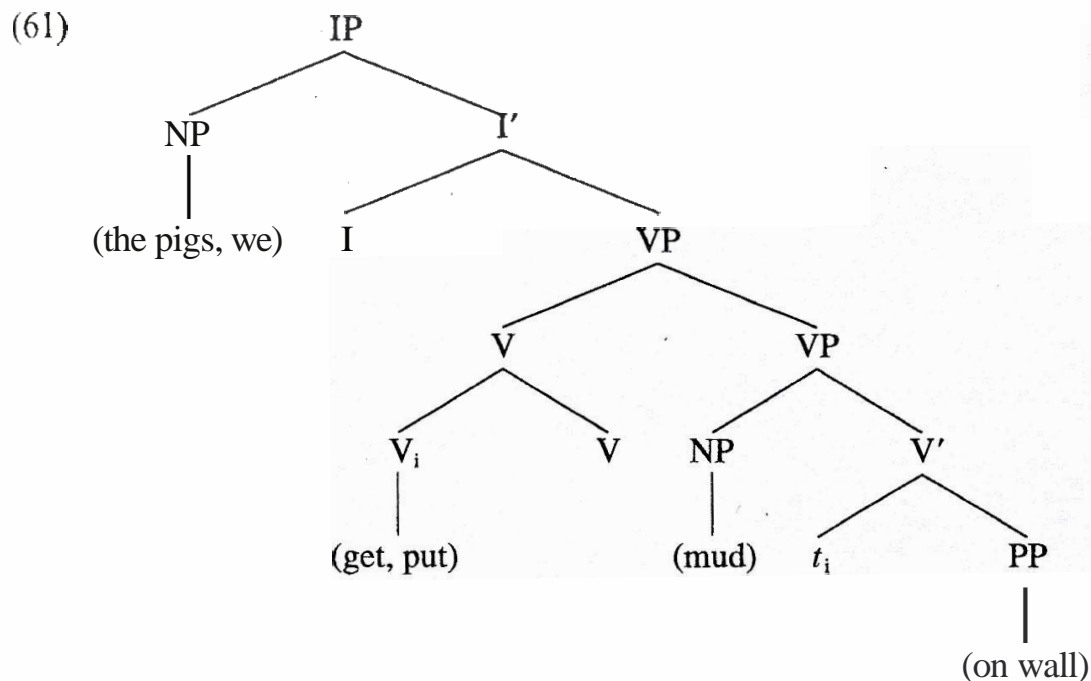
The structures given in (57)–(59) are I-syntactic representations. The D-Structure representation of a given sentence comprises a pair consisting of lexical structure and the system of functional categories that select designated lexical projections. D-Structure is itself subject to various well-known principles that, in some cases will force displacement, or movement, of phrases and/or heads.

The D-Structure representation of (55b) involves at least the lexical argument structure (57) and the functional category I, as shown in (60).



This will be modified in s-syntax, in accordance with principles of both Universal Grammar and English-specific grammar, deriving an S-Structure representation in which (i) the lexical "subject," originating in [Spec, VP], appears in [Spec, IP] (substituting for NP there), thereby satisfying the Case and agreement requirements associated with the subject, and (ii) the head of the functional category I is combined with the lexical head of the construction (i.e., with V) in accordance with principles of English morphology, among other things.

By hypothesis, the D-Structure representation of the transitive verb *put* arid of the transitive alternant of *get*, as used in (55a), will take the form shown in (61).



Here, of course, the external subject NP (e.g., the pigs, we) is truly an "external" argument, appearing in D-Structure in [Spec, IP] and getting its semantic role directly through the predication relation that holds between it and the verb phrase as a whole. The inner "subject" (e.g., mud) does not "raise" in this case, since it is assigned Case by the transitive verb that heads the projection bearing the predicate relation to the external subject. In this circumstance, therefore, the inner "subject" is the D-Structure "object" of the transitive verb.

Returning now to the original question—why English *get* may enter into both the transitive and intransitive constructions, whereas *put* may only be transitive—we begin to consider a possible answer.

3.2 Inchoatives and the Licensing of Means and Manner

To address this problem, it is necessary to move beyond this very restricted set of data to a larger group of transitive and intransitive verbs of "change of location," which share the selectional property that they take a PP complement, together with an NP corresponding to the semantic role "theme." Consider first the set of verbs in (62), having to do with the motion or transfer of liquids, or liquid-like matter.

(62) splash, drip, dribble, pour, squirt,...

As shown in (63)–(65), these verbs appear readily in both the inchoative (intransitive) and transitive forms.

(63) a. The pigs splashed mud on the wall.
b. Mud splashed on the wall.

(64) a. We dripped honey on the cornbread.
b. Honey dripped on the cornbread.

(65) a. They poured gas into the tank.
b. Gas poured into the tank.

Now compare these verbs to the ones in (66).

(66) smear, daub, rub, wipe,...

Like *put*, these fail to appear in the inchoative.

(67) a. We smeared mud on the wall.
b. *Mud smeared on the wall.

(68) a. They daubed pipeclay on their bodies.
b. *Pipeclay daubed on their bodies.

- (69) a. He rubbed ochre on his chest.
 b. *Ochre rubbed on his chest.

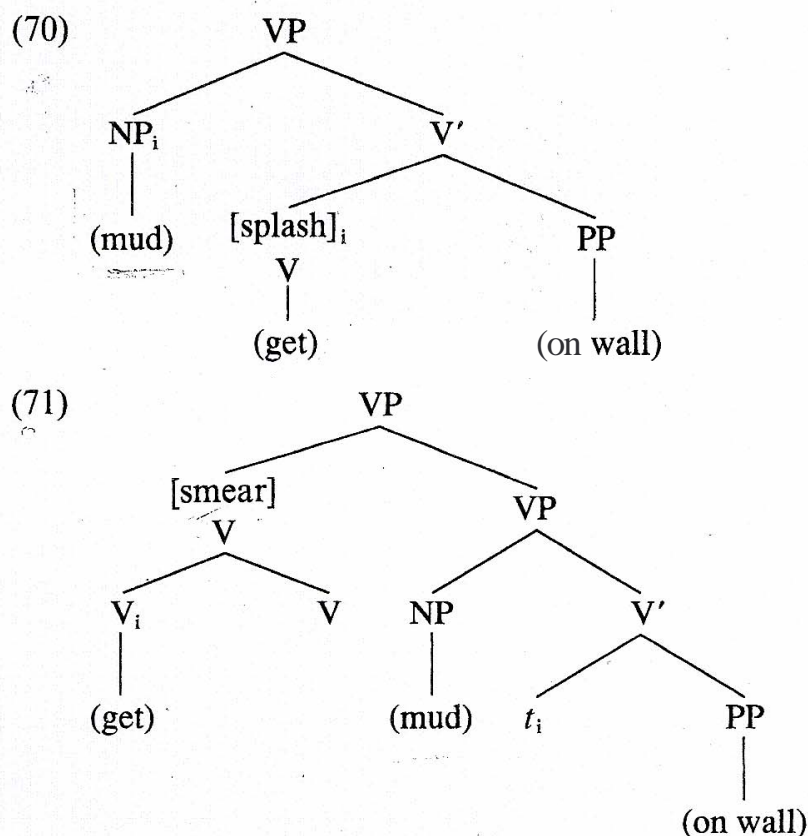
There is a sense in which the verbs of (62) and (66) are more "complex" than the simple verbs examined so far. They are more complex, not in their argument structure, which rather closely parallels those of the verbs *get* and *put* in the relevant uses, but in terms of the presence of an additional factor. Thus, for example, sentences (63a–b) do not speak simply of mud getting on the wall, but of mud getting on the wall in a particular way—namely, in the manner customarily referred to as "splashing." Similarly, sentence (67a) speaks of mud getting on the wall by a particular means or manner—that referred to as "smearing."

We wish to suggest that the difference in syntactic behavior between the two classes of verbs is related to this extra level of complexity, which we will refer to as the *manner component*, in the lexical representation of verbs. The difference between the "ergative" class (the class that has both transitive and intransitive members), like (62), and the transitive class, like (66), lies in the principles according to which the manner component is "licensed."

The manner component modifiers of the verbs of (62) are primarily "internal" in their orientation. In effect, they are adverbial modifications to the VP and in particular to the event depicted by the verb and its most prominent direct argument. Thus, "splashing" describes the configuration and motion of the liquid or liquid-like matter corresponding to the internal subject of the verb *splash*; "dripping" describes the configuration and motion of the liquid or viscous material corresponding to the internal subject of *drip*; and so on. That is to say, the manner component in these verbs is justified internally to the argument structure of the verb.

For present purposes, we will represent the manner component of a verb as a "tag" on the appropriate V node, leaving open the question of how it should properly be represented and of how it is introduced into the LRS representation. Further, we will assume that the internal "licensing" relation just discussed is represented by coindexing the manner component with the internal subject, as in (70), representing the verbs of (63a–b).

By hypothesis, a corresponding representation exists for each of the ergative verbs of this type. By contrast, transitive verbs of the type represented by (66) involve a manner component that relates, not internally to the lexical argument structure, but to the external argument, or "agent." Thus, for example, the manner component in the verb of (67a)—[smear]—receives no licensing index in the LRS representation (71).



Only at D-Structure is the manner component [smear] properly licensed, since it is only at D-Structure that the required external argument is "visible" to the manner tag associated with the verb.

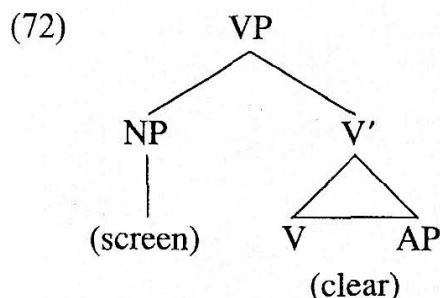
Assuming that all of the transitive verbs of the type represented in (66) share this property of having an externally licensed manner component, then the ill-formedness of the inchoative, or intransitive, (b) variants of (67)–(69) can be explained. The intransitive variant is formed by moving the internal subject into [Spec, IP]. If this raising process applied to the verbs in question, the appearance of an external argument would be blocked. This would prevent licensing of the manner component of these verbs, violating Full Interpretation.

In light of this, is it possible to explain the ill-formedness of inchoatives formed from location verbs like *shelve*, as in (53a)? We believe that the solution to this problem is in fact to be found in the study of the means and manner modifier components. At this point, though, we can only suggest what the solution will be. Location verbs are verbs of "putting," suggesting that they share certain essential properties with *put*. They clearly share the basic relational structure; but it is possible that they share a manner, or means, component as well. Like the denominal location verbs, *put* fails to participate in the transitivity alternation; it has no inchoative form. If this is because its manner component requires external

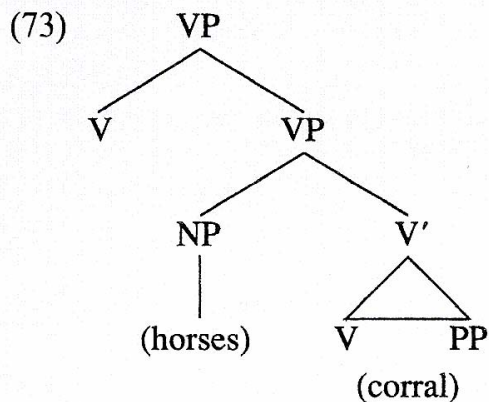
licensing, and if the denominal location verbs share this property, then the problem is solved. The inchoative is impossible for *put*, and for the denominal location verbs as well, because raising the object to [Spec, IP] blocks licensing of the externally oriented manner modifier. By contrast, English *get*, though structurally identical to *put* in 1-syntax, is evidently devoid of all means or manner modification; and, as expected in view of the fact that no licensing is required, the inchoative is possible for *get* (as in (55b)).

If the inchoative blocks licensing of externally oriented manner modifiers, then why is the middle construction possible for denominal location verbs, as in (53c)? With respect to middle formation, these verbs do not differ from ergative verbs. If the middle involves extraction of an object, as is usually assumed, then how is the manner component of the verb of (53c) licensed?

Here again, we can only suggest the answer to this question. The middle is uniformly possible, we contend, for all (single-complement) transitive verbs that have an internal subject, whether or not the inchoative is also possible.¹¹ We suspect that the middle is formed from a transitive structure, rather than from the simple intransitive structure in which the internal subject is immediately dominated by the uppermost VP node. The latter is the structure associated with the inchoative. Thus, the verb of *The screen cleared* is the intransitive depicted in (72), whereas the verb of the middle construction, as in *These horses corral easily*, is the (causative) transitive construction depicted in (73).



If this is true, then the presence of the upper, causative VP projection is relevant to the issue we are addressing. Imagine that the distinction between externally and internally oriented manner components has a structural basis. Suppose that, as a matter of lexical structure, internally oriented manner components are associated with the inner verb, and externally oriented manner components are associated with the upper, causative verb. Licensing of a manner component is nothing more than that: association with a particular verbal element in the LRS represen-



tation. The verbs of (66) cannot appear in the intransitive, inchoative form because their externally oriented manner modifiers are associated with the causative verb. They are *necessarily* transitive—and the (b) sentences of (67)–(69) are accordingly impossible. On the other hand, if the middle is formed from the transitive, that construction will not interfere with the licensing of externally oriented manner modifiers, since their required locus—the causative verb—is present in the transitive LRS representation.

4 Final Remarks and Remaining Questions

The purpose of this paper has been to explore the limits on (verbal) lexical items with respect to their argument structures and, if possible, to give an explanatory account of linguistically relevant limitations on lexical entries. Our intent has been to contribute to the effort to determine what is and what is not a possible lexical argument structure. We have made use of denominal verb formation as a probe into the inner organization of lexical argument structure, concluding that argument structure can be properly viewed as a *syntax* and, accordingly, subject to the laws of syntax, as known generally. In particular, it is subject to the principles determining the grammatical uses of head movement or incorporation (Baker 1988). A full attempt to account for argument structure must, we have argued, assume that the syntactic projection of lexical categories and arguments conforms to the principles of Unambiguous Projection (Kayne 1984) and Full Interpretation (Chomsky 1986b). We suspect, and have intended to show, that this is essentially all that is needed to give a full account of the notion "argument structure." If so, then there are no linguistic mechanisms that are specific to argument structure. For example, there is no process of "thematic role assignment," apart from predication; and there are no "thematic roles," apart from the lexical relations ex-

pressed in unambiguous, fully interpreted projections of the elementary lexical categories.

Clearly, however, this research program has a long way to go before it can be claimed with any surety to have demonstrated that argument structure is in fact a properly constrained syntax defined by elementary, independently established principles and elements. Only a small fraction of the total range of verb types, of English or any other language, has been submitted to analysis along the lines suggested here. This fact is immediately evident, for example, from even the most cursory examination of Levin's excellent annotated corpus of English verbs and argument structures (Levin 1991). Here we have discussed essentially only two verb classes: unergatives and a class whose members are characterized by the appearance of an internal predication and therefore an internal subject (the steadfastly transitive location and locatum verbs, and the alternating deadjectival causative/inchoative verbs).

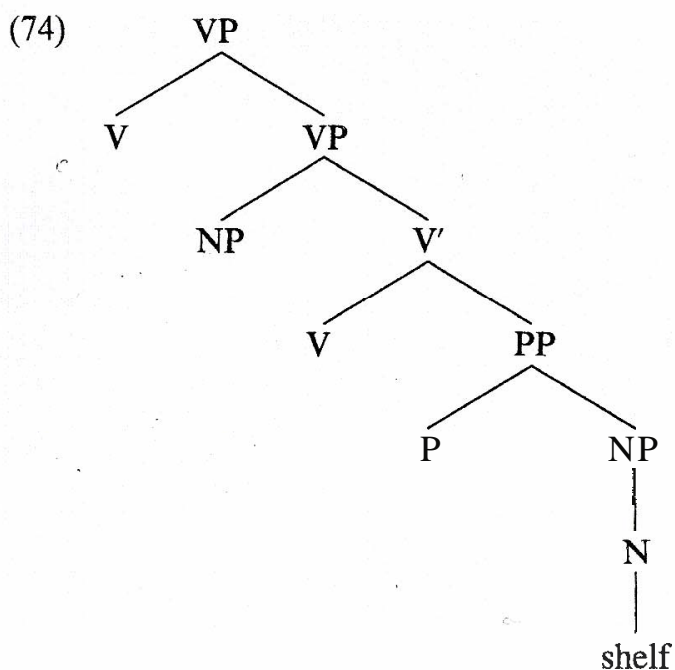
We will not attempt now to extend the range of coverage, leaving that for later stages in our research program. But we will briefly address two of the many questions that have arisen in exploring the proposal set out here, beginning with the issue of what is lexical and what is syntactic, in the traditional sense (i.e., s-syntactic, in the usage temporarily adopted here). In closing, we will briefly summarize our position in relation to the theory of lexical argument structures.

4.1 Lexical versus Syntactic

We have proposed that argument structure is a syntax, but we have also separated it from s-syntax, referring to it as a collection of Lexical Relational Structure (LRS) representations. This is probably an onerous distinction, as many of our colleagues have pointed out in discussions with us, and it is important to determine whether it is anything more than a temporary terminological convenience. Although we suspect that the latter is the case, and although we will "chip away" at the distinction in future work, we must nevertheless assume that there is *something* lexical about the entries for verbs like *shelve*, or any verbal entry, in fact.

What is it that is lexical about the entry corresponding to *shelve*? Clearly, it is a lexical fact that *shelve* exists as a simple transitive verb in English, with a "meaning" embodying the same system of elemental relations as put. And if our analysis of it is correct, it is derived by incorporation of a noun in the manner suggested in preceding sections. This latter circumstance is also a lexical fact, since not all nouns can incorporate in this manner.

In thinking about this, we have taken a conservative view and assumed that this array of facts compels us to suppose that the lexical entry for *shelve* includes at least the full the syntactic structure depicted in (74).



The entry will, of course, be inserted into an s-syntactic structure as a phrasal category, and its insertion will be grammatical if the point of insertion sanctions a verb phrase. The entry itself contains an empty phrasal position (symbolized NP here, but in fact, most likely neutral for category). This identifies a structural position in which an NP (or more accurately, a DP) will be sanctioned at D-Structure, other things being equal.

We believe that the conservative position would have the lexical entry stipulate all of this, plus the special property of *shelve*, shared with a few other location verbs, that its final consonant is voiced in the verbal form. This position is reasonable in one respect, since it assigns idiosyncratic properties to the lexicon, honoring an established and long-standing tradition that the lexicon is the "repository of irregularities." But it is unreasonable in another respect. The structural representations proposed here are identical to those defined in syntax generally, and they are subject to principles of grammar that determine well-formed syntactic structures in general. In short, the conservative position is moderately in conflict with the general thesis of this paper, that argument structure is a syntax of the conventional sort. We cannot resolve this contradiction here, though we expect that its resolution will not be specific to denominal verbs, or any other particular class of verbs, but will rather be part of a general theory of argument structure that takes into account the relational structures

inherent in individual lexical entries. In reality, all verbs are to some extent phrasal idioms, that is, syntactic structures that must be learned as the conventional "names" for various dynamic events. That is our view of the matter, in any event, and it seems to be forced on us by the very framework we are considering. Moreover, it is not without empirical support, at least at the observational level. In many languages a large percentage of verbal lexical items are *overtly* phrasal (e.g., Igbo, Nwachukwu 1987); in others a healthy inventory of "light verb" constructions represents the class of overtly phrasal lexical entries (e.g., Japanese, Grimshaw and Mester 1988; English, Kearns 1988); and in still others (e.g., the Tanoan languages, including Jemez, Tewa, and the Tiwa languages), the verbal lexicon contains an extraordinary number of entries whose morphological make-up is overtly the result of incorporation. To be sure, many languages boast a large inventory of simple monomorphemic verbs. But our guess is that most, probably all, superficially monomorphemic verbs are lexically phrasal, possessing a structure that is syntactic, satisfying the requirements of Unambiguous Projection and Full Interpretation.

The above remarks are concerned with the notion "lexical" as it pertains to the *lexical entries* we assume for verbal lexical items. Our conservative position holds that the lexical entry of an item consists in the syntactic structure that expresses the full system of lexical grammatical relations inherent in the item. Thus, all of (74) is included in the lexical entry for *shelve*. But here, as elsewhere, the syntactic structure itself is determined by *general* syntactic principles that define unambiguous projections of category and argument structure. Whereas a particular entry, on the conservative view, must list the argument structure representation in full, the structure in which the lexical relations (specifier, complement, head, etc.) are expressed is purely syntactic in every sense of the word. This is not a "contradiction" that concerns us very much at this point.

But there is more to the issue than this, of course. We claim that the observed surface form of a verb like *shelve* is due to incorporation, an instance of the head movement variant of Move α . This is a purely syntactic process, constrained by grammatical principles that function generally to define well-formed syntactic structures. But, given our conservative view of lexical entries, it is legitimate to ask whether incorporation — say, in the formation of denominal verbs — is lexical or syntactic.

The notion that syntactic processes might apply in the lexicon is a familiar one (see Keyser and Roeper 1984, 1992), and it is coherent where lexical and syntactic structures are rigidly distinct. But in the system we are examining here, the two domains are not necessarily rigidly distinct,

Argument Structure

even under the conservative view of lexical entries just outlined, which seeks simply to place the lexicon-syntax "boundary" where it belongs by defining the notion "lexical entry."

This is not to say that it is impossible to imagine what it might mean, in our framework, for Move α to "apply in the lexicon." Suppose it means that the process applies within lexical items "prior to lexical insertion." And imagine further that the derivation of a lexical item (i.e., the chain structure defined by incorporation in the lexicon) is invisible in what we have been referring to as s-syntax. It would then be a simple empirical matter to decide whether there are, in this sense, syntactic processes that "apply in the lexicon." But, so far as we can tell, the results are negative, or at least inconclusive, in this regard.

For example, if the structure to which lexical incorporation applies were invisible to s-syntax, in the sense of the preceding paragraph, there would, contrary to fact, be no syntactic distinction between simple transitive verbs like *make (trouble)*, *have (puppies)*, *dance (a jig)* and, say, the ergative verbs, like *break*, *clear*, *thicken*. Any conceivable algorithm for "masking" the derivation and underlying structure of the latter class of verbs renders them effectively indistinguishable from the former. Both would involve just a verb and a single argument; but their syntactic properties are utterly different, as is well known. Simple transitives fail to participate in the middle and inchoative constructions, whereas the "ergatives" do so freely. This difference in syntactic behavior relates, of course, to the difference in structural position (complement versus specifier) occupied by the relevant internal NP argument in the distinct LRS representations assumed for the two classes, a difference that is "visible" in the full derivations of lexical items, but not, presumably, in some "trimmed" version devoid of traces.

Observations of this type will, we believe, lead to the conclusion that it is wrong to insist too firmly upon the distinction implied by our use of such terms as Lexical Relational Structure, an expression we will continue to employ for expository convenience. The "structures" implicated in that usage are simply syntactic structures, expressing such normal syntactic structural relations as "head," "specifier," and "complement." And they are present in the syntactic representations over which normal syntactic processes and principles are defined. The qualification "lexical" refers to the property that the argument structures of verbs are "listed" in the lexicon, perhaps in the manner suggested by the conservative view of lexical entries.

There is a sense in which incorporation of the type we have been considering here is in fact "restricted to the lexicon." It is restricted to the domains defined by lexical items, that is, to LRS representations. But this apparent restriction reflects an accidental circumstance, having to do with the fact that incorporation effecting denominal and deadjectival verb formation involves strictly local movement from lexical head to lexical head. In contrast to movement processes in what we have termed s-syntax, no functional categories are involved in the verb formation processes at issue here, since no functional projections are present at points internal to the domains defined by lexical entries. Thus, there are real differences among movement processes that can, with some justice, be associated with a distinction between lexical and nonlexical phenomena, in some accepted sense. Denominal verb formation is in some sense lexical, whereas the passive, say, is nonlexical ("syntactic" in the traditional sense). But these differences are in reality ones of structural and categorial domain. The two types share the property that they are syntactic and are defined over syntactic structures.

We should mention here that, on the assumption that the passive (or NP-movement in general, perhaps) involves crucial reference to functional categories (e.g., to I and Case), Larson's appealing and conceptually productive analysis of the double object construction (Larson 1988) is incompatible with the view that LRS representations exclude functional projections. Although Larson's analysis does not itself directly obtrude this problem, since he does not necessarily share our assumptions, our own framework simply cannot make use of an "internal passive" to derive the double object construction — NP-movement cannot be motivated, and there can be no "place" for the agent in LRS representations (but see Hale and Keyser 1991:chap. 1, in which the passive analysis is briefly assumed).

Our position is that the double object construction is not an "internal passive" of the sort proposed by Larson. Rather, it involves a nonovert preposition expressing "central coincidence" (Hale 1986), corresponding to the overt *with* in its "possessive" use. This is the same as the nonovert preposition appearing in the LRS representations of locatum verbs like *saddle*, and it contrasts with the *to* of "terminal coincidence" that appears in the overtly prepositional partner in the dative alternation. On this view, *saddle the horse*, *give John a saddle*, and *provide John with a saddle* all have the same LRS representation involving the preposition of central coincidence (see (15), (16), and associated text), whereas *give a saddle to John*

involves the preposition of terminal coincidence. By hypothesis, therefore, the dative alternation involves a lexical parameter: namely, the choice of the central or the terminal preposition at the head of the internal PP predicate (see Hoffman 1991 for a related conception of certain Bantu applied constructions).

4.2 The External Subject Relation

The idea that the passive may not apply, internal to an LRS representation, to introduce an NP argument into the Spec position is perhaps akin to the general fact that the Spec position may not be occupied unless the appearance of an NP there is "motivated" in some manner, whether by predication (as in section 2.3) or by circumstances having to do with Case and agreement, irrelevant in LRS, by hypothesis. But this raises again the question of what permits the appearance of subjects—at D-Structure, at least—with unergative and transitive verbs, and with passives, for that matter.

The matter is not simple, by any means, but it appears that the presence of an NP in [Spec, VP] can be motivated, and therefore required, by factors having to do with the *matrix syntactic environment* in which a lexical item appears, regardless of properties internal to its LRS representation. For example, the causative of an unergative verb is perfectly well formed in many languages that have *overt* causative morphology, as exemplified by the Papago (Tohono O'odham) verbs in (75), in which the matrix causative verb is realized overtly by the suffix *-cud*.

- (75) a. bisck-cud 'cause to sneeze'
 b. 'a'as-cud 'cause to laugh'
 c. wihos-cud 'cause to vomit'
 d. 'i'ihog-cud 'cause to cough'

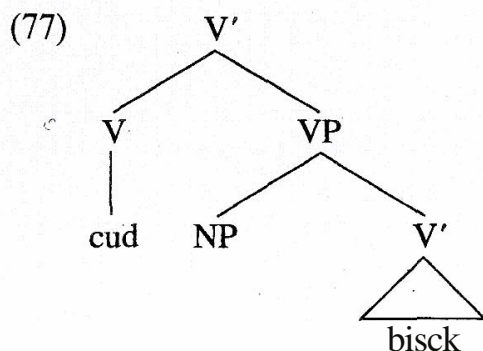
Here, we might suppose, some grammatical property of the suffixal causative verb—for example, its "transitivity," including the ability to assign accusative Case—licenses the NP in the Spec position of the unergative verb. This NP will correspond to the semantic "agent" in the event named by the unergative predicate; that is, it will bear the same semantic relation to the unergative predicate that its s-syntactic subject bears in the intransitive construction. But in the causative, this "agent"—the *causee*, as it is sometimes called—is realized by an NP argument having the properties of a grammatical object in relation to the derived causative verb. The latter, in its general syntactic behavior, is simply a transitive verb. In (76a), for example, the NP (g) 'a'al 'children' is the

grammatical subject of the intransitive verb *bisck* (perfective *bisc*) 'sneeze', requiring third person agreement in the auxiliary (the element appearing in second, or Wackernagel's, position) in accordance with the general principles of subject agreement in the language. In the causative construction (76b), the same NP appears as the grammatical object, requiring object agreement in the verb word; the subject function in this transitive form is assumed by the NP corresponding to the "agent of causation," and it is this argument (represented here by the first person singular pronominal 'a:ñ(i)) that determines subject agreement in the auxiliary.

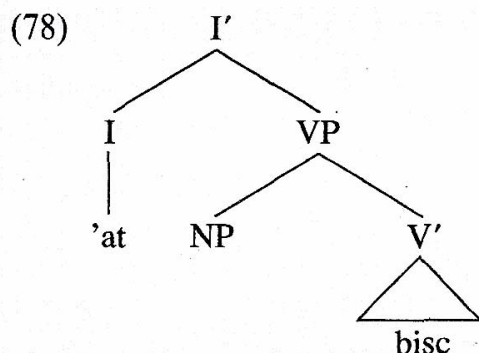
- (76) a. 'A'al 'at *bisc*.
 children 3:PERF *sneeze*:PERF
 'The children sneezed.'
- b. 'A:ñ 'ant g 'a'al *ha-bisck-c*.
 I 1sg:PERF ART children 3PL-*sneeze*-CAUSE:PERF
 'I made the children sneeze.'

In both sentences the nominal expression (*g*) 'a'al 'children' represents the semantic role commonly called "agent" in relation to the verb *bisck* 'sneeze'—that is to say, the children are the sneezers in the events depicted in both (76a) and (76b). In the framework we are examining here, however, the "agent" of an unergative is not, strictly speaking, an argument of the verb. The "agent" enters into no relation in the syntactic representations of the argument structures of lexical items headed by unergative verbs. It is an external argument, related to the unergative verb indirectly through predication, the same being true of the "agent" of transitive verbs as well.

If at some point in the derivation of (76b) the NP (*g*) 'a'al 'child' is in fact in the Spec position of the verb *bisck* 'sneeze', then it must be permitted there by virtue of some feature of its environment—some property that sanctions, in fact forces, an NP to appear there. Presumably, the feature in question is some property of the affixal causative verb -*cud* 'cause', as suggested above. And the derived verb does indeed have the property of transitivity and therefore requires an argument to which it can assign accusative Case (realized overtly in object agreement). We will assume for present purposes that this is the circumstance that forces the appearance of an NP in the Spec position of the embedded unergative verb *bisck* in the Papago causative *bisckcud* 'cause to sneeze'.¹³ The relevant structure is roughly as in (77), abbreviating the derivation of the unergative verb itself.

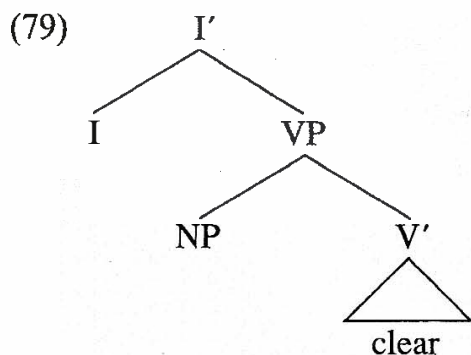


If the NP in (77) is permitted to appear there by virtue of features associated with the matrix causative, what factors are responsible in sanctioning the subject of (76a)? Here again, we assume that it is properties of the local matrix environment that are responsible for the appearance of a grammatical subject—that is, for the effect commonly referred to as the Extended Projection Principle (Chomsky 1982). We will adopt the traditional view that the relevant properties—nominative Case and associated subject agreement—are lodged in the functional category I (termed the "auxiliary" in most of the literature on Papago), as shown in (78).



We are assuming that the D-Structure position of the grammatical subject is [Spec, VP].¹⁴ A subject may appear in that position only if it is, in principle, forced to appear there. The predication requirement forces the appearance of a subject for verbs whose complements are inherently predicational, that is, PP or AP; this is, so to speak, a "VP-internal" motivation. Otherwise, the motivation is "external," in the sense that the appearance of a subject is forced by properties of the matrix—for example, the transitive features of a causative verb, or the Case and agreement features of I, as illustrated above. An internally motivated subject is, in an intuitively clear sense, a "part" of the lexical item with which it is associated, inasmuch as its appearance is determined by properties of the lexical item itself. In short, it enters into grammatical relations defined by the projection of the lexical head.

The appearance of a subject in [Spec, VP] is not a uniform phenomenon. In (78) we must assume that the subject appears in that position as a result of lexical insertion, since it is not forced to appear by virtue of any requirement inherent to the verbal projection itself. On the other hand, in the case of a verb of the type represented by English *clear* (79), the subject is forced by predication internal to the verbal projection, the complement of the head V being an adjective (whose incorporation results in the de-adjectival verb).



At D-Structure these subjects are identical in their structural positions. Where governed by I (as in (78–79)), both raise to [Spec, IP] to satisfy requirements of that projection and, presumably, to realize the relation, traditionally called predication, that holds between [Spec, IP] and the VP (Rothstein 1983), a relation that may or may not be distinct from the very real VP-internal relation, also called predication, that is assumed to hold of [Spec, VP] in relation to the head V and its V' projection.

However, although internally and externally forced subjects (as exemplified by (79) and (78), respectively) are structurally indistinct, they differ in "interpretation," in the manner suggested in earlier discussions. An internally forced subject is the subject of a VP-internal predicate, that is, of the PP or AP complement of a head V. By contrast, externally forced subjects are regularly interpreted as "agents" (or some other thing appropriate to the event depicted in the verbal projection), purely as a product of the construction itself. If this interpretation is by predication, as suggested above, it is purely constructional and is not inherent to the relevant lexical items, which systematically lack internally forced, or "lexical," subjects.

Before concluding this subsection, we should say something more about the fact that English unergatives lack causative forms. If the overt causative morphology of *Papago*, and many hundreds of other languages, has properties (whatever these may be) that force the appearance of a subject in its immediate complement VP, why does the nonovert causative postu-

lated for English *fail* to force that argument to appear—why is *Sneeze the child impossible in English, while its Papago counterpart (G) 'ali *bisckcud* is perfectly well formed? The answer lies in the nature of (certain) nonovert verbal elements. The English nonovert “causative” is fundamentally devoid of properties, apart from the category V itself (and the associated elementary semantics). In particular, it has no properties that could force the appearance of an NP in the Spec position of its complement. To all intents and purposes, the nonovert causative is simply “not there.” To be sure, it could “acquire properties” through incorporation of the overt head of its complement. But this would effectively block lexical insertion, of a subject, into the lower Spec position. The result is the same: the causative of the unergative is ungrammatical.

The notion that the nonovert causative of English is devoid of properties makes sense of another fact of English: namely, the extremely free transitivity alternation found with the ergative verbs of the language. Verbs like *clear*, *thin*, *lengthen* have both transitive and intransitive (inchoative) form ~ . This comes for free under the hypothesis that the nonovert causative verb has no properties of its own (apart from category, of course). It acquires properties through incorporation (giving the transitive variant). Thus, the observed transitivity alternation depends simply on whether head movement applies or not. The alternation is not stipulated for these verbs, since it follows directly from the essential nature of nonovert verbs.

4.3 A Summary of the Framework

The approach we have entertained here is fundamentally one that seeks to determine the extent to which it is possible to understand certain observed limitations on argument structure in terms of the essential nature of preestablished principles and elements.

The relevant constraints on argument structure are basically these: (i) the variety of relations between arguments and the head and its projections is highly restricted, a circumstance that is reflected, for example, in the correspondingly restricted range of semantic roles (thematic roles) recognized in an ample and well-informed linguistic literature; (ii) what might be termed the “depth of embedding” in lexical structures is uniformly modest, generally permitting no more than one complement VP for a given lexical entry, shunning full use of the “recursive” capacity inherent in complementation.

We have argued that the lexical categories (V, N, etc.) project unambiguous syntactic structures. Crucially, Unambiguous Projection prohib-

its *n*-ary branching, where *n* is greater than two, and it prohibits the projection of a phrasal category through more than one intermediate level (e.g., *V* projects at most *V'* and *VP*). This accounts in large measure for constraint (i) by restricting arguments to the complement and Spec positions in LRS representations. These positions correspond to the grammatical "relations" an argument may bear in LRS: specifier of *VP*, complement to *V*, complement to *P*, and so on. And, in this conception of argument structure, there are no lexically determined "roles" beyond these.

Argument structure representations are also subject to Full Interpretation. This is relevant primarily in connection with the Spec position, which can be occupied only if the appearance of an argument there is internally motivated by predication. Since only *AP* and *PP* are predicates in LRS representations, *VP* recursion, which would be possible only if *VP* were a predicate, is excluded. We suggest that this is what accounts for constraint (ii), in part at least.

Notes

Like this volume, this paper is dedicated to Sylvain Bromberger, to whom we are indebted for the many ways in which he has enriched our understanding of linguistic problems. We wish also to acknowledge the helpful comments and criticisms of a number of colleagues, including Mark Baker, Robert Berwick, Maria Bittner, Noam Chomsky, Chris Collins, Abdelkader Fassi Fehri, Jeff Gruber, Morris Halle, Mika Hoffman, Richard Larson, Beth Levin, Alec Marantz, Richard Oehrle, David Pesetsky, Tova Rapoport, Tom Roeper, Susan Rothstein, Carol Tenny, and Ken Wexler. In addition, we are grateful for the comments and criticisms of students and colleagues who were present when various versions of this work were presented in the context of the MIT Lexicon Project and elsewhere. Finally, we wish to acknowledge the support of the MIT Center for Cognitive Science to the MIT Lexicon Project.

1. Notationally, the trace of a category affected by head movement is represented here as *X*-dominating-*t*, where *X* represents the lexical category of the trace *t*.
2. The issue of linguistic level (lexicon, D-Structure) will figure in our discussion only where it is directly relevant. For the most part, we will be talking about structures we assume to be present at the lexical level of linguistic structure.
3. We do not attempt to account here for the morphophonological developments (final voicing in this instance) that characterize certain denominal verbs.
4. For some remarks on English weather verbs, see Hale and Keyser 1991:21–22.
5. It could be argued that these sentences are ill formed because the adjectival secondary predicates have no overt subject. But an overt subject does not seem to be a requirement for secondary predication in general—note, for example, *We*

pick green, We ship dry (i.e., ship our cows dry), We wean young (i.e., take calves from their mothers while they are young).

6. In LRS representations, of course, we are dealing with the universal categories, whatever they turn out to be. Their realization in individual languages as nouns, verbs, and so on, is a parametric matter. Thus, the English possessive verb *have*, for example, is probably a realization of the universal category P, not V. But the Warlpiri verb *mardarni*, which most often "translates" English *have*, is clearly V, not P.

7. In assuming complex VP structures as the basis of denominal location (e.g., *shelve*) and locatum (e.g., *saddle*) verbs, we do not intend to imply that a conflation like *shelve* "means" the same thing as its analytic paraphrase *put on a shelf* (cf., *put the sand on a shelf, shelve the sand*). We maintain simply that they share the same LRS representation (a claim that could also be wrong, to be sure). We will not address here the very real linguistic problem of accounting for the fact that conflations typically do not, in the full sense, mean the same things as the expressions usually put forth as their analytic paraphrases.

8. We use the expressions *s-syntactic* and *s-syntax* for expository convenience to refer to syntax in the sense of D-Structure or S-Structure, that is, syntax in the generally received sense, in contrast to syntax in the lexicon, to which we sometimes refer as *l-syntax*.

9. This is a feature that distinguishes lexical syntactic representations from s-syntax, where causatives in many languages readily take unergative complements (see section 4.2 for discussion). We postpone for later work an analysis of prima facie LRS counterexamples represented by English "comitative" transitives such as *trot the mule, jump the horse, and run the hounds*; see Brousseau and Ritter 1991.

10. It is likely that the requirement of full interpretation also limits the appearance of subjects within the LRS projections of the categories other than V, an issue we will not discuss here (but see Hale and Keyser 1991).

11. The S-Structure representation (43) is simplified in relation to the lexical syntactic representation in various ways—for example, by erasure of the trace defined by head movement, together with the phrasal node projected thereby. We leave open here the important question of whether the material thus deleted is "visible" at D-Structure and S-Structure.

12. The qualification "single-complement" is necessary since, for reasons we do not understand, middles cannot be formed where an overt expression would remain behind in complement position in s-syntax. Thus, **These books put easily on shelves*, beside *These books shelve easily*.

13. The factors that force the appearance of a subject in the complement of overt causative verbs are elusive and cannot be identified exclusively with Case; if Case alone were the factor, then we would expect **with John speak for us, *consider Mary speak well*, and **get Bill leave early* to be grammatical, other things being equal.

14. We assume this simply as a temporary convenience, without argument. We do not intend to imply that the question is settled, by any means. Strong arguments

exist in favor of other alternatives (see especially Bittner 1991, Koopman and Sportiche 1987, Speas 1990, Sportiche 1988).

15. We must assume that the overt derivational ending *-en* appearing on many such verbs is associated with the "lower" (inchoative) verb and not with the "upper" (causative) verb. But see Pesetsky 1990 for detailed discussion of derivational morphology and for observations that might show our assumption to be wrong.

References

- Anderson, M. 1977. NP pre-posing in noun phrases. In *Proceedings of the 8th Annual Meeting of the North Eastern Linguistic Society*, ed. M. J. Stein. GLSA, University of Massachusetts, Amherst.
- Baker, M. 1988. *Incorporation: A theory of grammatical function changing*. Chicago: University of Chicago Press.
- Baker, M., and K. Hale. 1990. Relativized Minimality and pronoun incorporation. *Linguistic Inquiry* 21:289–97.
- Bittner, M. 1991. Case and scope. Ms., Rutgers University.
- Branigan, P. 1992. Subjects and complementizers. Doctoral dissertation, MIT.
- Bresnan, J., and J. Kanerva. 1989. Locative inversion in Chichewa: A case study of factorization in grammar. *Linguistic Inquiry* 20:1–50.
- Brousseau, A. M., and E. Ritter. 1991. A non-unified analysis of agentive verbs. To appear in *Proceedings of the Tenth West Coast Conference on Formal Linguistics*.
- Burzio, L. 1981. Intransitive verbs and Italian auxiliaries. Doctoral dissertation, MIT.
- Carrier-Duncan, J. 1985. Linking of thematic roles in derivational word formation. *Linguistic Inquiry* 16:1–34.
- Chomsky, N. 1970. Remarks on nominalization. In *Readings in English transformational grammar*, ed. R. Jacobs and P. Rosenbaum. Waltham, Mass.: Ginn.
- Chomsky, N. 1981. *Lectures on government and binding*. Dordrecht: Foris.
- Chomsky, N. 1982. *Some concepts and consequences of the theory of government and binding*. Cambridge, Mass.: MIT Press.
- Chomsky, N. 1986a. *Barriers*. Cambridge, Mass.: MIT Press.
- Chomsky, N. 1986b. *Knowledge of language: Its nature, origin, and use*. New York: Praeger.
- Clark, E., and H. Clark. 1979. When nouns surface as verbs. *Language* 55:767–811.
- Condoravdi, C. 1989. The middle: Where semantics and morphology meet. In *MIT working papers in linguistics 11: Papers from the Student Conference in Linguistics*. Department of Linguistics and Philosophy, MIT.

- Grimshaw, J. 1990. *Argument structure*. Cambridge, Mass.: MIT Press.
- Grimshaw, J., and A. Mester. 1988. Light verbs and 0-marking. *Linguistic Inquiry* 19: 205–32.
- Gruber, J. 1965. Studies in lexical relations. Doctoral dissertation, MIT.
- Hale, K. 1986. Notes on world view and semantic categories: Some Warlpiri examples. In *Features and projections*, ed. P. Muysken and H. van Riemsdijk. Dordrecht: Foris.
- Hale, K. 1989. The syntax of lexical word formation. Paper presented at the Amerindian Parasession of the Fourth Annual Pacific Linguistics Conference, University of Oregon, Eugene.
- Hale, K., and S. J. Keyser. 1986. Some transitivity alternations in English. Lexicon Project Working Papers 7, Center for Cognitive Science, MIT.
- Hale, K., and S. J. Keyser. 1987. A view from the middle. Lexicon Project Working Papers 10, Center for Cognitive Science, MIT.
- Hale, K., and S. J. Keyser. 1988. Explaining and constraining the English middle. In *Studies in generative approaches to aspect*, ed. C. Tenny. Lexicon Project Working Papers 24, Center for Cognitive Science, MIT.
- Hale, K., and S. J. Keyser. 1991. On the syntax of argument structure. Lexicon Project Working Papers, Center for Cognitive Science, MIT.
- Hale, K., and S. J. Keyser. 1992. The syntactic character of thematic structure. In *Thematic structure: Its role in grammar*, ed. I. M. Roca. Berlin: Foris.
- Hale, K., and T. R. Rapoport. In progress. On the licensing of subject, manner, and means in the syntactic representation of lexical argument structure. Ms., MIT.
- Higginbotham, J. 1985. On semantics. *Linguistic Inquiry* 16: 547–93.
- Hoffman, M. 1991. The syntax of argument-structure-changing morphology. Doctoral dissertation, MIT.
- Jackendoff, R. 1972. *Semantic interpretation in generative grammar*. Cambridge, Mass.: MIT Press.
- Jaeggli, O. 1984. Passives, middles, and implicit arguments. Ms., MIT.
- Jaeggli, O. 1986. Passive. *Linguistic Inquiry* 17: 587–622.
- Kayne, R. 1984. *Connectedness and binary branching*. Dordrecht: Foris.
- Kearns, K. 1988. Light verbs in English. Ms., MIT.
- Keyser, S. J., and T. Roeper. 1984. On the middle and ergative constructions in English. *Linguistic Inquiry* 15: 381–416.
- Keyser, S. J., and T. Roeper. 1992. Re: The abstract clitic hypothesis. *Linguistic Inquiry* 22: 89–125.
- Kipka, P. 1990. Slavic aspect and its implications. Doctoral dissertation, MIT

- Koopman, H., and D. Sportiche. 1987. Subjects. Ms., UCLA.
- Lakoff, G. 1977. Linguistic gestalts. In *Papers from the Thirteenth Regional Meeting, Chicago Linguistic Society*. Chicago Linguistic Society, University of Chicago.
- Larson, R. 1988. On the double object construction. *Linguistic Inquiry* 19:335–91.
- Levin, B. 1983. On the nature of ergativity. Doctoral dissertation, MIT.
- Levin, B. 1991. English verb classes and alternations: A preliminary investigation. Ms., Northwestern University.
- Levin, B., and T. R. Rapoport. 1988. Lexical subordination. In *Papers from the Twenty-fourth Regional Meeting, Chicago Linguistic Society*. Chicago Linguistic Society, University of Chicago.
- Lombard, L. B. 1985. How not to flip the prowler: Transitive verbs of action and the identity of actions. In *Actions and events*, ed. E. LePore and B. McLaughlin. Oxford: Blackwell.
- Marantz, A. 1984. *On the nature of grammatical relations*. Cambridge, Mass.: MIT Press.
- Mithun, M. 1984. The evolution of noun incorporation. *Language* 60:845–95.
- Nwachukwu, P. A. 1987. The argument structure of Igbo verbs. Lexicon Project Working Papers 18, Center for Cognitive Science, MIT.
- Oosten, J. van 1977. Subjects and agenthood in English. In *Papers from the Thirteenth Regional Meeting, Chicago Linguistic Society*. Chicago Linguistic Society, University of Chicago.
- Perlmutter, D. 1978. Impersonal passives and the unaccusative hypothesis. In *Proceedings of the Berkeley Linguistics Society* 4. Berkeley Linguistics Society, University of California, Berkeley.
- Pesetsky, D. 1990. Experience predicates and universal alignment principles. Ms., MIT.
- Pullum, G. K. 1988. Topic... comment: Citation etiquette beyond Thunderdome. *Natural Language & Linguistic Theory* 6:579–88.
- Rapoport, T. R. 1987. Copular, nominal, and small clauses: A study of Israeli Hebrew. Doctoral dissertation, MIT.
- Rothstein, S. 1983. The syntactic forms of predication. Doctoral dissertation, MIT.
- Speas, M. J. 1990. *Phrase structure in natural language*. Dordrecht: Kluwer.
- Sportiche, D. 1988. A theory of floating quantifiers and its corollaries for constituent structure. *Linguistic Inquiry* 19:425–50.
- Talmy, L. 1985. Lexicalization patterns. In *Language typology and syntactic description*, ed. T. Shopen. Cambridge: Cambridge University Press.

Travis, L. 1984. Parameters and effects of word order variation. Doctoral dissertation, MIT.

Walinska de Hackbeil, H. 1986. The roots of phrase structure. The syntactic basis of English morphology. Doctoral dissertation, University of Washington, Seattle.

Walinska de Hackbeil, H. 1986. Theta-government, thematic government, and extraction asymmetries in zero derivation. Report **CS-R8918** April, Center for Mathematics and Computer Science, Amsterdam.

Williams, E. 1980. Predication. *Linguistic Inquiry* 11:203–38.