

A minimalist view of the syntax-lexical semantics interface*

MAYA ARAD

Abstract

This paper presents a restrictive theory of the interface between the lexicon and the syntax. I assume that only a limited amount of lexical information is available at the interface, and, following Borer (1994), that semantic (aspectual) interpretation is assigned at specifiers of aspectual projections, rather than within the VP. Thus, the concept of "Mapping" from lexicon to syntax or the "Linking" of arguments has no meaning in my theory. Instead, the syntax narrows down possible aspectual interpretations of predicates, and aspectual information at the interface forms a constraint on the association of verbs with syntactic structures.

1 The interface between the lexicon and syntax

The main question about the syntax-lexicon interface is whether, and to what extent, there exists a correlation between the lexical properties of predicates and the syntactic structures in which they appear. Why should such a correlation exist at all? One good reason is, that a strong correlation between meaning and structure might explain the rapidity of language acquisition: children need not learn syntactic structures of verbs on an item-by-item basis, but rather, make generalizations on the basis of the regular correlation.

However, while it is agreed that some correlation between meaning and structure exists, the nature of this correlation differs substantially from one theory to another. Approaches to the syntax-lexicon interface can be characterized according to two parameters, which I adopt from Benua and Borer (1996):

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- (i) **Lexical-entry driven approaches vs. predicate-based approaches:** lexical-entry driven approaches assume that the syntax of verbs is projected from their lexical entries, and is determined by them. Lexical entries should therefore contain all the information (thematic or aspectual) needed for projecting verbs' syntax correctly (see, for example, Chomsky's 1986 Canonical Structure Realization, Baker's 1988 UTAH, Tenny's 1992, 1994 Aspectual Interface Hypothesis, Pesetsky 1995, Levin and Rappaport Hovav 1995, Carrier and Randall 1993, Larson 1988, Grimshaw 1990). Predicate-based approaches, on the other hand, assume that at least part of the interpretation of individual arguments in the clause depends on the syntax of the entire predicate, rather than on specification of lexical entries (see Hoekstra and Mulder 1990, Borer 1994, van Hout 1996).
- (ii) **Thematically-based approaches vs. event structure-based approaches:** in thematically based approaches, arguments are licensed by being assigned a thematic role by the verb. The set of thematic roles differs slightly according to the theory, but it generally includes Agent, Causer, Experiencer, Theme, Goal, Source, etc. All traditional approaches within GB belong to this type. In event structure-based approaches, the lexical information available at the interface is the event structure of the verb. The verb assigns aspectual roles (Tenny 1992, 1994), or specifies event participants (van Hout 1996), rather than assign thematic roles.

In this paper I will argue in favour of an approach which is both predicate-based and event-structure based. Before doing so, it is useful to present some of the problems that often occur within lexical-entry driven, thematically based approaches. I will demonstrate this on one such approach, Baker's (1988) 'Uniformity of Theta Assignment Hypothesis' (UTAH):

- (1) **Uniformity of Theta Assignment Hypothesis (UTAH)**
Identical thematic relationships between items are represented by identical structural relationships between those items at the level of D-Structure (Baker, 1988:46).

UTAH claims that a lexical item bearing a certain thematic role (e.g., Theme), will always be mapped into a certain, fixed, structural position (e.g., direct object). It can be seen that according to UTAH, the correlation between the syntax and the lexicon is both deterministic (once we have the set of roles the verb assigns, the syntactic structure is

determined by them), and, for the same reason, also trivial. UTAH being a function (for mapping between the lexicon and the syntax), two distinct roles may be mapped into the same position (e.g., Agent, Causer and Experiencer may all appear at the subject position). However, if a specific role appears in two different syntactic positions, UTAH is violated, and the trivial mapping no longer holds. In fact, there are several such cases in which arguments bearing identical thematic roles are mapped into different structural positions. To mention just a few:

The dative alternation, the alternation exhibited by verbs such as *give*, whose Goal argument may either be Case-marked by the verb or by the preposition *to*.

The locative alternation, i.e., *load*-type verbs which allow either their Goal argument or their Theme argument to occupy the direct object position.

Experiencer verbs, i.e., pairs such as *fear/frighten*, in which the argument bearing the Experiencer role is mapped, in the first, to the subject position and in the second, to the object position.

Variable behaviour verbs, i.e., intransitive verbs which may appear as both unaccusatives and unergatives, with the existence of a locative PP (in Dutch and Italian) or without (in Hebrew).

Assuming we want to maintain the UTAH (or any other deterministic system of mapping), there are three possible types of solutions to the problems mentioned above:

- (i) *"Finer-grained semantics"* (term taken from Pesetsky 1995): what looks like one thematic role is in fact two distinct roles, and therefore may be associated with two different positions.
- (ii) *"Finer-grained syntax"* (ibid.): apparent identities between structural positions may be false (in particular, certain surface subject positions are derived from D-Structure objects).
- (iii) *Multiple lexical entries*: some predicates are associated with two lexical entries which take different thematic roles. Multiple entries are suggested by Levin and Rappaport-Hovav (1995) in dealing with the locative alternation and other alternation types.

These three types of solutions may result in a more complicated system of thematic roles, a more complex syntax, and a substantial fragmentation of the lexicon.

I claim that syntactic structure of arguments is not determined exclusively by the lexicon. Instead of a deterministic, uni-directional mapping from the lexicon to the syntax, I suggest a bi-directional view of the interface, in which both the syntax and the lexicon constrain the association of possible interpretations with possible structural positions (I discuss this claim in section 2). Such a view is capable of dealing with lexical alternations such as those mentioned above more elegantly and adequately, without invoking any of the solutions above.

What about the other parameter, namely, UTAH being based on thematic roles as mediators? I argue that thematic roles are not adequate candidates for mediating between the lexicon and the syntax, for the following reasons:

- (i) Thematic roles are theory-internal entities. They do not have any independent manifestation either in the lexicon or in the syntax.
- (ii) Thematic roles are both unrestricted and unfalsifiable. They are unrestricted because nothing prevents us from postulating a new role whenever this is needed to save the UTAH. Since they have no independent manifestation, they are also unfalsifiable, because there is no real way to prove that a specific role either exists or does not exist. One could invoke finer-grained semantic distinctions (as does Pesetsky 1995 when motivating the roles Target and Subject Matter), but it can never be proved that these are indeed the manifestations of a distinct role, rather than correlations between other (possibly pragmatic) factors.
- (iii) Finally, at least part of the theta theory (the identity of particular roles, not the theta criterion) has to do with Selection Restrictions (Chomsky 1965), which are not, I argue, part of the grammar (for motivations for this view see McCawley 1968).

2 Capturing the syntax-lexicon interface

2.1 Aspectually-constrained interface

Before going further, an alternative for thematic roles is needed. Consider Tenny's Aspectual Interface Hypothesis (AIH):

(2) **Aspectual Interface Hypothesis**

The mapping between thematic structure and syntactic argument structure is governed by aspectual properties. A universal aspectual structure associated with internal (direct), external and oblique arguments in syntactic structure constrains the kind of event participants that can occupy these positions. Only the aspectual part of thematic structure is visible to the syntax. (Tenny 1992:2)

Aspectual properties, unlike thematic roles, are interface entities: aspect is a semantic notion, but it has manifestations in the syntax as well, and therefore it makes, in my opinion, a better mediator between the lexicon and the syntax. It is, of course, an empirical issue whether the AIH proves true.

According to Tenny, aspectual properties of verbs are those which determine the mapping of arguments into the syntax. In particular, only arguments that measure out the event that the verb describes (hence *measurers*) appear at the direct object position. A measurer is an argument that undergoes some change of state or motion, which serves as a scale upon which the event may be seen as proceeding. A measurer is an aspectual notion: an event that has a measurer is necessarily an event which is bounded in time (a telic event): the event terminates when the change of state (or other change) that the measurer undergoes has taken place. To take an example: in the proposition "John mowed the lawn", the lawn undergoes a gradual change: when it is half mowed, the event has proceeded halfway through. When it completely mowed, the event is terminated. In the proposition "John killed Bill", Bill is the measurer of the event, because he undergoes some change of state, and this change of state also determines the temporal bounds of the event: the event of killing Bill terminates once Bill is killed, and cannot proceed afterwards. Unlike the case of "mow the lawn", the change of state that the object undergoes is not gradual. We cannot imagine an event of killing proceeding exactly halfway, with half of Bill being killed (compare this to half of the lawn being mowed). However, in spite of this difference, both "mow the lawn" and "kill Bill" share the property of being measured out over time by their measurer argument. The fact that the

events they encode are bounded in time is inherent to these verbs, and is part of their lexical properties (Note that in the examples above, both measurers, "the lawn" and "Bill" are direct objects, as argued by Tenny). Events which have no measurers are not bounded in time (atelic events): in the proposition "John worked" there is no argument that undergoes some change that measures out the event. Temporal adverbs can determine the bounds of such an event (e.g., *work for two hours*, *work from two to three*), but these are not inherent properties of the event of working, but outside modifications.

2.2 Projection of arguments

In what follows, I present a model of the interface which is based on the model designed in Borer (1994). As far as I know, Borer was the first to suggest that arguments bear no thematic labels or other specifications ("external" or "internal") within the VP, but rather, are interpreted semantically at specifiers of aspectual projections.

Assume now that arguments are **generated** in specifiers of aspectual projections, where they are assigned aspectual interpretation: the first of which is **AspEM** (for **event measurer**), where accusative Case is assigned. When this node is specified as [+EM], the argument that is generated at its spec is interpreted as the *measurer* of the event described by the verb, and the predicate is given a telic interpretation (the existence of a measurer entails a telic interpretation, because, as I showed above, a measured event terminates once the change that the measurer undergoes has taken place).

The second node is **AspOR** (for **originator**). The argument that is generated at spec, AspOR is interpreted as the originator of the event, and the event therefore has a point of beginning in time. An "Agent", in my model, is just a convenient label for the argument which is at spec, AspOR (an originator of an event). All other properties which are associated with "Agents" or agentivity, such as volition, sentience, or existence independently of the event (cf. Dowty 1991), may be side effects of its aspectual property, but are irrelevant to the interface with the syntax. "Theme" is a label associated with the argument at spec, AspEM (the measurer of the event), and its other alleged properties, such as being stationary relative to another participant, or non-existing independently of the event (*ibid.*), are derivatives of its aspectual role of measuring out the event¹.

¹It may be that properties typically associated with "Agents" or "Patients" which are not aspectual come into the picture in the case of non-eventive verbs, such as *love*, *fear*, etc.

To give an example of how this model deals with projection of arguments, let us look at the structures associated with unaccusatives (4) and unergatives (5):

$$(4) \quad [_{TP} \quad NP_i \quad [_{AspEM} \quad t_i \quad [_{VP} \quad V_{arrive}]]]$$

$$(5) \quad [\quad _{TP} \quad NP_i \quad [_{AspOR} \quad t_i \quad [_{VP} \quad V_{work}]]]]$$

Both unaccusatives and unergatives specify the existence of one NP argument. However, unaccusative verbs describe an event that only specifies an endpoint². Therefore they have a specified AspEM node, where they are assigned a telic interpretation (I assume that no accusative Case is assigned when there is only one argument, and therefore the argument has to move further to spec, TP to be assigned nominative Case). Unergatives describe an event that specifies only a beginning in time³. Therefore they project an AspOR node and are atelic (telicity is achieved only when an argument is generated at spec, AspEM).

The difference between unaccusatives and unergatives is thus captured in the syntax (the single argument of an unaccusative verb is generated at the same position where objects are generated). At the same time, the semantic differences between the two classes (unaccusatives being non-agentive and telic, unergatives - agentive and atelic) are an immediate result. This model can also account for the problem of variable behaviour verbs without invoking multiple lexical entries. Such verbs, e.g. *run* (in Italian), specify only the existence of one argument. This argument may undergo either the derivation associated with unaccusatives (as in 4) or that associated with unergatives (as in 5). The syntactic structure in which they appear, rather than their lexical entries, determines their meaning. I suggest that a simple transitive verb, such as *kill*, has its arguments generated as follows:

$$(6) \quad [_{AspOR} \quad NP \quad [_{AspEM +EM} \quad NP \quad [_{VP} \quad V_{kill}]]]$$

²For example, *die* only encodes the endpoint of dying, namely being dead. It does not specify the beginning of the dying event. Similarly, other unaccusative verbs such as *arrive*, *go (away)* and *fall asleep* describe end states, and do not encode any point of beginning in time.

³Unergatives, being processes, encode, aspectually, the beginning of that process: the transition from not working to working. The event of working, once begun, is unbounded in time and has no inherent endpoint.

The event described by a simple transitive verb (such as *kill*) specifies both a beginning and an endpoint of an event. Therefore, it has two aspectual projections. (I assume that the verb moves to some functional projection to achieve the surface word order, and that the subject NP ends up at spec, TP).

AspEM has, apart from its aspectual interpretation, the role of accusative Case checking. In some cases, such as *love*, *hate*, and *know*, AspEM checks Case, but does not have any aspectual contents (because these verbs are stative and inherently atelic). It is for these cases that I assume that AspEM may be unspecified, namely, assign no aspectual interpretation. The argument at spec, AspEM is interpreted as NOT measuring out the event⁴. AspOR has no function of Case checking. I assume, therefore, that it is not projected when it has no aspectual contents (i.e., in unaccusatives and States).

The reason I assume that arguments are **generated** at the specifiers of AspEM and AspOR (rather than move into them out of the VP) is, that these are positions where semantic interpretation is assigned, and therefore no movement into them may take place (cf. Brody's 1995 formulation of the Generalized Projection Principle). I will later claim that this assumption also helps us deal with the more complicated case of double object constructions, where locality considerations would rule out a solution based on movement of arguments out of the VP.

What about the information that is available at the interface? In Borer (1994) it is assumed that predicates only specify the number (and possibly type) of their arguments. This works well for variable behaviour verbs, but it leaves all intransitives ambiguous between an unaccusative and an unergative reading. However, some predicates do not allow any flexibility in meaning: *arrive* only has an unaccusative interpretation, while *work* has only an unergative one. Similarly, *kill* must only have a telic interpretation, and *know* an atelic one.

I suggest that the lexical information which is visible to the syntax contains the number of arguments that the predicate takes and, additionally, aspectual information, namely, whether the event the predicate describes is telic or not. [+telic] amounts to having a [+EM] node, and [-telic] means a non-specified EM node. Suppose verbs project freely. If the structure they project is incompatible with the lexical information at the interface, it is not possible to assign interpretation to the proposition. Such a case, for example, is *arrive* projecting two aspectual nodes. Syntactic structures form a constraint on aspectual interpretations: there is no way to achieve a telic interpretation without an argument being generated at spec, AspEM, or an agentive interpretation without an argument being

⁴Note that [+EM], the notation of a specified AspEM, is missing when AspEM is unspecified.

generated at spec, AspOR. On the other hand, in order to assign predicates the right interpretation, aspectual information has to constrain the syntactic structures in which the verb appears (we have to know that *arrive* is telic if we want to rule out a structure in which its argument is generated at spec, AspOR).

Why distinguish aspectual and categorial (the number of arguments the predicate takes) properties as the only information available at the interface? We could include other selectional features, such as [+human subject], [-animate object]. The answer (assuming we want to restrict the information at the interface as much as possible) is twofold. First, aspectual and categorial properties, unlike selectional features, are the only properties which have an effect on the ability to assign interpretation to the predicate. If an argument is missing, or an inherently telic predicate has no specified AspEM node, it is impossible to assign it an interpretation. However, it is not difficult to interpret sentences which violate selectional restrictions (e.g., *the sandwich ate John*). The interpretation assigned may seem implausible and be later ruled out, but this has nothing to do with assignment itself. Second, unlike selectional features, aspectual and categorial features are not context-dependent. We could imagine a world in which sandwiches eat people. We cannot, however, construct a world in which *arrive* is atelic, or *die* takes two arguments.

2.3 Measuring-out and delimiting: the case of datives and double objects

So far it has been assumed that the delimiting (marking the endpoint) of an event is done by its measurer. In most transitive predicates, such as *wash the car*, this is indeed the case: *the car* measures out the event, because the event progresses along with the change in the car (being washed). The measurer also delimits the event, because the event of washing the car terminates once the car is washed.

However, delimiting and telic interpretation are not exclusively associated with measurers. Consider (7):

- (7) a. John pushed the cart.
b. John pushed the cart to New York.

(7a) is atelic: pushing a cart can take place indefinitely, and does not have an inherent endpoint. (7b), on the other hand, is a telic event: it terminates when the cart has reached New York. The delimiter is not the measurer (the event has no measurer), but the PP *to*

New York. This PP provides an endpoint to the event. Note, however, that *push the cart* does not obligatorily require an endpoint.

Many (if not all) verbs of motion behave in the same way, in that they allow an optional delimiter. Such cases are:

- (8) a. John drove the car (to NY).
- b. Mary rode her bicycle (to school).
- c. Bill moved the chair (to the corner).

A delimiter can also turn an atelic intransitive predicate, namely, an unergative predicate (*run, walk*), into a telic, unaccusative one (*run to the store, walk to school*). Tenny (1994) argues that motion verbs contain a path, either overt or covert, as part of their meaning. In the examples in (8) above there is a covert path: the distance to NY, to school or to the corner. there can also be an overt path, as in (9) (examples from Tenny 1994:77):

- (9) a. Carmen walked the path to school.
- b. Jonathan swam the distance to the end of the lake.
- c. Maria ran the long road to the next town.

According to Tenny, the difference between a path and a measurer is the following: a measurer has an inherent endpoint. A path has no endpoint. It only gives a scale (of distance), which can be given an externally imposed endpoint (in this case, the locative PPs). The path together with the delimiter (Terminus, in Tenny 1994) have the same function as a measurer. To take (8a) for example: the distance to NY indicates what is the stage at which the event stands. If the car has made half that distance, the event has proceeded halfway through. When it has reached NY, the event has terminated. In a measured event, such as *wash the car*, the measurer (the car) takes up both functions: giving a scale for the proceeding of the event, and marking its (inherent) endpoint. In my model I will refer to "path" arguments as non-measures, i.e., [-EM]. I assume that the telic interpretation of motion verbs is achieved through the formation of a complex predicate (V+PP), which is inherently telic (thanks to the PP). Thus, there are two ways to achieve a telic interpretation: either by having an argument generated at spec, EM (+EM), or by having a lexical PP delimiter. It is beyond the scope of this paper to decide whether only

verbs of motion can be delimited by an external delimiter⁵. The delimiting properties of some PPs are not fully clear to me yet. It could be that all unergatives may be delimited by a PP, whose contents may vary according to the selectional properties of the predicate (e.g., *laugh to tears*, *work to exhaustion*).

The discussion of paths and delimiters now leads us to discuss dative constructions (hence DAC) and double object constructions (hence DOC), which, I argue, share some properties with motion verbs. Consider the following examples of DAC (10) and DOC (11):

(10) John gave a book to Mary.

(11) John gave Mary a book.

Much attention was recently given to these constructions (Larson 1988, Pinker 1989, Pesetsky 1995). However, none of the suggested analyses seems to have noticed a significant fact about their event structure:

(12) **Event structure of dative constructions and double object constructions:**

- a. The two internal arguments (direct and indirect object) of dative and double object constructions serve as a path and a delimiter.
- b. Only dative constructions which obligatorily require a delimiter may alternate between DAC and DOC.

The (a) clause specifies the aspectual characterization of DAC and DOC. The (b) clause explains why *give*, but not *donate*, may appear in the DOC (see section 4.3.1 for discussion).

Consider (10): "John" is the originator of the event of giving a book to Mary. "A book" indicates some path upon which the event may proceed, the way it does from the giver to

⁵Interesting asymmetries are found between verbs of motion and other non-measured verbs. Compare the following:

- (i) a. John ran.
- b. John ran to the store.
- c. John ran all the way to the store.
- (ii) a. John laughed.
- b. *John laughed to the store.
- c. John laughed all the way to the store.

the recipient (the path is more obvious in the case of *send*). However, the final goal, which is also the endpoint of the event, is the PP "to Mary": the act of giving in (10) terminates (and this is part of the meaning of *give*) when Mary has received the book. In (11) it is the NP "Mary" which serves as the delimiter of the event⁶. Dative constructions have an aspectual characteristic: they are the group of verbs that obligatorily takes three arguments, one of which (necessarily) a delimiter. Other predicates (e.g. *push* in (7) above) only take a delimiter optionally. (11) has the same event structure as in (10), only it is delimited by an NP rather than a PP. This NP must have a Case position, as well as be assigned an aspectual interpretation. There have been several suggestions that the "Goal" argument in double object constructions ends up at the specifier of some functional projection (e.g. Koizumi 1993). I suggest that the this argument ends up at the specifier of a projection which I call DEL Phrase (for delimiter), which assigns it both Case and an interpretation of delimiting the event.

I assume that the delimiting of (10) is done by the complex predicate that the verb and the PP form. The existence of such a delimiting PP makes it redundant for the verb to project an aspectual projection which delimits the event (and if it were projected the sentence would be ruled out, because it would have one redundant Case position without an argument to fill it). The structure I suggest for (10) and (11) is as follows:

(13) [_{AspOR} John [_{AspEM} A book [_{VP} gave to Mary]]]

(14) [_{AspOR} John [_{DELP} Mary [_{AspEM} a book [_{VP} gave]]]]]

DELP, like AspOR, always has aspectual contents, otherwise it is not projected. Indeed, there are no ditransitive verbs which are atelic. Note that if arguments were assumed to move from the VP into aspectual projections, movement to spec, AspOR would be barred

⁶Verbs which alternate between DAC and DOC are ungrammatical without a delimiter, either NP or PP. Consider (i):

(i) Mary gave a book.

This sentence is ungrammatical, unless a very specific context is provided (e.g., if it is uttered as an answer to the question "What did everyone give to the charity shop?"). Also, in some particular constructions of *give*, which deviate from its basic meaning, the delimiter is not obligatory: *give a lecture*, *give a kiss*, or *give a headache*. Note, also, that when the delimiter is missing, the verb can only be interpreted as an habitual, non delimited action:

(ii) People normally give gifts / send cards on Christmas.

under the Chomsky's 1995 Minimal Link Condition. This problem does not arise if we assume that arguments are base-generated where they are interpreted.

2.4 Summary

Let me sum up what I have claimed so far. The correlation between syntax and semantics is based on aspectual properties. Aspectual interpretation is assigned in functional projections rather than in the VP. Thus, syntactic structures of verbs narrow down the number of possible aspectual interpretations, being associated from the start with a set of possible interpretations. However, aspectual and categorial properties of verbs also constrain the syntactic structures in which they may appear. Projection is not determined by lexical entries. Rather, it is constrained by the lexical information they contain, in such a way that mismatches between meaning and form are ruled out as uninterpretable. The fixed part of meaning is listed in the lexicon. Flexibility in meaning occurs when the lexical information of verbs is compatible with more than one syntactic structure (e.g., variable behaviour verbs). In such cases, the different syntactic structures, rather than two distinct lexical representations, are the source of flexibility.

I now pass briefly through different "inputs" which lexical entries provide, and show how these correlate with syntactic structures. (I assume that all subjects end up at spec, TP. However, for the sake of simplicity I included TP only where AspOR is not projected):

lexical input:

- (i) NP, telic.
- (ii) NP, atelic.
- (iii) NP, NP, telic,
- (iv) NP, NP, atelic, non agentive
- (v) NP, NP, atelic
- (vi) NP, NP, PP, telic
- (vii) NP, NP, NP, telic

syntactic structure:

- [_{TP} NP_i [_{AspEM} +EM t_i [_{VP} V]]] (unaccusative)
- [_{AspOR} NP [_{VP} V]]] (unergative)
- [_{AspOR} NP [_{AspEM} +EM NP [_{VP} V]]] (kill)
- [_{TP} NP [_{AspEM} NP [_{VP} V]]] (love)
- [_{AspOR} NP [_{AspEM} NP [_{VP} V]]] (push)
- [_{AspOR} NP [_{AspEM} NP [_{VP} V PP]]] (give)
- [_{AspOR} NP [_{DELP} NP [_{AspEM} NP [_{VP} V]]]] (give)

Ignoring sentential complements, the above cases cover all possible argument types. The information concerning telicity is necessary for securing the correct interface. It indicates the status of AspEM, which is always projected in case there is more than one NP argument. The information concerning agentivity (namely, the projection of AspOR) is

necessary only in the case of state predicates (in 3): only states and unaccusatives lack AspOR. However, in the case of unaccusatives there is no need for specification, because a telic intransitive verb is necessarily unaccusative. Variable behaviour verbs do not contain any aspectual specification in their lexical entries, being thus compatible with the structures in either (1) or (2).

I do not have at this stage a fully fledged theory of lexical entries, which captures both the fixed aspectual properties of predicates and the flexibility in structure and meaning. I suppose that such a theory will have to associate telicity with the presence or absence of arguments. Thus, while both *break* and *eat* are compatible with either one or two arguments, *break* is always telic, whereas *eat* is telic only when it has two arguments:

break (John broke the vase, the vase broke): [NP, (NP), telic]
eat (John ate, John ate an apple): [NP, (NP, telic)]

Such notation captures the fact that intransitive *break* is unaccusative and intransitive *eat*, unergative.

3 Motivation for the model

3.1 A model based on aspectual projections can capture the correlation between certain semantic and syntactic properties (e.g. telicity and non-agentiveness of unaccusatives) in a way other models cannot. The association of aspectual interpretation with syntactic positions entails that "Agents" (Originators of events, in my terms) appear at the subject position without postulating a Thematic hierarchy which puts the Agent role above all other roles (to be more specific, I assume that AspOR is above AspEM, just as other theories assume that the subject position is above the object position. However, in my theory there is no need for further stipulation, that arguments labelled "Agents" must be mapped into the subject position). Also, the association of Case positions with positions where aspectual interpretation is assigned can explain the universal correlation between accusative Case and telic interpretation, a point to which I return in the following section.

I assume that aspectual projections can check Case, and therefore there is no need for agreement projections or multiple specifiers, both of which lack semantic contents or any independent motivation. Aspectual projections, on the other hand, have semantic contents, and unlike agreement projections, the features they check are interpretable and in some languages have also phonological contents.

Another construction which we can now dispense with, and which lacks either contents or independent motivation, is the VP-shell, which was first suggested for treating double object constructions (Larson 1988), and is assumed in Chomsky (1995) for all verb types except unaccusatives. As I showed above, double object constructions can be accounted for without VP shells.

3.2 My model makes minimal assumptions about the lexicon-syntax interface. All the following are now redundant:

- i) A set of unrestricted theta roles, as in classical GB.
- ii) Individual linking rules, role-hierarchies, and the UTAH.
- iii) Different levels of lexical representation that mediate between the lexicon and the syntax, such as Predicate-Argument Structure (PAS, Levin and Rappaport-Hovav 1995), lexical-Conceptual Structure (LCS, *ibid.*), Lexical Relational Structure (LRS, Hale and Keyser 1992) or Event Structure (Pustejovsky 1991).

The devices above are all designed to ensure the right "mapping" or "linking" from the lexicon to the syntax. Mapping has no meaning in my theory: any argument may be generated in any aspectual projection, where it is interpreted.

3.3 The number of possible argument positions is constrained by interface considerations (aspect). There can be no other aspectual interpretation apart from the three mentioned here (originating an event, measuring out an event and delimiting an event), and therefore there can be no other positions which are selected by verbs, except the three projections assumed here. The claim that two macro-roles are sufficient for describing argument selection (Dowty 1991) is a consequence of my model: most verbs describe a beginning and/or an endpoint of an event. If there are three arguments, then necessarily one designs a path (at spec, AspEM) upon which the other — a delimiter (which is at a "default" position) — delimits the event the verb describes.

3.4 In my model a strong correlation between meaning and structure is maintained, but at the same time projection is non-deterministic: the argument that happens to be generated at some projection is assigned the interpretation which is associated with that projection. I believe that non-deterministic projection is descriptively more adequate: it has been argued that lexical meaning of verbs is associated with syntactic positions rather than arguments themselves (Borer 1994, van Hout 1996). This is easy to see, if we take the verb *eat* and project its two arguments, *the apple* and *Mary*, so that *the apple* is at spec, AspOR and *Mary* - at spec AspEM: *the apple ate Mary*. The meaning of *eat* entails

that *the apple* is the eater, rather than being eaten. This is the only interpretation that may be associated with that sentence, even if it does not seem to be a very plausible one. There is no way in which this sentence can be interpreted as *Mary ate the apple* (which seems more compatible with extra-linguistic world knowledge). Lexical-entry driven approaches seem to ignore this fact: first, arguments are assigned lexical specifications (*the apple* being assigned the thematic role Theme); then, linking rules or thematic hierarchies (e.g., link the argument bearing the Theme role with the direct object position) are invoked, in order to secure the lexically determined projection (=to prevent the Agent, Mary, from being linked with the object position).

4 Empirical predictions of the model

4.1 Telicity and accusative Case

4.1.0 I assume that accusative Case is assigned at the aspectual node that is responsible for the telicity of the event. To show the association between accusative Case and telic interpretation, I bring evidence from three sources of data:

- (i) Languages that have an objective Case other than accusative (i.e. partitive Case).
- (ii) Languages which exhibit an alternation between accusative Case and partitive prepositional objects.
- (iii) Languages which mark their objects with dative or ablative Case.

In all these cases, only accusative Case is associated with a telic interpretation. (Note that accusative Case assignment is not a sufficient condition for a telic interpretation: there are several English predicates which are inherently atelic, yet mark their objects with accusative Case: *know the answer, like John, fight racism, use the car*).

4.1.1 Partitive Case. Consider the following example from Finnish (from de Hoop 1992):

- (15) a. Anne rakensi taloa
 Anne built part-house
 'Anne was building a/the house' (atelic)

- b. Anne rakensi talon
 Anne built acc-house
 'Anne built a/the house' (telic)

Partitive Case in Finnish is associated with an atelic reading, whereas accusative Case is associated with a telic one. In my model, this association of morphological Cases with aspectual interpretation is straightforwardly explained. Either partitive Case is assigned at a functional projection other than AspEM, or it is the morphological realization of an unspecified AspEM. Correspondingly, accusative Case is exclusively associated with AspEM (or with a [+EM] specified node, if we assume that partitive Case is associated with a non-specified AspEM).

4.1.2 Direct objects vs. partitive prepositional objects. Some languages allow partitive prepositions instead of direct objects. In all these cases, the partitive preposition is associated with an atelic reading, and the direct object with a telic one:

English:

- (16) a. John ate the cake (telic)
 b. John ate at the cake (atelic)
- (17) a. Mary shot the bird (telic)
 b. Mary shot at the bird (atelic)

Hebrew:

- (18) a. axalti et ha uga
 I ate acc the cake
 'I ate all of the cake' (telic)
- b. axalti me ha uga
 I ate from the cake
 'I had some of the cake' (atelic)

- (19) a. karati et ha sefer
 I read past acc the book
 'I read the book' (telic)
- b. karati ba sefer
 I read past in the book
 'I was reading the book' (atelic)

Unsurprisingly, the Reflexive Dative (hence RD) in Hebrew, an operator that gives the predicate a self directed, volitional and atelic meaning, is more felicitous with the partitive (atelic) form:

- (20) a. karati_i li_i ba iton
 I_i read to me_i (RD) in the paper
 'I was reading the paper (leisurely)'
- b. (?)karati_i li_i et ha iton
 I_i was reading to me_i (RD) acc the paper

4.1.3 Cross-linguistic variation in Case marking. Telic predicates that take two arguments are universally marked with accusative Case, whereas atelic ones may be marked either by accusative, dative, ablative or genitive Case, or by a preposition. Consider the following data on Case marking:

(21) English	Latin	Classical Greek	Hebrew
help + acc	auxilior + dat	boetheo + dat	azar + le (to)
use + acc	utor + abl	xraomai + dat	hiStameS + be (at)
trust + acc	fido + dat	pisteuo + dat	batax + be (at)
fight + acc	pugno + dat	polemeo + dat	nilxam + be (at)
rule + acc	dominor + abl	arxo + gen	maSal + al (upon)
obey + acc	pareo + dat	peithesthai + dat	ziyet + le (to)

The above predicates are differently marked across languages. Their Case marking seems arbitrary (though it may follow some pattern within a particular language). However, consider the pattern exhibited by the following predicates, which are universally marked with accusative Case:

(22)	English	Latin	Classical Greek	Hebrew
	build + acc	construo + acc	oikodomeo + acc	bana + acc
	write + acc	scribo + acc	grapho + acc	katav + acc
	murder + acc	occido + acc	apokteino + acc	racax + acc
	eat + acc	edo + acc	esthio + acc	axal + acc
	wash + acc	lavo + acc	luo + acc	raxac + acc

The predicates in (21) and (22) belong to two different aspectual classes (cf. Smith 1991): those in (21) are **States** and **Activities** (hence atelic), whereas those in (22) are **Accomplishments** (hence telic). The data are easily explained if we assume that accusative Case is assigned at the aspectual projection that is responsible for a telic interpretation of the predicate (AspEM). I predict that all predicates belonging to the (telic) class of Accomplishments will be universally accusative marked (or, if there exists some Case alternation, only the accusative variant should be telic). The Case marking of state and activity predicates, on the other hand, is unpredictable, and may be language particular.

To sum up: I brought evidence to support the claim that accusative Case is universally associated with a telic reading, whereas other Cases or prepositions are not associated with such interpretation. The correlation between Case and aspectual properties in predicates works only in one direction: no telicity without accusative Case (ignoring, of course, PP delimiters, which I discussed briefly before).

4.2 Agentivity and impersonal constructions

I argued that agentive interpretation (i.e., originating an event) is assigned at spec, AspOR. Some support for this claim comes from dative arguments. Arguments of some predicates, which in English appear as subjects, are dative-marked in Hebrew and Latin. Unsurprisingly, dative-marked arguments lack agentive interpretation. In English, I assume that these predicates have their subject generated at spec, TP, bearing no aspectual interpretation of an originator. Consider the following data, from English, Hebrew and Latin:

English/Hebrew:

- (23) a. I am cold / hot
 b. kar/xam li
 cold / hot (impers.) to me
 'I am cold'
- (24) a. I am fed up
 b. niSbar li
 broke (impers.) to me
 'I am fed up'
- (25) a. I am sad
 b. ani acuv *or* acuv li
 I sad *or* sad to me
 'I am sad'
- (26) a. I do not care
 b. lo ixpat/meziz li
 not care /move (impers.) to me
 'I do not care'

English/Latin:

- (27) a. I like it / it pleases me
 b. id mihi libet
 it to me pleases
- (28) a. I need...
 b. opus est / necesse est mihi...
 need is / necessary is to me

I predict that only non-agentive predicates may vary across languages in the way in which they Case-mark their arguments (nominative or dative). States, I assume, cannot have an AspOR node, because they have no point of beginning in time, and, indeed, the predicates

in (23)-(28) are all stative. There is no language (as far as I know) which allows the following:

- (29) a. sings (impers.) to me
 'I sing'
 b. works (impers.) to me
 'I work'

Hebrew allows one agentive verb, *holex* (walk, go), to appear in an impersonal construction, but crucially, the interpretation associated with the verb in this construction is not the ordinary, agentive meaning, but a completely different one:

- (30) *holex* *li*
 goes (impers.) to me
 'it's going fine for me', 'I'm doing fine'.

The dative argument is not interpreted as agentive (=specifying a beginning), because it is not at spec, AspOR. The fact that a predicate which is otherwise agentive is interpreted as non agentive in this particular construction supports the hypothesis that meaning (or lexical entailments in Dowty 1991) is associated with syntactic positions rather than with particular arguments. The interplay between syntax and the lexicon can be demonstrated on (29b). The syntactic structure narrows down possible interpretations of that construction: an argument cannot be interpreted as an originator unless it is at spec, AspOR. Lexical information at the interface contains a AspOR node for *work*, and the sentence is ruled out as uninterpretable. (A non-agentive interpretation for (29b) does not exist, although such interpretation is possible, in principle, something like "everything works fine for me". It is a lexical fact that *work*, unlike *walk*, does not have this interpretation).

4.3 Some well known alternations revisited

4.3.0 I now show how my model can explain three cases of lexical alternations mentioned earlier in this paper.

4.3.1 The dative alternation. I dealt before with the dative alternation, and showed that it is aspectually constrained: only verbs which obligatorily take three arguments (one of which a delimiter) are allowed to alternate between a dative construction and a double object construction. The difference between *give* and *donate* has often been noticed with respect to the dative alternation (Pinker 1989, Pesetsky 1995). Consider (31) (Pesetsky's 356):

- (31) a. Mary gave some canned food to Oxfam.
 b. Mary gave Oxfam some canned food.
 c. Mary donated some canned food to Oxfam.
 d. *Mary donated Oxfam some canned food.

However, consider the following difference between the two verbs:

- (32) a. Mary gave some canned food *(to Oxfam).
 b. Mary donated some canned food (to Oxfam).

Donate may or may not take a delimiter (although in most cases it is more felicitous with a delimiter), whereas *give* must. This is the also difference between the other pairs mentioned in Pesetsky: *show* vs. *display*, *tell* vs. *recount*, *wire* vs. *telegraph* (and, I add, *send* vs. *deliver*). The double object construction occurs also with beneficiary verbs:

- (33) a. Mary baked a cake for John.
 b. Mary baked John a cake.

It is argued in Tenny (1987) that (33a) is ambiguous between a benefactive (i.e., the cake is baked for John) and a recipient reading (i.e., John receives the cake), whereas (33b) only has a recipient reading. Also, she argues that (33b) implies that John actually got the cake (and that the endpoint of the event is once the cake has reached John), whereas in (33a) this is so only on the recipient reading. This supports the hypothesis that the second, indirect object in the double object construction is the delimiter of the event.

4.3.2 The locative alternation. The locative alternation (Levin and Rappaport 1988, Levin and Rappaport Hovav 1995, Tenny, 1987, 1992, 1994, Dowty 1991, Pinker 1989) is found in a number of languages, and is not unique to English. Consider the following examples:

(34) English:

- a. The farmer loaded the hay on the truck.
- b. The farmer loaded the truck with hay.

(35) Dutch (Tenny 1994):

- a. Jan plant bomen in de tuin.
John plants trees in the garden.
- b. Jan be-plant de tuin met bomen.
John be-plants the garden with trees.

(36) Japanese (Tenny 1994):

- a. kabe ni penki o nuru
wall on paint-ACC paint (VERB)
'smear paint on the wall'
- b. kabe o penki de nuru
wall-ACC paint-with paint (VERB)
'smear the wall with paint'

(37) Hebrew:

- a. ha yeled marax xem'a al ha lexem.
the child smeared butter on the bread.
- b. ha yeled marax et ha lexem be xem'a.
the child smeared ACC the bread with butter.

It was noticed (see Levin and Rappaport 1988), that (34a) and (34b) carry slightly different implications: (34a) implies that all the hay was loaded, but the truck is not necessarily full. (34b), on the other hand, implies that the truck is full, but not that all the hay was loaded. This difference is, as noted by Tenny (1992), an aspectual one. In my model the aspectual differences between the two variants follow straightforwardly: the argument that is generated at the spec of AspEM receives the interpretation of a measurer. If it is *the hay* that is generated at AspEM, the interpretation is that all the hay was loaded. If it is *the truck*, the interpretation is that the truck is full. The syntactic structure of (34) is as follows:

- a. $[_{AspOR} \text{ the farmer } [_{AspEM +EM} \text{ hay } [_{VP} \text{ load on the truck}]]]$
- b. $[_{AspOR} \text{ the farmer } [_{AspEM +EM} \text{ the truck } [_{VP} \text{ load with hay}]]]$

I assume that the verb is adjoined to some higher functional head, so that the surface word order is achieved.

This alternation poses a problem for lexical-entry driven theories, because the Theme argument of the alternating verbs is mapped onto two different positions (either direct object or an object of a preposition). This problem does not exist in my model. In fact, there is no alternation: the two meanings result from the possibility of the verbs to generate any of its arguments at the spec of AspEM, and from aspectual information being assigned at aspectual projections rather than determined by lexical entries. Dowty's (1991) claim, that either of the arguments could potentially be Incremental Theme (p.595), is straightforwardly entailed in my model. There is no need to assume that these verbs allow both their "Theme" argument and their "Goal" argument to function as a measurer (Tenny 1992). Needless to say, there is no need to postulate two lexical representations for these verbs (Levin and Rappaport 1988). As for the lexical content of the preposition which the verb selects, I assume that any lexical item categorized as P (or, for that matter, any Case marker) would do. A sentence such as "The farmer loaded the hay around the truck" may be ruled out by world knowledge, but not on syntactic grounds.

4.3.3 Experiencer verbs. Experiencer verbs pose a problem to lexical-entry driven, thematically-based approaches, because of such pairs as the following (examples from Pesetsky 1995):

- (38) a. Bill was very angry at the article in the Times.
(subject Experiencer)
- b. The article in the times angered/enraged Bill.
(object Experiencer)
- (39) a. Bill was satisfied/content with the Chinese dinner.
(subject Experiencer)
- b. The Chinese dinner satisfied/contented Bill.
(object Experiencer)

- (40) a. John worried about the television set.
(subject Experiencer)
b. The television set worried John.
(object Experiencer)
- (41) a. Bill was furious about/fumed about the article in the Times.
(subject Experiencer)
b. The article in the Times infuriated Bill.
(object Experiencer)
- (42) a. Bill fears/is afraid of Ghosts.
(subject Experiencer)
b. Ghosts frighten Bill.
(object Experiencer)

In the sentences above an argument bearing the thematic role Experiencer is mapped into the subject position in the (a) sentences, and into the object position in the (b) sentences, thus violating UTAH. A possible solution (the one suggested by Pesetsky) is to assume that the role assigned to the object in the (a) sentences is not identical to that assigned to the subject in the (b) sentences (contra Belletti and Rizzi 1988, who assume that both of these are Themes). Pesetsky suggests that the objects of the (a) sentences bear the role **Target** (of emotion, e.g. 38a) or **Subject Matter** (of emotion, e.g. 40a). The subjects of the (b) sentences, on the other hand, bear the role **Causar**.

Pesetsky then postulates a thematic hierarchy:

- (43) Causar > Experiencer > Target/Subject Matter

The Causar role (subjects of the (b) sentences) is mapped into the subject position, the Target or Subject Matter roles (objects in the (a) sentences) are mapped into the object position, and Experiencer is mapped higher than Target/Subject Matter, but lower than Causar. The UTAH can now be maintained, but at the cost of complicating the system of

thematic roles without any independent motivation⁷, and, in addition, a stipulated hierarchy has to be invoked.

The solution I suggest does not make use of theta roles, but rather, of the aspectual properties of those predicates. It has been noted (Grimshaw 1990, Tenny 1992, 1994) that the events that the (a) sentences describe are atelic. In fact, they are States. On the other hand, the (b) sentences describe, at least according to one of their readings, telic events: telicity is expressed by a change of state that the object undergoes: Bill becomes angry, content, furious or frightened. This change of state determines the endpoint of the event: the event described by *fear* (42a) is unbounded. We have no way to know (unless some external context is provided) when it ends. As for the event described by *frighten* (42b), speakers seem to vary in their judgements: some consider it a telic event, which terminates once Bill has become frightened⁸. Others, on the other hand, judge it as ambiguous between a telic event and a state, or a generic statement: *Ghosts frighten Bill* is construed as a generic statement, not a single event, and therefore cannot be interpreted as telic. On the other hand, *The neighbour's dog frightened Bill yesterday* is construed as a single event, and therefore can be interpreted as telic⁹. For my purposes it is important to note only that *fear* is always atelic, whereas *frighten* (at least) allows a telic interpretation.

It turns out that the difference in the syntax of "Subject Experiencer" and "Object Experiencer" predicates correlates with a difference in their aspectual properties: "Subject Experiencer" verbs do not project an AspEM node (or project it unspecified). Thus, no telic interpretation is given to the event. They also lack an AspOR node. This means that the verb's event structure specifies neither a beginning nor an ending. This is the event structure I assume for stative predicates, and *fear* is indeed a State. "Object Experiencer" verbs, on the other hand, project an AspEM node, that may either be specified or unspecified¹⁰. When it is specified it gives the event a telic interpretation, and the

⁷Does the fact that there is indeed a truth conditional difference between "X worried Y" and "Y worried about X" suffice to postulate two distinct thematic roles? It is not evident that subtle truth conditional differences have any effect at the interface with the syntax.

⁸An appropriate context, in particular temporal adverbs and progressive tense, can render it atelic. Consider the sentence *Loud noises have been frightening John for years*.

⁹The two interpretations correlate with different tenses in Italian: the first takes the imperfect tense, the second - perfect tense. The interaction of grammatical aspect and tense with lexical aspect is beyond the scope of this paper.

argument that fills it is marked with an Accusative Case and serves as the measurer of the event. The precise conditions under which AspEM is unspecified must await further research. However, I believe that the basic event type that *frighten* describes is telic (this is more evident with other "Object Experiencer" verbs such as *enrage*, *infuriate*, and *worry*), and only outside modifications such as progressive or present tense render it atelic.

Instead of specifying the different thematic roles that these predicates assign, their lexical entries specify the number of arguments they take and aspectual information:

fear: [NP, NP, atelic, non agentive]
frighten: [NP, NP, telic]

(44) [_{TP} Bill [_{AspEM} ghosts [_{VP} V]]]

(45) [_{TP} ghosts_i [_{AspOR} t_i [_{AspEM +EM} Bill [_{VP} V]]]

The fact that *frighten* is telic entails that it projects a specified AspEM node. *Fear* also has an AspEM node, where accusative Case is assigned, but it is obligatorily unspecified, so no telic interpretation arises.

When dealing with Experiencer predicates, Tenny (1994) argues that an argument bearing the Experiencer role can either measure out the event (and is then mapped into the direct object position), or not (and then it is mapped into the subject position). Thus, children not only have to learn individual linking rules and labels such as "Experiencer" and "Theme", but also to cope with the fact that those labels are aspectually ambiguous (i.e., either measure out the event or not). In my model, the child has to learn that only the argument that is marked as a direct object may measure out the event. Assuming that the primary data the child has are utterances, I believe it is easier for her to discover whether the direct object (a syntactic position, which is easily identified) measures out the event, than whether the Experiencer role that the verb assigns may be construed as undergoing some change.

Tenny's model associates aspectual properties with syntactic positions. In particular, only arguments which are direct objects may measure out the event. However, lexical

¹⁰Note that "Object Experiencer" verbs mark their objects with an accusative Case, whereas "Subject Experiencer" verbs tend to mark their non-subject argument with a preposition (although there are some exceptions to this, such as *like*, *love*, *adore*, *dislike*, *hate*, *detest*). This has to do with the correlation between telicity and accusative Case, which I discussed before.

specifications on arguments determine whether they can be construed as measurers (Tenny argues that the Experiencer argument of *frighten* undergoes some change, hence may be construed as a measurer, whereas the Experiencer argument of *fear* does not, and therefore cannot be a measurer). Tenny assumes mapping, whereas I assume constraints on association of semantic interpretations with structural positions: in particular, I argue that only the argument generated at AspEM can be interpreted as a measurer (thus no argument in the subject position can be one). In addition, interface information allows *frighten* to project a specified AspEM, and requires that *fear* do not, thus avoiding a telic interpretation of *fear*.

Dowty (1991), following Croft (1986), mentions that the predicates in the (a) sentences are always stative, whereas those in the (b) sentences can either be stative or inchoative, and then they involve a change of state. Change of state, according to Dowty, is a Proto-Patient property. Thus, the argument with respect to which the verb entails the property of change of state will make a "better" Patient. This follows straightforwardly in my model: the argument generated at the position where telic interpretation is assigned will be the measurer, namely, the argument undergoing change of state. Lexical entailments such as those assumed by Dowty are entailed, in my model, with respect to syntactic positions, rather than arguments in the VP. Dowty's "Argument Selection Rules" do not form a lexically-determined linking mechanism, but rather are "a constraint on what kind of lexical predicates may exist in a natural language, out of many imaginable ones" (ibid., 576). My model is in line with Dowty's theory. The association of measuring out and of originating an event with two separate syntactic positions can serve as such constraints.

5 Summary

In this paper I argued in favour of a theory of the syntax-lexicon interface in which the burden of keeping the correct interface is shared by the syntax and the lexicon, rather than placed exclusively upon the latter. I showed that such a theory reduces substantially the amount of information that lexical entries should contain in order to project well-formed structures, and that it captures the descriptive fact, ignored by most other theories, that meaning is entailed by predicates with respect to structural positions, rather than particular arguments. I also showed that it predicts some correlations between aspectual interpretation and Case marking, and that it can account for lexical alternations without assuming multiple lexical entries, or other unmotivated solutions.

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