This research was supported by THE ISRAEL SCIENCE FOUNDATION – (grant No. 44/05). To appear. The Theta System: At the Interface between Concepts and Syntax. MIT Press.

The Thematic Phase and the Architecture of Grammar
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1. Introduction

This paper directly addresses the controversy around the division of labor between the lexicon and syntax. The last decade has seen a centralization of the operational load in the syntactic component. Prevalent trends in syntactic theory form predicates syntactically by the merger of various heads that compose the event and introduce arguments. The traditional lexicon is reduced to non-computational lists of minimal building blocks (Borer 2005, Marantz 1997, Ramchand 2006, Pylkkänen 2008, among others). The Theta System (Reinhart 2002, this volume), in contrast, assumes that the lexicon is an active component of the grammar, containing information about events and their participants, and allowing the application of valence changing operations. Although Reinhart's work does not explicitly discuss the controversy around the division of labor between these components of grammar, it does provide support for the operational role of the lexicon. Additional evidence in favor of this direction is offered in works such as Horvath and Siloni (2008), Horvath and Siloni (2010), Horvath and Siloni (to appear), Marelj (2004), Meltzer (to appear), Reinhart and Siloni (2005), Siloni (2002, 2008, 2010), among others. This paper examines the background and reasons for the rise of anti-lexicalist views of grammar, and undertakes a comparative assessment of these two distinct approaches to the architecture of grammar.

Section 2 starts with a historical survey of the developments that led linguists to transfer functions previously attributed to the lexical component into the syntax. Section 3 shows that two major empirical difficulties that seemed to favor the transfer, can in fact be handled under an active lexicon approach. We then take stock, assessing the evidence and achievements of each of the two approaches to grammar. We examine how both theories fare with argument realization (section 4.1) and adverb interpretation, which has been taken to provide evidence in favor of the "transfer to syntax" (section 4.2). We conclude that the transfer is unwarranted. Section 4.3 defines what we believe is the ultimate criterion for determining whether or not all valence changing operations can apply postlexically; it then surveys evidence for the application of some such operations prior to emergence of syntactic structure. The Appendix examines the step in the evolution of the theory that preceded the transfer of argument structure information into the syntax, namely, the exclusion of the external role from the lexical information of verbs and its insertion in the syntax. This step, too, we conclude, is unmotivated and problematic.

2. The emergence of syntactic decomposition

 Debates over the division of labor between different components of the model have persisted through the past forty years of the evolution of generative grammar, and have led to significant empirical insights, as well as to the emergence of major diverging theoretical trends (e.g. Generative Semantics in the late ‘60s, Lexicalism,
LFG, in the ‘70s). The bone of contention is whether computation is concentrated in one component (in the syntactic "engine") or divided between two components, syntax and lexicon (independently of whether it is the lexicon proper or some module interacting with the lexicon, as proposed in DiSciullo and Williams 1987, Williams 2007).

Chomsky's (1965) Aspects of the Theory of Syntax integrated the lexicon into the model of grammar as a significant component feeding the syntactic derivation. Thus, from the early ‘60s, the information encoded in the lexicon, together with the phrase structure component, constituted the basis for the formation of D-structures; lexical entries included syntactic category specifications, as well as strict subcategorization, and semantic selectional features determining lexical insertion into phrase markers. Viewing transformations a priori as the only device for capturing regularities, the Generative Semantics trend of the late ‘60s (Lakoff 1970, McCawley 1968) proposed to perform word formation and specify all systematic relations detected among lexical items by using an extremely unconstrained transformational component. It was in the early ‘70s, due to the impact of Chomsky's (1970) groundbreaking study “Remarks on Nominalization”, which advanced the "Lexicalist Hypothesis", that the lexicon itself became the focus of intensive investigation. As a result of research during the '70s and '80s, the lexicon came to be conceived as an active component of the grammar: it was assumed to contain derivational operations, and/or “redundancy rules” for capturing various regularities of word formation and argument structure. These applied autonomously from the syntax and were formally distinct from syntactic operations (Halle 1973, Bresnan 1982, Freidin 1975, Jackendoff 1975, Wasow 1977, Grimshaw 1990). Thus, the view of the lexicon that grew out of Chomsky's (1970) Lexicalist Hypothesis ("lexicalism") played an increasingly important role in the evolution of the theory, far beyond the immediate desirable consequences of lexicalism for limiting the expressive power of transformations.

Controversies regarding the lexicon during these decades involved only issues such as how much of linguistic phenomena should be captured by lexical operations, and exactly what kinds of lexical representations and lexical rules (e.g. word formation rules or redundancy rules) are appropriate to account for regularities regarding words and for the mapping of lexical items to syntactic structure (Jackendoff 1975, Wasow 1977, Williams 1981, DiSciullo and Williams 1987, Jackendoff 1990, Grimshaw 1990, Levin and Rappaport-Hovav 1986, 1992, 1995). Until the late '80s, it was a standard, essentially unchallenged, assumption that beyond just being the storehouse for minimal atomic units (morphemes), i.e., a repository of idiosyncratic information, the lexicon is a component where word formation takes place, and where alternations in the projection of argument taking heads (valence-changes) are accounted for. The items composed and listed in the lexicon – Lexical Items, “words” – were seen as the basic units of input for the syntax. A fundamental tenet of classical lexicalism was the Lexical Integrity Hypothesis (or Atomicity Thesis) stating that lexical items are unanalyzable units once inserted into syntactic structure, and thus drawing a sharp distinction between the lexical item as a domain opaque to syntactic processes on the one hand and all syntactically composed domains on the other (see Lapointe 1980, DiSciullo and Williams 1987, and Williams 2007).

This classic view of the division of labor between the syntax and lexicon has been gradually changing since the late '80s in a direction away from lexicalism. Recent
years witnessed the elimination of the active (operational) role of the lexicon, and the replacement of what used to be word formation, category and valence changing processes in the lexicon by syntactic operations (via the enrichment of functional syntactic structure). Thus a new, "single generative engine" architecture was borne. A further major development that followed this shift has been the extraction of thematic information from lexical entries, i.e., the elimination of theta-grids and argument mapping specifications, in favor of a syntactically decomposed representation of predicates that encodes event structure. These changes turn the lexicon into a non-computational mere storage place, containing only bare roots (and functional morphemes), i.e., minimal building blocks.

This radical change in the conception of the lexicon and the division of labor between it and syntax has been both enabled and actively driven by the convergence of several simultaneous developments that occurred from the mid '80s in the evolution of syntactic theory on the one hand, and semantics on the other.

Let us start with a survey of relevant developments on the syntactic side that rendered syntactic derivations able to take over the function of word formation, and that also made the decomposition of verb meanings in the syntax feasible. We then will turn to further developments and findings that brought to light particular empirical and conceptual shortcomings of the theory at the time, which favored the representation of event structure in the syntax.

Major developments within syntactic theory of the mid '80s that played a role in enabling the shift included (a) the introduction of functional heads and projections into X-bar theory (Chomsky 1986), (b) the appearance of independently motivated syntactic head movements, constrained by structure-preservation (Chomsky 1986, Koopman 1984, Pollock 1989). These developments rendered the syntactic derivation capable of handling word formation and grammatical function changing, via head movement ("incorporation") and A-movements of arguments. They also opened the way for a further step: the syntactic decomposition of previously atomic lexical predicates.

The above aspects of syntactic theory of this period enabled the anti-lexicalist redistribution of labor but by no means motivated it. Thus the next question to consider is: What were the factors that drove the radical shift from an active lexical component towards a non-computational lexicon? The answer to this is split between a number of different, independently evolving trends that coincided roughly over the same period of time (from around the mid '80s to the '90s), and had the effect of jointly driving and reinforcing the shift.

One major strand of research consisted of a reexamination of the notion word and aspects of word formation. Initiated by Halle and Marantz' (1993) and elaborated in Marantz (1997) and much related work, the model of Distributed Morphology (DM) advanced the claim that all word formation takes place post-lexically, and words are constructed by the same operations and in the same component as phrases. Marantz's (1997) main reason for rejecting lexicalism, and his call for the elimination of an operational lexicon was a rather indirect one. It is based on challenging the traditional notion "word" as a unitary, well-defined linguistic entity, namely a domain where sound-meaning connections and idiosyncratic properties coincide. According to
Marantz, there is no reason to assume any special status for words as atomic building blocks (i.e., domains of special sound or meaning); only roots (morphemes) are such atomic units. Therefore, there is no more reason to derive and list words in the lexicon than there is to list phrases. This in turn is taken to justify the conclusion that only roots should be listed in the lexicon, and all derived entities, whether words or phrases, must be constructed in the syntax. In section 4 we resume discussion of this conclusion. It is worth noting here that Marantz advocates depriving the lexicon of both thematic information (transferred to the syntax) and morpho-phonological matrixes (inserted post-syntactically). Our discussion does not concern the latter facet. It may well be that late insertion of phonological material is the correct approach (see Anderson 1992, Marantz 1993, among others), but this does not entail stripping thematic information and operations from the lexicon. It is the latter, independent, issue that our paper addresses.

Apart from DM's calling into question an active lexicon based on the status of "word", additional factors suggesting benefits from the transfer of derivational operations to the syntactic component involved developments within syntax itself. First, studies in the '80s have uncovered a number of cases where a syntactic, rather than lexical, account for grammatical function changing and the corresponding word formation operation turned out to be empirically well-motivated. Most prominent among these was Baker's (1988) work, leading to his "mirror" principle, which argued in favor of the syntactic nature of a variety of derivational word formation processes. In view of the initial empirical success, Baker took the further step of introducing a principle constraining the mapping of thematic roles to syntactic structure, namely the Uniformity of Theta Assignment Hypothesis (UTAH), which required that identical thematic roles be mapped in identical structural (D-structure) configurations. This linking hypothesis and its variants had the far-reaching consequence of systematically forcing more argument structure changing operations out of the lexicon, reanalyzing them as syntactic operations involving head movement. This in turn contributed to the addition of new abstract functional heads to clause structure.

Further impetus for the shift to enriching syntax and eliminating information from the lexicon emerged from two other independent directions. Both of them arose directly from certain inadequacies inherent to syntactic theory as it stood at the time.

One of these involved the realization that the internal structure of the verb phrase as assumed under X-bar theory is too impoverished to be able to handle some major robust empirical findings. Specifically, with the adoption of the VP-internal subject hypothesis in the mid '80s, the VP turned out to be unable to properly accommodate verbs with more than one internal argument. Their properties, regarding hierarchy and linear order, necessitated "more structure" within the VP, as was most prominently noted in relation to the dative construction.

The crucial pattern of data involved the structural hierarchy among the arguments of ditransitives and the linear position of the verb. As indicated by examples of weak crossover (1a,b), anaphor binding (2a,b), and negative polarity item licensing (3a,b), in the case of three-place predicates, the first one of the two internal arguments asymmetrically c-commands the second (see Barss and Lasnik 1986, Larson 1988):

(1) a. I gave every worker, his, paycheck.
b. *I gave its owner every paycheck.

(2) a. I showed Mary to herself.
   b. *I showed herself to Mary.

(3) a. I sent no one anything.
   b. *I sent anyone nothing.

Thus, the traditional VP had no sufficient structural positions to accommodate the hierarchical relation among the three arguments. This shortage of appropriate positions was what gave rise to the influential VP-shell proposal of Larson (1988). The Larsonian shell provided the necessary positions for accommodating the observed structural hierarchy between the internal arguments as shown in (4b), while maintaining the VP internal subject hypothesis. The correct linear order, namely V preceding both internal arguments, was derived by verb movement up to the empty V position of the outer layer of the VP-shell.

(4) a. John gave the book to Mary.
   b. [VP θ1 give [VP θ2 t θ3 ]]

But there was a disturbing assumption involved in this solution: the head of the outer VP-shell was a contentless V node, namely, a base-generated head void of any lexical material (whether overt or null). The postulation of this element was ad hoc and contrary to restrictive theories of phrase structure.

It is clear then why any proposal making available some new contentful head in addition to the lexical verb seemed correct. Such an extra head had the important added benefit of (a) introducing an additional specifier, thus making room for an extra argument, and (b) providing a legitimate target (as required by structure-preservation) for V-raising. Indeed a series of different proposals adding a contentful head to the lexical verb, such as the "little-v" or a Voice head (e.g., Chomsky 1995; Kratzer 1996, respectively), and later heads reflecting event structure (von Stechow 1995, 1996, Pylkkänen 2008, Ramchand 2006) achieved immediate popularity, also owing to this structural side-benefit.

Unrelated to the above developments, there was a further major factor driving the shift from lexicalism to syntactic decomposition of predicates. It was the realization that the treatment of thematic roles and their linking to syntactic positions (mapping) within syntactic theory of the '80s was empirically and conceptually inadequate. Specifically, beyond the well-formedness condition on θ-assignment stated by the Theta Criterion (Chomsky 1981), the semantic substance and cross-linguistic inventory of thematic roles had been left essentially unsettled. θ-roles were mentioned only as non-essential informal labels providing a convenient taxonomy. As observed most prominently by Dowty (1991), the assumed θ-role labels were unable to capture relevant empirical generalizations across θ-roles; they did not give rise to natural linguistic classes. Moreover, the rules specifying mapping (linking) of θ-roles to syntactic positions were in a similarly unsatisfactory state. There were thematic hierarchies proposed to determine the order of argument mapping, but the particular roles making up the hierarchy and their adequate ranking within it were quite controversial. Furthermore, thematic hierarchies seemed ad hoc devices, still unable to capture mapping generalization across θ-roles. Finally, thematic hierarchies also failed empirically, as they could not capture attested mapping alternations of
particular θ-roles, such as the Experiencer (see discussion in section 4). It became widely recognized that existing accounts for argument structure generalizations and the thematic information they made use of were inadequate (Jackendoff 1987, Rappaport and Levin 1988, Dowty 1991).

Given this background on the state of syntactic theory of the '80s and early '90s, let us turn now to some simultaneously occurring developments on the semantic side. In contrast to the meager progress within syntactic theory proper regarding θ-roles, the topic of thematic structure and its relation to event structure were subject to intensive and very fruitful research within lexical semantics. In fact, over the past thirty years, starting with Davidson's (1967) seminal paper on the semantics of events, and with Vendler's (1967) work on aspectual types, a significant body of literature emerged addressing the structure of verb meanings in novel ways. These approaches advanced the hypothesis that the meaning of a verb is a structured representation of the event that it designates. Investigation of the internal structure of complex events in this research program has led to the idea that these events consist of an inner and an outer event (i.e., two subevents): the outer one is associated with causation and agency, while the inner one with telicity and change of state. This was taken to be shown, for instance, by canonical accomplishment verbs such as in John sliced the bread (Tenny and Pustejovsky 2000). The inner event was analyzed as the telic, change of state, event of the bread becoming sliced, and the outer event as the event of John acting agentively, namely doing "whatever is involved in the act of slicing". The outer event was causing the inner one, thus the outer event was associated with causation.

The accumulation of such semantic insights and empirical generalizations regarding events resulted in the decomposition of verb meanings into structured subevents, captured by abstract predicates, such as CAUSE and BECOME (as in the semantics of Dowty 1979, and Parsons 1990). This development originally occurred within semantic representations and, in particular gave rise to rich lexical semantic representations, such as Lexical Conceptual Structure (LCS) (e.g., Jackendoff 1983, 1987, Grimshaw 1990, Pustejovsky 1991, Levin and Rappaport Hovav 1995). Thus, at the beginning the decomposition of verb meanings into abstract predicates capturing event structure had no direct reflection in syntactic structure; they were semantic representations and were fully consistent with lexicalist models.1

However, as the emerging rich literature on event structure, and its apparent role in the mapping to syntax became more widely known to syntacticians, the idea arose of having event structure more directly reflected in syntax. The idea, in its strongest form, was that elements of event structure are explicitly represented in syntactic phrase structure. It is this approach that became known and widely popular within syntax, as syntactic decomposition, or in a broad sense of the term, constructionism. The approach, developed most consistently by researchers such as Borer (1994, 2005), Travis (1994, 2000), Ramchand (2006) eliminated thematic representations from the lexicon, and accounted for the relation of arguments to the event via the position they occupied within the syntactic representation of event structure. The adoption of event structure information into syntax took hold and became a dominant

1 The only exceptions to this were the early generative semanticists (such as Lakoff 1970, McCawley 1968), and possibly Hale and Keyser's (1993) proposed syntactic representations, which involved predicate decomposition, but which was, according to them, part of the lexicon, namely "lexical syntax" (their l-syntactic structures).
trend in syntactic theory with unusual speed and without much critical scrutiny. This seems to be attributable to the specific time and state of syntactic theory at which the idea entered the scene. As outlined in detail in the discussion above, syntactic decomposition of predicates and the resulting phrase structure representation of subeventual structure seemed to immediately remedy (a) major structural problems such as the lack of sufficient room within the VP to properly accommodate the verb's arguments (see discussion of (4) above), and (b) the obvious insufficiency of the treatment of thematic roles and event structure within the '80s model of the syntax and lexicon. This direction also clearly dovetailed with the independently developing anti-lexicalist trend associated with the DM framework and Baker's UTAH. In sum, importing event structure representation into the syntax was both feasible within syntactic theory of the time, and furthermore seemed highly beneficial.

In section 4 we will examine the move of representing event decomposition in syntactic structure and assess its consequences for the theory. Prior to that, however, it is crucial to clarify that we believe that roughly simultaneous recent developments in the theory of syntax and the lexicon in fact resolve the two major problems just mentioned, which favored the move towards such an approach. The next section is devoted to that.

3. Successive V-merger

3.1 The Thematic Phase: Merger and Remerger

We put aside syntactic decomposition for a while and return to evaluating it in section 4. Let us now examine an alternative path of exploration paved by the development of Bare Phrase Structure (Chomsky 1995) and the Theta system (Reinhart, this volume, 2002). As will become clear below, these two independent scientific developments crystallize into an elegant resolution for the above problematic facets of the theory targeted by syntactic decomposition. The stipulations of X-bar theory gone, minimalist bare phrase structure avails itself of (i) multiple specifiers (ii) a novel conception of head movement. We first discuss and discard the relevance of (i) for the issues at hand.

The option of multiple specifiers allows the correct hierarchical accommodation of the verb's arguments within the verbal projection ((1)-(3)). However, it fails to yield the proper position of the verb, as shown in (5)). Under the multiple specifier scenario, English-type languages are erroneously predicted to realize the verb between the two internal arguments, rather than to the left of both.

\[ \text{VP} [\text{SPEC } \theta_1] [\text{SPEC } \theta_2] \text{V} [\text{COMPL } \theta_3] \]

Note that the position of the head V is indeed higher in the structure than its initial merger ("base") position, and outside of the constituent formed by the two internal
arguments (hence higher than the position of either of the latter), as shown, for instance, by the coordination in (6).

(6) Bill will give [a book to John] and [a scarf to Mary].

The multiple specifier option, thus, is of no help here. Bare phrase structure however also freely offers a syntactic mechanism of head movement, which can straightforwardly derive the internal organization of the verbal projection. As observed by Chomsky (2001), given that the syntactic component, by nature, must involve External Merger, Internal Merger – that is, Remeger, movement – should a priori also be possible. Heads merge and consequently should be able to remerge (move). After the first merger of the verb, nothing prevents its copy from remerging to the root, respecting the extension condition (no tampering condition) of Chomsky (1995, 2005). In light of that, we suggest that the external argument unlike the internal ones is merged by V-remerger. This means that in addition to feature checking (valuation), also θ-assignment can trigger movement (remerger). Thus, while the verb assigns its internal roles via its first (external) merger, the external role triggers V-remerger. Arguments themselves, of course, undergo external merger, as on earlier assumptions.

Taking the case of a ditransitive verb, the internal arguments are projected via the verb's first merger (its external merger); subsequently, the external θ-role gets assigned by internal merger (remerger) of V to the root, as schematized in (7) below.

(7)

θ-information, thus, is not divorced from the verbal head in the lexicon. The domain of θ-assignment is the VP, which is formed by V-merger and remerger. We believe this domain constitutes the lower phase, which we label the thematic phase. The thematic phase allows accommodating the verb's arguments in the correct hierarchy as well as locating the verb in the right position. We now turn to mapping.

2 For concreteness, we assume (following Legate (2003) among others) that transitives as well as unaccusatives and passives give rise to a phase, the lower phase, the thematic phase, in our terms. Nothing we say, however, is contingent upon that.

3 Assuming PF-linearization of sister nodes and Spell-out of either the head or the tail of chains (at least), various surface VP realizations emerge. Examining the various options and possible constraints is beyond the scope of this paper. Let us nonetheless illustrate what we have in mind, taking an OV language (German) as an example. The German VP shows constituency effects different from English; as the coordination in (i) shows, the verb can form a constituent with its internal argument (compare with (6)).

(i) Ich habe gehört, dass Bill seiner Frau [ein wertvolles Buch gezeigt] und [eine
3.2 Mapping

Any mapping theory has to deal with the following questions: (a) What determines the order of mapping, including which role will be mapped externally? (b) What underlies the mapping generalizations observed across certain θ-roles and not others? For instance, what is common to Cause and Agent that makes them always external? And what is it about the Experiencer and Instrument that allows them in certain sentences to be external but not in others? If θ-roles are grammatical primitives, it is not at all obvious what the reason could be for Experiencers and Instruments to behave alike. As Dowty (1991) has argued, the θ-role labels as traditionally formulated do not give rise to natural linguistic classes in terms of their syntactic or semantic behavior.

In the Theta system (Reinhart this volume, 2002) θ-roles are conventionalized labels for feature clusters. The feature composition of roles is based on their semantics. Importantly, however, it turns out to allow capturing generalizations across θ-roles regarding mapping among other things. As will become clear below, under the Theta system, θ-roles patterning alike form natural classes. The atomic features underlying the set of θ-roles are: \( c \), which determines whether or not the argument in question is necessarily responsible for causing the denoted event, and \( m \), which determines whether or not the mental state of the argument in question is relevant to the denoted event. Each of these features can be valued for [+] or [−], or left unvalued. Thus, consider the following roles (for a more complete discussion, see Reinhart, this volume):

(8) a. The **Agent** role is \([+c+m]\), as it brings about the relevant event or change and must be animate (its mental state is relevant).
    b. The **Cause** is \([+c]\), as it brings about the relevant event and is unspecified with regard to mental state, and can therefore be realized either by an animate argument or by an inanimate.
    c. The **Theme** role is \([-c–m]\), as it does not trigger the event in question nor is its mental state relevant to the event.4
    d. The **Goal** is \([-c]\) as it does not bring about the relevant event, and is unspecified regarding mental state.
    e. The **Experiencer** role is \([-c+m]\) as it does not cause the relevant event, but its mental state is relevant to the event.
    f. The **Instrument** role is \([+c–m]\) as it brings about the relevant event and its mental state is irrelevant.

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I have heard that Bill his-DAT wife a valuable book shown and a schöne Schallplatte geschenkt hat. nice record given (as gift) has

This is straightforward under the thematic phase, if in German, the tail of the V-chain is pronounced and spelled-out at the right edge of the VP.

4 At the semantics, an argument bearing a \([+c]\) cluster, which is unspecified with regard to \( m \), can be interpreted either as an Agent (*Dan* in (i)) or as a non-Agent (say, an Instrument, *this key* in (i)) (see Marelj 2004). The mental state of an argument specified \(-m\), say \([-c–m]\), *the door* in (i), remains irrelevant at all stages of the derivation, including the semantics.

(i) Dan /This key opened the door.
Note that the Cause role [+c], unlike the Agent, can be assigned to both animate and inanimate entities, as the role is unvalued with regard to the feature m. It can thus be interpreted in a given sentence either as a causer with volition, whose mental state is therefore relevant ([+c+m]) (e.g., Sara opened the door) or as a causer whose mental state is irrelevant ([+c–m] (e.g., A gust of wind opened the door), like the Instrument. If so, then the question arises as to what distinguishes between the Instrument and the [+c–m] interpretation of the Cause. In the theta system, the difference between the two is that the Instrument, unlike the Cause, never acts alone, but in association with an Agent. This can be captured by the following generalization: A cluster with the interpretation [+c–m] is an instrument iff an Agent ([+c+m]) role is also realized in the derivation or is contextually inferred (see Reinhart 2002, this volume, Siloni 2002).

Importantly, the feature composition of θ-roles gives rise to natural classes of roles with regard to mapping. The Cause and Agent, which are mapped externally, belong to the class of roles with positively valued features only (they are [+ ] roles); this correlation underlies the mapping instruction (9a). Theme and Goal, which are internal roles, are negatively valued ([– ] roles), which is captured by (9b). Experiencer and Instrument have in common their non-homogeneous feature composition: they both involve a [– ] and a [+ ] feature. As mentioned above, they are external in certain sentences but not in others. More precisely, they are external when the sentence does not involve a [+ ] role (Agent or Cause), as is illustrated in (10b) with an Instrument. In other words, they turn out to be external arguments in the absence of an external role by definition (9a)).

(9) a. The class of [+ ] clusters is mapped externally.
   b. The class of [– ] clusters is mapped internally.

(10) a. Sara can peel the apple with a knife.
   b. The knife can peel the apple.
   c. Sara can peel the apple.

Note that (10b) indeed involves an Instrument (and not a Cause) as an Agent is necessarily implicated. This is also shown by the fact that the subject of peel cannot be a natural force (*The heat peeled the apple), as natural forces are not liable to serve and instruments. Since the Instrument is the subject in (10b), it must be part of the argument structure of peel (and not an adjunct, as in other cases, e.g., John painted the wall with a brush vs. *The brush painted the wall). It is known that verbs whose θ-grid involves an Agent as well as an Instrument, can realize both, as in (10a), or either one of the two, as in (10b-c). In case the Agent is projected, it is mapped externally because it is a [+ ] role. In case the Agent is not realized, the Instrument is mapped externally (10b) because it is a mixed role, which is external in the absence of a [+ ] role (The same point can also be made regarding the Experiencer, as the reader can see on the basis of examples (21) in section 4.1.)

Technically, the mapping instructions are captured in the Theta system by marking rules that assign to [+ ] roles the merging index 1, which determines mapping as external argument and to [– ] roles the merging index 2, which indicates internal mapping. Mixed clusters are not assigned any index; they are external in the absence of an external role (a role indexed 1). In the theta system, external mapping is preferred (probably on

5 But see discussion of Theme-ungeregent verbs at the end of this section (3.2).
grounds of economy); it follows that unary concepts are not subject to the marking rules, and automatically map externally. This is the reason why unergative verbs map externally. Intransitive verbs whose subject is internal (unaccusatives) are derived from their respective transitive alternates in the lexicon; their subject role retains the merging index that it is assigned in the input. Their internal mapping thus is the result of their derivational "history", as extensively discussed in Reinhart (this volume).

The exemption of unary (underived) verbs from the marking rules makes a strong prediction. Underived one-place predicates are predicted to map their argument externally irrespective of its content (feature composition). Indeed, a set of underived intransitives, illustrated in (11) with Hebrew examples, map their role externally, although it is neither agentive (see Levin and Rappaport-Hovav 1995, 2000) nor is its mental state relevant for the denoted event. In other words, the feature composition of their role is reasonably \[-c\_m\] (Theme). These verbs have been consequently labeled Theme-unergatives by Reinhart (2002) and subsequent work. Theme-unergatives have been reported to fail unaccusativity diagnostics in a variety of languages (see Levin and Rappaport-Hovav 2000). Indeed, in Hebrew, Theme-unergatives, unlike unaccusatives (13) license neither a strict VS order (12a-b) nor possessive datives (expressing a loose notion of possession) (12c-d), which are both diagnostics of internality (see also Reinhart, this volume: examples (31b-c)). Theme-unergative verbs pose a challenge to any theory of argument realization as they map the Theme, typically an internal role, externally. Under the Theta system, their existence is expected.

(11) a. Štēy mexoniyot bahaku.
   two cars shined
b. Štēy mexoniyot nacecu.
   two cars shined glimmered

(12) a. *Bahaku štēy mexoniyot.
   shined two car
b. *Nacecu štēy mexoniyot.
   glimmered two car
c. *Ha-mexonit bahaka le-Dina.
   the car shined to-Dina
d. *Ha-mexonit naceca le-Dina.
   the car glimmered to-Dina

(13) a. Naflu štēy tmunot.
   fell two pictures
b. Hitnadnedu šney tranim.

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6 Licensing a VS order is argued by Shlonsky (1997) to be a test of internality. This is true modulo two caveats, as observed by Siloni (2010). First, [V S] order is never allowed with proper names and personal pronouns. Second, an intervention between V and S can in certain cases license "inversion" also with unergatives. Modification by possessive datives is argued by Borer and Grodzinsky (1986) to diagnose internal arguments. As observed by Siloni (2010), this is so provided that the subject is an alienable noun and the possessive dative a lexical noun phrase, not a personal pronoun. Inalienable subjects license possessive datives with unergatives, too. Personal pronouns can be ethical datives, which are also possible with unergatives. Finally, the possessee can be neither a proper name nor a kinship noun. While these observations await an account, they nonetheless allow identifying internal argument subjects.
swung two masts

c. Ha-tnunot naflu le-Dina
the-pictures fell to-Dina
d. Ha-kise hitnadned le-Dina.
the-chair swung to-Dina

Finally, it is important to mention that the feature composition of 0-roles allows capturing additional generalizations, beyond those regarding mapping. Thus, for instance, it is shown in Horvath and Siloni (to appear) that the set of verbs that can serve as input to causativization (resulting in an Agentive verb) in Hungarian constitutes a natural class under the theta system, namely, the class equipped with a [+\_\_\_\_\_\_\_\_] role. Crucially, mapping externally is insufficient to qualify as input; it is the presence of a positively valued role that makes a verb eligible input for the operation.

3.3 Back to the thematic phase

As is clear from the previous section, there are in effect three types of arguments as far as mapping is concerned: (i) those that are mapped externally in any context ([+\_\_\_\_\_\_\_\_] roles: Agent, Cause) (ii) those that are external if possible (mixed roles: Instrument, Experiencer, and roles of unary entries) (iii) those that are internal in any context ([-\_\_\_\_\_\_\_\_] roles: Theme, Goal…). Two additional observations are in order. First, no role is a priori obligatory (independently of the verb). Second, while the external role is exclusive (natural language allows only one external role per predicate), the others are not.

The thematic phase straightforwardly allows a structural definition for each set of arguments (roles). Recall first that we suggested in section 3.1 that internal roles (indexed 2) are mapped via the first merger (external merger) of V, while the external role (indexed 1) is mapped via remerger (internal merger) of V to the root. More precisely, since the external role is exclusive, it must be defined as the last role assigned by remerger of V; hence, the exclusiveness What about mixed clusters (unmarked roles)? We know that unlike internal roles (roles indexed 2), a mixed role is external if the verb does not include a role indexed 1 (a [+\_\_\_\_\_\_\_\_] role). It follows that mixed roles must be assigned differently than internal roles. Assume a mixed role is uniformly assigned via remerger of V following the first merger of V (which introduces the internal arguments). If so, then in the absence of a role indexed 1, the mixed role is automatically the last argument merged by V-remerger, and therefore qualifies as external. In case a role indexed 1 is present, the mixed role is not the last argument merged by the remerger of V and therefore does not count as external.

(14) summarizes the structural definitions of the external versus internal arguments. Any other argument is neither internal nor external; it is mapped by remerger of V and qualifies as external in the absence of a [+\_\_\_\_\_\_\_\_] role, as just explained.

(14) a. The last specifier merged by V-remerger is the external argument.
   b. Any argument merged by the first merger of V is an internal argument.

As any argument merged by the first merger of the verb is an internal argument, it follows that [-\_\_\_\_\_\_\_\_] roles (indexed 2) can cooccur. In case, two arguments are marked for internality (receive index 2), we expect optionality in the merging order. A priori,
either can be merged first (in the complement position), unless independent considerations block one order (e.g., case). (15) illustrates this optionality in Hebrew; (16) schematizes the corresponding trees. Unlike the internal arguments, the external one is merged by remerger of V.

(15) a. Dan natan sefer le-Dina.
   Dan gave book to-Dina
b. Dan natan le-Dina sefer.
   Dan gave to-Dina book

(16) a.

Further, the structural distinction between intransitive unaccusatives and unergatives follow from our definition of externality versus internality (14). Specifically, as unergatives map externally, they must merge their argument upon remerger of V because an external argument, by definition, cannot be merged by the first merger of V. Thus, on the thematic phase approach, being unergative means undergoing external merger vacuously, given that this merger cannot involve an argument. The ensuing structural definition of unergative verbs in given in (17).

(17) Unergative verbs are intransitives whose external merger is vacuous (fails to include an argument).7

The structural distinction between these two types of intransitive verbs is schematized in (18a-b) below.8

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7 It is well-known that only unergative verbs allow the so-called argumental cognate object. More precisely, languages either (i) allow cognate objects only with unergatives (English, French) or (ii) exhibit two types of cognate objects: argumental – only with unergatives – and adverbial (possible with transitives, passives and unaccusatives, e.g., in Hebrew, see Pereltsvaig 2002 for the distinctions between the two). This peculiarity of unergatives may be an additional reflection of their inert external merger: it is either vacuous or involves a cognate object, which is to some extent "internal" to the verb.

8 Our definitions also capture the distinction between two-place unaccusatives, which map both arguments by the first merger of V, versus other two-place verbs, which merge one argument upon the
Structurally, only the first argument merged via external V-merger – that is, the argument merged in the complement position is c-commanded by all copies of the verb. The external argument is c-commanded by no copy of the verb. Intermediately merged arguments (whether by V merger or V-remerger) occupy the midfield and are c-commanded by some but not all copies of the verb.

These structural distinctions offer an insight into the varied extraction data that these three types of arguments show. It is well-known that extraction from the verb's complement is unproblematic (19a), while extraction from its external argument is disallowed (19b). Under the thematic phase, extraction from a position c-commanded by all copies of the verb is possible, while extraction form a position not c-commanded by the verb is disallowed.

(19)  a. Who did you tease friends of?
     b. *Who did friends of tease you?

However, one finds more variable judgments, and intermediate degrees of acceptability, when testing whether extraction is possible from diverse arguments occupying the intermediate specifier positions within the thematic phase (as in (16)). Thus, for instance, speakers we consulted tend to detect a mild contrast between (20a,c) and (20b,d), favoring the former over the latter versions:

(20)  a. Who did John send a friend of Mary pictures of?
     b. ?Who did John send pictures of to a friend of Mary?
     c. Which book did you show Bill reviews of?
     d. ?Which book did you show reviews of to Bill?

first merger and the other upon remerger of V. For reasons of space we do not elaborate on that any further here, nor do we examine other interesting consequences of our approach with regard to various verbs classes and their mapping.

9 For evidence that what is violated in cases like (19b) is indeed a prohibition on extraction from an external argument, rather than from a subject in Spec, TP position, see Chomsky 2008.
This difference in acceptability level could follow directly from the structural distinction between the two pairs, if extraction from positions c-commanded by some, but not all, copies of the verb is more difficult than extraction from the complement position, which is c-commanded by all copies. Thus, in (20b,d) extraction takes place from an intermediate specifier position and hence is worse than extraction in (20a, c), which is from the complement (first merged argument) position.\(^{10}\)

In the next section we resume discussion of syntactic decomposition, evaluating its qualities in comparison with those of the thematic phase couched in terms of the theta system.

4. Back to syntactic decomposition: Taking stock

Let us then assess the importation of event decomposition into the syntax, comparing it with the alternative we proposed in section 3.

4.1 Argument realization

In rough lines, syntactic decomposition approaches define arguments (or their role) via the syntactic position they are merged in, as discussed in section 2. No need for mapping (linking) rules. Syntactic structure directly determines the role that the argument plays in the event, as syntactic structure is determined by event decomposition. Approaches of the sort fare nicely with salient generalizations regarding argument hierarchical structure. Thus, for instance, the causer is external as it is merged in the cause subevent, which is higher than other subevents. The Theme is (mostly) internal as it is part of a lower subevent (e.g., Process in Ramchand's (2006) terms).

Syntactic decomposition can also account for the alternating realization of the Experiencer illustrated in (21). The reading of (21a) relevant for the issue at hand is the one where the doctor causes Sara to worry, but is not necessarily the Subject Matter of her worries (the Subject Matter reading is briefly discussed below (examples (26)-(27)).\(^{11}\)

\(^{10}\) A possible alternative account that might come to mind at this point is that the (20a,c) versions are judged superior due to a preference for extraction from clause final phrases, possibly due to phonological factors (such as the phrase bearing nuclear stress). Further data however indicates that the latter idea is not on the right track, and provides additional support for our structure-based hypothesis stated in terms of the thematic phase. Consider the following contrasts, noted in Johnson (1992: 269 (24c)).

(i) ??Who did this book worry a friend of?
(ii) Who did you visit a friend of?

Extraction in (i) is from a clause final phrase, just like in (20a-c) above, yet its acceptability is degraded compared to (ii). On our assumptions about argument mapping couched in the Theta system, the contrast follows. The Experiencer argument of worry is a mixed (non-homogeneous) cluster, while the other argument in (i) (this book) is a [–] one, which always maps internally (see (9)). Accordingly, the latter gets merged first, and the Experiencer argument merges after it, thus occupying a specifier position. Extraction from the Experiencer argument (a friend of who) in (i) is then correctly predicted to be degraded relative to extraction from a complement (ii) (for more on the derivation of (i), see Reinhart this volume).

\(^{11}\) These two readings were first distinguished by Pesetsky (1995). We first discuss the alternation between \(V\{\text{Cause}\} [\text{Experiencer}]\) and \(V\{\text{Experiencer}\} ([\text{Subject Matter}]\) and then the more challenging
(21) a. The doctor worried Sara.
    b. Sara worried (about her health).

If the syntactic hierarchy of subevents locates the subevent inserting the Experiencer argument lower than the causing subevent, but higher than other subevents, then the Experiencer is expected to be the hierarchically highest argument in the absence of the causing subevent, thus qualifying as the external argument in (21b).

But syntactic decomposition is a hierarchy with no derivational "history" that could affect argument realization. Therefore, it suffers from the same problems mapping hierarchies encounter. It cannot deal with alternating realizations of the same role that do not result from the absence of a role higher in the hierarchy, in one of the realizations. In contrast, under the theta system and the thematic phase, the lexical "history" of the entry can affect mapping.

First under syntactic decomposition, the distinct mapping of unaccusatives versus Theme-unergatives is completely unexpected. One could suggest that this mapping divergence follows from some aspecual difference in the type of eventuality that the two types of verbs denote. However, this cannot be the reason. While many unaccusative verbs are eventive, some are activity verbs (as extensively discussed in Reinhart, this volume), on a par with Theme-unergatives. While it may be true that intransitives denoting a telic eventuality (an achievement) are always unaccusatives, the class of unaccusatives cannot be defined on that basis. Relying on the distinct temporal entailment of telic and atelic predicates, Reinhart (this volume) shows that alongside telic unaccusatives, there are also unaccusative verbs denoting an atelic eventuality (an activity).

It is well known that the conjunction of telic eventualities have a temporal entailment that the conjunction of atelic ones does not share (Kamp 1979, Partee 1984). While the former entails that the eventualities are temporally ordered, such an entailment does not hold for the latter. On that basis, Reinhart shows that the class of unaccusatives involves both types of eventualities. This is illustrated below with Hebrew examples. While reversal of the order of verbs in the conjunction in (22) entails the reverse temporal order of eventualities, in the conjunction in (23), no temporal entailment holds. This is so because the former are telic verbs while the latter are activity verbs, which denote an atelic eventuality. Both types of verbs are unaccusative; they pass internality diagnostics, as illustrated by (14) (section 3.2) and (24) below. Thus, the unaccusatives in (23) behave aspecually on a par with Theme-unergatives (25).

(22) a. Hu nafal ve-nišbar.
    he fell and-broke
    b. Hu nišbar ve-nafal.
    he broke and-fell

(23) a. Hu histovev ve-hitnadned.

one: V[Subject Matter] [Experiencer] and V[Experiencer] ([Subject Matter]) (see discussion of (26)-(27)).
he spun and swung
b. Hu hitnadned ve-histovev.
  he swung and spun

(24) a. Nišbar ha-kad.
  broke the-jar
b. Ha-kad nišbar le-Dina.
  the-jar broke to-Dina
c. Histovevu šney sevivonim.
  spun two whipping tops
d. He-kise histovev le-Dina.
  the-chair spun to-Dina

  the-car shined and glimmered
b. Ha-mexonit naceca ve-bahaka.
  the-car glimmered and shined

The diverging mapping exhibited by unaccusatives versus Theme-unergatives is a serious challenge for syntactic decomposition. Under the theta system, it follows from the fact that Theme-unergatives are underived unary entries which are therefore not subject to marking (indexation). Unaccusatives, in contrast, retain the merging index assigned to their argument in the transitive alternate from which they are derived in the lexicon (for extensive discussion see Reinhart, this volume: sections 3-4).

An additional difficulty to syntactic decomposition is raised by the Subject Matter reading available for sentences involving an object-Experiencer verb such as (26a) below. Consider the minimal pair in (26).

(26) a. His remark puzzle Sara.
    b. Sara puzzles (over his remark).

The verb puzzle appears in both examples of (26) with the same arguments, Experiencer and Subject Matter. Nonetheless, argument realization is different. Under the theta system and the thematic phase, the difference boils down to the availability of accusative case in (26a) (assigned to Sara) versus its unavailability in (26b). This in turn follows from the distinct lexical "history" of the two entries: while the verbal entry in (26b) is derived in the lexicon by a valence reducing operation, which has the side-effect of reducing accusative case, the verbal entry in (26a) is not subject to such an operation (for extensive discussion, see Reinhart, this volume: section 5). A glance at the Hebrew examples reveals that indeed these two verbal instances bear a different morphological form and must therefore be different instantiations of the same verbal concept. Importantly, the morphological form of the verb in (27b) is the one typical of outputs of valence reducing operations. Under syntactic decomposition it is not at all obvious what could derive the difference between (26a) and (26b).\textsuperscript{12}

\textsuperscript{12} Reinhart (this volume) shows that The Subject Matter (his remark) in (26a) is an internal argument (section 5.4-5.5) just like in (26b) (as briefly mentioned in note 10 above), and that the Experiencer in (26b) is the external argument (section 5.2). Given the definition of externality offered by the thematic phase, the Experiencer in (26a) is also an external argument (as expected based on its feature
(27) a. Ha-he'ara Šel-o mafli'ā et Sara.
    the-remark of-him puzzles/amazes ACC Sara
b. Sara mitpalet (al ha-he'arot šel-o).
    Sara puzzles/is amazed (about the-remark of-him)

Thus, data from the realm of argument realization do not favor syntactic decomposition. It is however widely held that certain ambiguities regarding adverb interpretation provide strong support in favor of the adoption of event decomposition into syntactic structure. The next section examines this evidence.

4.2 No support from adverb interpretations

The interpretation of certain adverbs is argued to provide strong support in favor of syntactic decomposition (a claim originating in the generative semantics literature of the '60s). Specifically, the different interpretations available for adverbs such as again and almost with certain lexical predicates have been commonly cited as direct evidence for the structural decomposition of individual predicates into multiple events, each represented by a distinct syntactic head (most prominently, in von Stechow's (1995) analysis of German wieder 'again'). Given the central role attributed to the adverb interpretation evidence in establishing the syntactic nature of decomposed event structure, it is important to subject these phenomena to some closer scrutiny in order to assess their validity and potential relevance.

The interpretations of again (see Dowty (1979)) and its counterparts in other languages are commonly used in current literature as important empirical support for syntactic decomposition. The argument is based on the so-called repetitive versus restitutive interpretations of the adverb again, and their syntactic analyses (e.g. von Stechow (1995, 1996); Beck (2005); Pylkkänen (2008)).

It is noted that a simple transitive verb such as the achievement verb open in (28) manifests the following two interpretations for again:

(28)  Bill opened the door again.
    i. Bill did it again – Presupposes: he had done it before. (repetitive)
    ii. The door is in an open state again – Presupposes: it had been open before. (restitutive)

The claim utilized in constructionist approaches is that these different readings are due to a structural ambiguity that results from the different structural positions that again (possessing a single constant meaning) occupies in the decomposed syntactic structure. In (28), syntactic decomposition would mean that we have an outer event of "Bill causing a process of the door opening", and an embedded result state of "the door being open". The attachment of the adverb again to the constituent denoting the causing (outer) event would result in the repetitive reading; its attachment to the embedded (inner) constituent denoting the result state (see Tenny 2000) would derive the restitutive reading.

composition): it is the argument merged last by V-remerger; nonetheless, there is no hindrance for it to check accusative case.
Based on the same rationale, the interpretation of the adverb *almost* is sometimes mentioned as evidence for decomposition, as first suggested by generative semanticists (McCawley 1972, and discussed more recently by Rapp and von Stechow 1999). Like *again*, *almost* seems to be able to modify the Cause meaning component of *open* as in (29i) or the Become/Result component as in (29ii).

(29)  
John almost opened the door.  
   i. John did something that came close to opening the door (e.g., he managed to turn the key in the lock, but failed to open the door).  
   ii. John did something that resulted in a very narrow slit between the door and frame head, but the door still wouldn't open

Kempson (1977) and Dowty (1979) question the claim that *almost* represents a case of ambiguity, on the basis of ellipsis constructions. Let us reproduce their line of reasoning. Recall first that an elided sentence must be structurally parallel to its antecedent sentence (Sag 1976, Williams 1977, Fox 1995, 2000). For example, the sentence in (30a) is structurally ambiguous: either the PP *with a stick* is dominated by the embedded predicate *walk* (as it modifies it), or it is outside the embedded constituent, attached to the matrix predicate (as it modifies the causing eventuality *make*). In the ellipsis construction (30b), this structural ambiguity is preserved, but crucially both the antecedent and elided sentences must involve the same interpretation (both matrix or both embedded construal for the PP).

(30)  
a. Max made the patient walk with a stick.  
b. Max made the patient walk with a stick and so did Felix.

Ellipsis constructions involving the above readings of *almost* do not exhibit the same parallelism requirement between antecedent and elided sentences. This casts serious doubt on the claim that these readings constitute a case of structural ambiguity. (31) is felicitous under the scenario in (i) although the scenario entails modification of the Cause event in the antecedent sentence and of the open state in the elided sentence.

(31)  
John almost opened the door and so did Bill.  
i. Both John and Bill were trying to open a door. John managed to insert the key in the lock, but was unable to turn it; the door did not move. Bill managed to turn the key in the lock on his door, creating a narrow slit between the door and the frame head but the door still would not open.

This strongly suggests that the interpretation of *almost* involves underspecification, not genuine structural ambiguity. Indeed, already McCawley (1972) has noted that *almost* can be associated with yet another interpretation. (32) describes an additional scenario in which (29) is felicitous (*kill* was the verb McCawley used in his example). The availability of scenarios of this type led McCawley to suggest that in addition to Cause and Become, such verbs also include a Do meaning component, which is the one modified in scenarios such as (32).

(32)  
John almost did something in order to open the door (e.g., he intended to open the door but at the last moment decided not to do it).
But, in fact, the interpretation of *almost* allows plenty of additional "intermediate" readings that do not clearly fall into one of the above interpretations, as shown by Sevi (1998) regarding *kill*. Thus, for instance, consider the additional interpretation suggested for (29) in (33). It is not at all obvious whether (33) involves modification of *Cause* or *Become*, as the door was affected by John's action but the effect did not involve any change in its positioning.

(33) John dismantled the higher lock, but the lower lock was still locked and the door did not open.

Sevi (1998) convincingly argues that the interpretations of *almost* represent a case of vagueness, and develops a semantic analysis (capturing also the semantics of *barely*) that derives the different available meanings from the adverb's "contextual dependence", namely its ability to choose various appropriate comparison domains (i.e., different aspects of evaluation circumstances, such as world/standard/time of evaluation).

Similarly, the picture emerging for the interpretations of *again* is in fact far from straightforward. Importantly, it turns out on closer examination that it is qualitatively different from cases of uncontroversial structural ambiguity induced by modification of two distinct syntactic domains.

First it must be noted that the accessibility of the repetitive versus restitutive readings differs sharply and systematically: across the board, the restitutive reading of *again* is much more difficult for speakers to access, and often can be induced only by providing an explicit explanation of the relevant state of affairs. On a strict structural ambiguity account for the two readings such an asymmetry would be quite unexpected.

An even more serious kind of problem for the syntactic decomposition approach is observed by Chierchia and McConnell-Ginet (1990:359). They note that the expected repetitive versus restitutive ambiguity is in fact not exhibited uniformly by the set of verbs that would be expected to show it, if it were structural. This is shown by the comparison of the behavior of the verb *clean* (34) with the widely used example (28) cited above. The interpretation of *again* in (34) is unambiguous: only the repetitive reading is available.

(34) John cleaned the jacket again.
    i. John did it again.       (repetitive)

The restitutive reading "the jacket is clean again" is unavailable with *clean* (34), in contrast to the ambiguity observed with *open* (28). This is brought out most clearly given the following scenario for (34):

(35) John bought a new jacket in a clean state which had never been cleaned before; when it got dirty with use, he cleaned it.

Under these circumstances, it is impossible to use (34). Further, it is observed that the periphrastic (36), unlike (34), indeed exhibits the repetitive versus restitutive
ambiguity, as expected; this is so because *again* can be structurally associated with either the matrix or the embedded predicate.

(36) John caused the jacket to be clean again.

So the question for proponents of syntactically decomposed event structure is why a verb such as *clean* would fail to exhibit the same structural ambiguity. Importantly, *clean* is an accomplishment verb that can denote a telic eventuality, which involves a CAUSE and a RESULT STATE. This is indicated by well-established aspectual diagnostics of the lexical semantics literature, such as the felicitous occurrence of the verb with adverbials denoting finite temporal duration of an event (expressions meaning 'in X amount of time'), as shown for both *open* and *clean* in (37a,b).

(37) a. John cleaned the jacket *in an hour*.
   b. John opened the door *in five minutes*.

Importantly, the verb *clean* in (38a), on a par with *open* (39), gives rise to an entailment regarding the result state (38b), reinforcing this telicity diagnostic.

(38) a. John cleaned the jacket in an hour.
   b. After that the jacket was clean.

(39) a. John opened the door in five minutes.
   b. After that the door was open.

Under syntactic decomposition, the complex event structure of these verbs would be represented by (at least) two distinct syntactic heads, as in (40).

(40) \[ \text{John CAUSE} \left[ \text{\sqrt{open/clean [the door/the jacket]}} \right] \]

But if this were the structure, we would expect that the (alleged) structural ambiguity of *again* would arise equally with both *open* and *clean*, contrary to fact.

It should be noted here that *clean* has an activity meaning ingredient. Thus the question might arise whether the availability of the restitutive reading of *again* with the verb *open* but not with the verb *clean* could possibly be due to this aspectual difference (achievement vs. accomplishment) between the two. That this is not the case is demonstrated by the fact that some other accomplishment verbs, such as *dig* in (41a-b), do exhibit the restitutive reading of *again* (42ii) (in addition to the repetitive one (42i)) as shown by the scenario in (43).

(41) a. They dug the cave in an hour.
   b. After that the cave was dug.

(42) They dug the cave again.
   i. They did it again. (repetitive)
   ii. There was a cave again (restitutive)
Story tellers used to meet every year in a huge natural cave in mount Ida for a story telling festival. Ten years ago the cave collapsed. The locals dug it again and intend to renew the tradition.

Recall also that in the periphrastic construction with clean (36,) again does manifest the repetitive/restitutive ambiguity.

The above discussion of the verb clean seems to provide strong indication that the interpretations of again in cases like (28) observed in the literature are in fact not instances of structural ambiguity, and thus cannot be taken to provide evidence for the syntactic representation of subeventual structure.

It is worth noting here that the behavior of clean is not a unique or isolated phenomenon. The same pattern is exhibited, for instance, by the verb whiten. As shown below, although it has a telic reading as shown in (44), it manifests no ambiguity with again (45); it is impossible to use (45) under the scenario in (46). In this case too, the unexpectedly missing interpretation is the restitutive, "inner", reading, the one syntactic decomposition would attribute to modification of the result state.

(44) John whitened his teeth in ten days.  
     After that his teeth were white.

(45) John whitened his teeth again.  
     i. John did it again.  \( \text{(repetitive)} \)

(46) John's teeth used to be white, but they got yellow from smoking. Then he whitened them.

Finally, consider the behavior of again in ellipsis constructions. Consider the scenario in (47) described by Paul, a nosy neighbor of John and Bill, who had to report their movements this morning to the police. Paul's last sentence is an ellipsis construction, in which again most naturally has the repetitive reading in the antecedent sentence, although it can only have the restitutive reading in the elided sentence. This would be unexpected if the two readings resulted from structural ambiguity, given the parallelism requirement exhibited by ellipsis constructions (cf. (30) above).

(47) Paul: "This morning I saw John open his door to pick up the newspaper; when he closed it, he must've realized that Bill, his neighbor next door, was also closing his door, which was installed wide open yesterday and left open since. Afterwards, John opened the door again and so did Bill."

In sum, the above observations cast serious doubt on the claim that the repetitive and restitutive interpretations of again, and its counterparts in other languages, are cases of structural ambiguity. If they are not, then they clearly provide no evidence for the syntactic decomposition of lexical verbs. Plausible alternatives to syntactic decomposition...
decomposition in fact have been developed for capturing the interpretations of again. See, for instance, Fabricius-Hansen (2001), who argues that again is lexically ambiguous: one of its meanings involves a counterdirectional action (subsuming the "restitutive" reading of von Stechow (1995) and related work), while the other a repetitive one.

4.3 The litmus test for an active lexicon

We have seen that adverb interpretation does not warrant syntactic decomposition (section 4.2). Furthermore, argument accommodation requirements and the inability of the traditional θ-roles to capture linguistic generalizations do not provide decisive evidence in favor of syntactic decomposition. This is so because (i) the thematic phase also takes care of argument accommodation (sections 3.1, 3.3), and (ii) the feature composition of θ-roles proposed by the theta system does give rise to natural classes that capture generalizations across θ-roles (section 3.2). Moreover, there are mapping phenomena that decomposition does not seem apt to account for (section 4.1). Assuming the theta system and the thematic phase these mapping phenomena receive an account. This casts doubts as to whether event decomposition should indeed have been adopted into syntactic structure without further examination.

As mentioned in section 2, Marantz (1997) argues that the "word" does not merit having its own storehouse as it does not define a domain with particular properties. He consequently proposes that the lexical component is a storehouse of roots, and as such cannot be active to the extent that it cannot host derivational operations forming words. Marantz' conclusion is based on his conception of lexicalism as the claim that words are created in the lexicon by processes different from syntactic processes. Unlike Marantz, we do not think that this is a good reason to void the lexicon of its operational role. An active lexicon does not entail that words constitute a domain with particular properties. To decide whether or not the lexicon allows valence changing operations, one should directly examine whether there is evidence that some such operations must apply before syntactic structure is available. Positive evidence to that effect constitutes, in our opinion, decisive evidence that the lexicon must be active, computational. (Lack of evidence to that effect may be inconclusive, but would certainly suggest that the lexicon is not operational.)

In recent years a series of papers that grew out of extensive work on the lexicon-syntax interface have repeatedly shown that certain valence changing operations must apply before any syntactic merger has taken place. Studies examining various verbal diatheses have shown time after time that certain diatheses must be lexical outputs on the basis of criteria such as (i) their formation makes use of information that indisputably cannot be considered syntactic; (ii) their formation cannot make use of syntactic structure, in sharp contrast with the formation of other diatheses or the formation of the same diatheses in other languages; or (iii) their formation involves an operation illegitimate post-lexically by standard assumptions, but plausibly licit pre-syntactically.
An example for (i) was already mentioned at the end of section 3.2. Horvath and Siloni (to appear) show that the set of verbs that can serve as input to causativization (resulting in an Agentive verb) in Hungarian is the class of verbs equipped with a [+] role. Having an external argument is insufficient for an entry to qualify as input, as certain externally mapping verbs can serve as input, while others cannot. What does manage to capture the common denominator to all inputs is the feature composition of their roles, which undoubtedly (its proponents as well as opponents would agree) is not the type of information available to the syntactic component.

Next, (ii) states that if syntactic structure is inaccessible to the operation, then there is good reason to suspect that the relevant predicate formation takes place prior to syntax. Let us illustrate the rationale of the argument. Reflexive verbs across languages involve associating their subject with two thematic roles. Thus, for instance, in *John dressed*, John is both the Agent and Theme of the event of dressing. However, in certain languages (Romance languages, West and South Slavic languages) reflexive verbs allow for one of these θ-roles to be the role of a distinct predicate that the syntax merges in the local domain of the reflexive verb (e.g., in its ECM complement). Other languages (English, Hebrew, Hungarian, East Slavic languages) require that the θ-roles associated with the subject of the reflexive verb belong to the reflexive itself (i.e., be part of the same grid, that of the input). This distinction strongly suggests that while in the former languages the reflexive verb is formed in the syntactic component, in the latter it is formed by a lexical operation, which given its locus of application, does not have access to syntactic structure (for a detailed discussion, see Reinhart and Siloni 2005). A parallel argument can be made with regard to reciprocal verbs (see Siloni 2001, 2008) and middles (Marelj 2004)).

Finally, if there is evidence in favor of an operation whose workings are infelicitous or illegitimate post-lexically, but plausible pre-syntactically, then not all operations can be syntactic, as stated in (iii). Reinhart (this volume) argues that the operation forming unaccusative verbs and alternating subject Experiencers eliminates the Cause role of the input altogether. Such reduction is at odds with the spirit of syntactic decomposition, which does not attribute θ-information to lexical entries. In other words, it seems senseless to propose a syntactic reduction of an argument if arguments are added by the syntactic component. What could such a proposal mean: adding an argument in the syntax in order to reduce it altogether? Under approaches that do associate θ-information with lexical entries, eliminating a θ-role post-lexically would violate any version of the principle requiring preservation of lexical-semantic information that entries are equipped with when merged (the traditional Projection Principle of Chomsky (1981) or any alternative formulation). In contrast, such reduction should not be illicit in the lexical component. Let us explain why. On our view, lexical entries are collections of semantic and formal features including thematic information. They do not involve an abstract event semantic representation of the type \( \lambda y \lambda x \lambda e (b r e a k(e) \ & \ A g e n t(e, x) \ & \ T h e m e(e, y)) \). Such formulas are read off syntactic structure, which is built by the syntactic engine on the basis of the relevant

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14 The relevance of the (in)accessibility of syntactic structure to diathesis formation was already discussed by Wasow (1977). Wasow applied the criterion regarding adjectival versus verbal passivization. The evidence in this case, however, only shows that the verbal passive involves syntactic movement while the adjectival one does not. It does not show where the operation on the external argument of the input takes place.
lexical-semantic information and syntactic constraints. Eliminating an argument from \((\lambda)\) formulas is logically illicit. But if lexical entries do not involve such formulas, as we argue, nothing blocks reduction of a role, which forms a new lexical entry (derivationally related to the input).

Note that in contrast to the above hallmarks identifying operations that must be pre-syntactic, the assignment of lexical status to operations in earlier literature has often relied merely on manifestations of various idiosyncrasies in their application (i.e., on the existence of gaps in the paradigm, or special meanings exhibited by input or output). Thus, it is worth pointing out here that the force of the above diagnostics is crucially distinct. While the existence of idiosyncrasies is of course fully consistent with a particular operation being lexical, there are ways of capturing them also within models placing all operations in the syntax. Marantz (1997, 2001), for instance, proposes that such idiosyncrasies can be accounted for as effects typical of the local domain of the root, which constitutes a derivational phase. Specifically, the root phase is claimed on Marantz's theory to be comprised of the root and its syntactic domain up to the point where the first category-determining head is merged. Thus, assuming that the root is the source of idiosyncratic information, only heads within the root's phase will have access to it; beyond the root phase, the derivation will be predicted not to exhibit idiosyncrasies. Beyond the question whether idiosyncrasies indeed are limited to the root phase, observe that such a layered syntactic structure (root phase and beyond) has nothing to offer when it comes to the diagnostics proposed above. This is so because the diagnostics do not pinpoint properties of the root. They detect information or mechanisms that ought to be pre- or post-syntactic by nature.

The above are just a handful of examples for the type of direct evidence that should enable linguists to determine whether or not the lexicon allows valence changing operations and must consequently list actual predicates (verbs, adjectives etc.) with their thematic information. We believe evidence of this type strongly suggests that the lexicon is active. We are thus convinced that linguists must examine such evidence thoroughly before they commit to approaches discarding lexical operations. The reader is referred to Fadlon (to appear), Horvath and Siloni (2008), Horvath and Siloni (2010), Horvath and Siloni (to appear), Marelj (2004), Meltzer (to appear), Reinhart (this volume), Reinhart and Siloni (2005), Siloni (2002), Siloni (2008, 2010) for arguments in favor of lexical operations.

**Appendix**

A predecessor of the constructionist approach, representing an initial step in the direction of syntactic decomposition, was the proposal to sever the external argument from the lexical verb. This approach, developed in the mid '90s, introduced the

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15 We believe not only that lexical entries do not have to involve \(\lambda\)-formulas, but that in fact they cannot. The reason for that is that the order of the \(\lambda\)-operators in the formula necessarily reflects the order of merging, namely, argument hierarchy. And structural hierarchy is not always dictated by lexical information exclusively. Case considerations, for instance, may affect the order of merging. See Preminger (2006) for the claim that the internal arguments of ditransitives merge in either order modulo Case. Attempting to build the full argument hierarchy in the lexicon would amount to duplicating the syntax in the lexicon.

16 For data calling into question the correctness of this claim, see Horvath and Siloni (2008)
external argument into syntactic structure via a separate (functional) head, e.g. Kratzer's (1996) Voice head or Chomsky's (1995) little-v. Below we will briefly examine the motivation and empirical merits of this proposal. Note that the direct syntactic insertion of the external argument apparently acted as a catalyst for the move towards full syntactic decomposition. The proposal has had direct implications as to the (im)possibility of certain lexical operations: it makes the prediction that the external role cannot be involved in any lexical operation affecting the lexical verb, as it is not part of the verb's lexical entry. This implication clearly conflicts with results of recent studies arguing that a number of independently motivated lexical operations must involve the external role of verbs, e.g., decausativization (Reinhart 2002, this volume) across languages, and reflexive verb formation (Reinhart and Siloni 2005), reciprocal verb formation (Siloni 2008, 2010), middle formation (Marelj 2004), and causative formation (Horvath and Siloni to appear) in certain languages.

The arguments cited for eliminating the external role from the lexical verb's theta-grid were based on two related long-standing thematic generalizations (originating in Marantz 1984): (i) the asymmetry of semantic composition between the external versus internal arguments, and (ii) the (alleged) non-existence of subject idioms. Generalization (i) captures the observation that the choice of the internal argument can affect the interpretation of the verb, and hence the interpretation assigned to the external argument (subject), but the choice of the external argument cannot do that. For instance, the interpretation of the verb in cases such as the pairs in (48), (49) below varies with the choice of internal argument, which in turn influences the interpretation of the subject. In contrast, no instances seem to exist where the choice of subject would have a comparable effect on the meaning of the verb and hence on the interpretation of the internal argument (Marantz 1984).

(48) a. John killed a cockroach.
   b. John killed an hour/an afternoon.
   c. John killed a bottle/the wine.

(49) a. John took a pen.
   b. John took a pill/some vitamins.
   c. John took a bus/the train.

The closely related generalization (ii) involves an asymmetry of idiom formation, and specifically, is based on the set of verb phrase idioms made up of a verbal predicate and (some of) its arguments. The claim due to Marantz (1984) is that although English has many idioms consisting of the verb and an internal argument (e.g., pull strings, spill the beans, kick the bucket, saw logs), there are no verb phrase idioms consisting of the verb and the external argument excluding the internal argument.

It is the above semantic asymmetries that led researchers in the mid '90s to conclude that the external argument cannot be an argument of the lexical verb, and inspired the postulation of a variety of functional heads to introduce it outside the verb's maximal projection. A closer examination of the above observations reveals that they do not warrant such a conclusion.

Addressing the issue of how the external argument could be prevented from affecting the meaning of the verb the way its internal counterpart does, (i.e., how to capture the
apparent asymmetry of semantic composition), Kratzer (1996) notes that semantics in principle allows arguments of the same predicate to combine with, and impose special meanings on, the predicate in any order. Specifically, her argument is that if both the external and the internal argument were arguments of the lexical verb, then it would be impossible to preclude restricting the function based on the external argument, but not based on the internal argument. If so, particular choices for the external argument or for the internal argument would be equally able to impose special meanings on the predicate, contrary to fact. This conclusion leads Kratzer to propose that the external argument must then be an argument of an independent predicative head and this is the reason why it cannot access the lexical predicate and affect its meaning.

Severing the external argument from the lexical verb, and stipulating an extra (functional) head (vP or voiceP) to introduce it raises the issue of how to integrate the two phrases in semantic interpretation. Kratzer's system achieves this via "Event Identification", a process that combines the denotations of VP and vP. This is meant to take care of the interpretation of e.g. John killed a cockroach, along the following lines: there is a "causing" event and a "killing" event, and John is the Agent of the "causing", a cockroach is the Patient of the "killing", and the "causing" and the "killing" are the same event (after Event Identification); i.e., using a rough paraphrase, John caused the killing of a cockroach.

But there needs to be more to the VP-vP relation than this. Not only the type of event, or the type of external role, specified by the v head needs to be compatible with the interpretation of the lexical VP, but semantic selectional relations holding between the lexical verb and the external argument also would need to be specifiable. Thus consider the following selectional phenomena involving the external argument of the transitive verbs in (50):

(50) a. The bees stung John.
    c. The snake/the mosquito bit John.
    d. *The snake/the mosquito stung John.

These distinctions cannot be attributed to the nature of the external role, which is uniformly an Agent in (50a-d). To capture such phenomena, one would have to allow the process of event identification to specify the (fine-grained) semantic restrictions that the lexical VP imposes on the external argument in the vP. But whatever mechanism is employed to achieve this will automatically also make possible the specification of various semantic restrictions on the meaning of the predicate based on the choice of the external argument. Event identification has to reconstruct all the lexical-semantic restrictions imposed by the traditional V (which bears the external

17 The representation of special interpretations such as in examples (48a) vs. (48b), under the "traditional" view that kill is a two-place verb, is assumed by Kratzer (1996) to look like (i) and (ii), respectively:

(i) KILL₁ is a function that takes an argument x and turns out a function that takes another argument y and turns out:
   truth value= TRUE iff x is an animate being and y kills x

(ii) KILL₂ is a function that takes an argument x and turns out a function that takes another argument y and turns out:
   truth value= TRUE iff x is a time period and y wastes x
role). So the question still is: what could be the reason that while the external argument is accessible to selection by the lexical verb (50), it cannot itself impose restrictions on or affect the interpretation of the verb and the internal argument. Introducing the external argument via a separate head thus turns out to be unable to explain the observation for which it was designed. With or without a “little v’ type projection, the question remains: Why do lexical-semantic restrictions operate bottom-up – from the verb+internal argument to the external argument – and not the other way around (i.e., from verb+external argument to internal argument)?

The observed asymmetry (i) then provides no reason against maintaining that the external argument is an argument of the lexical verb, and no motivation for stipulating an extra functional head to introduce it. We claim the asymmetry follows from the hierarchical syntactic asymmetry between the external and internal argument, in conjunction with the strictly node-by-node bottom-up compositional procedure of semantic interpretation. The development of special meanings (exemplified in (48)-(49)), just like the development of idioms, is based on the process of conventionalization of particular interpretations that have been used consistently in specialized contexts. We believe that semantic composition proceeds gradually, along the syntactic derivation, assembling step-by-step the interpretations of successive structural units. The internal argument merges with the selecting lexical verb before the external argument does and thus, given the strict node-by-node procedure of composition, the two form an interpretative unit. We therefore expect that these V + internal argument units will be able to develop special and idiomatic meanings productively. The external argument is higher in syntactic structure than the internal arguments even without a stipulated extra functional head. Under our approach, it is merged last, at the edge of the thematic phase (see section 3.3). Therefore, there is no interpretative unit composed only of the verb and the external argument that excludes the internal one. It is thus expected that special meanings and idioms made up of V + external argument will not arise productively. 

It is worth noting here that the proposed step-by-step compositional procedure does not mean that the range of external arguments could not be restricted by the selecting lexical verb (as in (50) above). On the contrary, selectional phenomena regarding the external argument are straightforward to state under our proposal: they are imposed by the interpretative unit V + internal argument.

Next, turning to the claim regarding subject idioms, a further look at the set of V + argument idioms shows that, contrary to the commonly assumed generalization (ii), we do find external arguments in such idioms. The following examples, from three unrelated languages, demonstrate that the external argument is not precluded from occurring within verbal idioms.

18 The above approach predicts that in languages such as Hebrew, where Theme and Goal do not have a fixed syntactic mapping order regulating their merger with the verb (see discussion in and Preminger 2006), no interpretative asymmetry will hold between them regarding the availability of special meanings and idioms. In contrast, in languages where there is a fixed order of merging, say Goal preceding Theme, as was proposed for English (e.g., Carrier-Duncan 1985, Larson 1988), then special meanings and the productive formation of VP idioms will be available for V + Goal excluding Theme, but not vice versa. In fact Larson (1988) presents evidence of precisely this sort.
(51) a. *a little bird* told me that
   b. *Lady Luck* smiled on X

(52) a. elkapta X-et *a gépszij* (Hungarian)
cought-3sg.def.DO X-ACC the driving-belt
   X got roped in
   b. rájár X-re *a rúd*
onto-him-goes X-onto the shaft
   X is having a series of misfortunes

(53) a. *ha-ru’ax* nasa et X (Hebrew)
the-wind carried ACC X
   X disappeared
   b. *bal’a* et X *ha-adama*
swallowed ACC X the-earth
   X disappeared

Thus, we find a number of examples where the fixed part of the idiom is made up only of the verb and its external argument, leaving the internal argument free. Examples such as (51), (52) and (53) provide clear evidence that Marantz's original generalization regarding the nonexistence of subject idioms with missing internal arguments is in fact not valid. (The same conclusion has been reached in an in-depth study of idiom formation by Nunberg, Sag, and Wasow (1994).) It is not an absolute restriction, rather only a statistical tendency. This makes it highly implausible that the phenomenon could be somehow related to the alleged extra-VP origin of the external argument, as that would predict a total absence of the relevant idioms. So the two generalizations to be accounted for are the following: (a) there do exist V+argument idioms formed with the external argument and excluding the internal argument, (b) external argument idioms are scarce, i.e., they form a significantly smaller set than V+argument idioms that do not include an external argument in their fixed part.

The existence of external argument idioms (generalization (a)) is in principle expected on our approach, since the external argument is an argument of the lexical verb, no less than the internal arguments are; therefore external arguments could get listed together with the verbal lexical entry, just like internal arguments can. As for the striking paucity of external argument idioms, relative to the overwhelming productivity of V+internal argument idioms (generalization (b)), this phenomenon arguably has two sources. First, given that the productive way to form idioms is via interpretative units acquiring conventionalized meanings, there will therefore be few idioms that fail to instantiate the compositionality principle of successive node-by-node interpretation. Such idioms could be arising only via a different, non-compositional route. On our approach, the above mechanism of productive idiom formation can yield a striking asymmetry in the number of V+internal argument vs. V+external argument idioms. Yet there must also be some other factor contributing to the paucity of external argument idioms, as external arguments are rare in idiom formation not only when the idiom excludes the internal argument of the verb, but also when the latter is part of the idiom (as in a case like *The shit hit the fan*). This fact clearly cannot be attributed to the lack of relevant compositional units, and indicates the existence of some further, independent factor contributing to the scarcity of idioms containing the external argument.
This further contributing factor appears to be the conjunction of two cognitive preferences, as demonstrated in detail by Nunberg, Sag and Wasow (1994): (a) Idioms describe abstract situations in terms of concrete ones and not vice versa, and (b) Animate noun phrases tend to preserve their animacy in metaphoric and idiomatic meanings. Given these two facts, since animates refer to concrete entities, they can hardly be used to describe abstract situations. Since the external argument is predominantly animate, it rarely appears in the fixed part of idioms (quantitative data regarding this hypothesis is provided in Nunberg, Sag and Wasow (1994)). This account is supported by the fact that Goal-Recipients (Kiparsky 1987) and Possessors (Marantz 1984) – which are not external arguments – are also rare in idioms. Since the latter are also characteristically animate (or human), their nonoccurrence in the fixed part of idioms is predicted.

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