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The Theta System

Argument Structure at the Interface

Edited by
MARTIN EVERAERT,
MARIJANA MARELJ,
AND TAL SILONI
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General Preface

The theoretical focus of this series is on the interfaces between subcomponents of the human grammatical system and the closely related area of the interfaces between the different subdisciplines of linguistics. The notion of ‘interface’ has become central in grammatical theory (for instance, in Chomsky’s recent Minimalist Programme) and in linguistic practice: work on the interfaces between syntax and semantics, syntax and morphology, phonology and phonetics, etc. has led to a deeper understanding of particular linguistic phenomena and of the architecture of the linguistic component of the mind/brain.

The series covers interfaces between core components of grammar, including syntax/morphology, syntax/semantics, syntax/phonology, syntax/pragmatics, morphology/phonology, phonology/phonetics, phonetics/speech processing, semantics/pragmatics, intonation/discourse structure, as well as issues in the way that the systems of grammar involving these interface areas are acquired and deployed in use (including language acquisition, language dysfunction, and language processing). It demonstrates, we hope, that proper understandings of particular linguistic phenomena, languages, language groups, or interlanguage variations all require reference to interfaces.

The series is open to work by linguists of all theoretical persuasions and schools of thought. A main requirement is that authors should write so as to be understood by colleagues in related subfields of linguistics and by scholars in cognate disciplines.

In the current volume the editors bring together international scholars to consider how lexical semantics relates to syntactic structure. All of them use the Theta System developed by Tanya Reinhart as a springboard for their investigations. The chapters present how the system works, and examine, extend, and critique its core theoretical commitments and its application to novel empirical domains. As a whole the volume is an in-depth exploration of the fecundity of this approach to the lexicon–syntax interface.

David Adger
Hagit Borer
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<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
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<td>first person</td>
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<tr>
<td>1s</td>
<td>class 1 (animate singular) subject agreement</td>
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<td>3</td>
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<td>argument</td>
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<td>agreement</td>
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<td>Argument Structure Nominals</td>
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<td>British National Corpus</td>
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<td>BY</td>
<td>by-phrase</td>
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<td>C</td>
<td>complementizer</td>
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<tr>
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<td>cause change</td>
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<td>CAUS</td>
<td>causative</td>
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<tr>
<td>CauseP</td>
<td>Cause Phrase</td>
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<tr>
<td>CCF</td>
<td>crucial contributing factor</td>
</tr>
<tr>
<td>COCA</td>
<td>Corpus of Contemporary American English</td>
</tr>
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<td>COND</td>
<td>conditional</td>
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<td>Complementizer Phrase</td>
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<td>Computational System</td>
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<td>CSH</td>
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<td>DP</td>
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<td>Abbreviation</td>
<td>Definition</td>
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<td>------------</td>
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<tr>
<td>E</td>
<td>event</td>
</tr>
<tr>
<td>ECM</td>
<td>Exceptional Case Marking</td>
</tr>
<tr>
<td>EIC</td>
<td>emission verbs involving cause</td>
</tr>
<tr>
<td>En-search</td>
<td>encyclopedic search</td>
</tr>
<tr>
<td>EP</td>
<td>Experiencer Phrase</td>
</tr>
<tr>
<td>EPP</td>
<td>Extended Projection Principle</td>
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<tr>
<td>Ev</td>
<td>event variable</td>
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<tr>
<td>F/FEM</td>
<td>feminine</td>
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<td>F, F₁, F₂</td>
<td>functional nodes</td>
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<td>focus</td>
</tr>
<tr>
<td>FSP</td>
<td>First Sister Principle</td>
</tr>
<tr>
<td>FUT</td>
<td>future</td>
</tr>
<tr>
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<td>final vowel</td>
</tr>
<tr>
<td>GABLE</td>
<td>graded accessibility by lexical encoding</td>
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<td>GEN</td>
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<tr>
<td>GF-changing processes</td>
<td>grammatical function changing processes</td>
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<td>Head Movement Constraint</td>
</tr>
<tr>
<td>HPSG</td>
<td>Head-Driven Phrase Structure Grammar</td>
</tr>
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<td>I/Infl</td>
<td>inflection</td>
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<tr>
<td>ILL</td>
<td>illative</td>
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<td>INF</td>
<td>infinitive</td>
</tr>
<tr>
<td>Init</td>
<td>initiator</td>
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<td>InitP</td>
<td>Initiator (i.e. causing) Projection</td>
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<td>IP</td>
<td>inflectional phrase</td>
</tr>
<tr>
<td>LAA</td>
<td>Local Accountability Assignment</td>
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<td>Lex</td>
<td>lexicon</td>
</tr>
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<td>LF</td>
<td>logical form</td>
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<td>Lexical Functional Grammar</td>
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<tr>
<td>LHM</td>
<td>Long Head Movement</td>
</tr>
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<td>LN</td>
<td>lexis-nexis</td>
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<tr>
<td>LocP</td>
<td>Locative Phrase</td>
</tr>
<tr>
<td>LSR</td>
<td>lexical semantic representation</td>
</tr>
</tbody>
</table>
Abbreviations

T  tense
ToBy  Theory of Body Mechanism
ToMM  Theory of Mind Mechanism
TOP  topic
Top  infinitival to Phrase
TP  Tense Phrase
TRANS  transitive

UAH  Universal Alignment Hypothesis
UG  Universal Grammar
Unacc  unaccusative

V  verb
v  ‘little v’
VoiceP  Voice Phrase
VP  Verb Phrase
vP  ‘little v’ Phrase
VS  verb–subject order

WS  working structure

XP  X (variable) Phrase
1

The Theta System: an Introduction

MARTIN EVERAERT, MARIJANA MARELJ, AND TAL SILONI

1.1 Background

The lexicalization of concepts and the way aspects of meaning interact with syntactic structures have been at the core of theoretical linguistics since its beginning. Three major topics have been the focus of an ongoing investigation: (a) the type of information relevant for determining argument structure, (b) the way these pieces of information are encoded so that they are usable by the computational system and by the inference system, and (c) the mapping from lexico-semantic information onto syntactic structure.

Ever since Gruber (1965) and Fillmore (1968), thematic (θ) roles have been playing a central role in the transmission of lexical information crucial for syntactic structure and its interpretation. Thematic roles (Agent, Theme, Experiencer, and the like) represent the relation between arguments of a verb (or other part of speech) and the eventuality it denotes. They have been said to define the role participants play in the eventualy and determine the order in which these participants are merged.

However, the exact semantic content of θ-roles and their inventory have been left essentially unsettled. With a few exceptions (e.g. Williams 1981, Levin and Rappaport 1986), θ-roles have been generally mentioned as informal labels providing a convenient classification (e.g. Grimshaw 1990). As time went by with no real progress in these respects, scholars started raising serious doubts about the definability of θ-roles and the empirical adequacy of their classification. As observed by Dowty (1991)...

Marijana Marelj’s work was supported by a grant from the Netherlands Organization for Scientific Research (NWO), which we hereby gratefully acknowledge. We are grateful to the participants in this volume for their contribution as well as for their help in the process of reviewing. We are also indebted to our external reviewers: Sharon Armon-Lotem, Sergey Avrutin, Michal Ben Shachar, Eugenia Birger, Chris Collins, Marcel den Dikken, Teresa Guasti, Julia Horvath, Roni Katzir, Christopher Piñón, Omer Preminger, Elizabeth Ritter, Galit Sasson, and Ivy Sichel. Finally, we would like to thank the editors at Oxford University Press for their patience and assistance in the course of the preparation of the manuscript.
among others, the assumed θ-role classification seemed unable to capture relevant empirical generalizations across θ-roles; it did not give rise to natural role classes.

Moreover, the rules specifying the linking of θ-roles to syntactic positions were in a similarly unsatisfactory state. Since Jackendoff’s seminal work (1972), there has been a strong belief that linking between semantic and syntactic categories is predictable. Not all linking, however, turned out to be as straightforward as the linking between Agents and Subjects. The initial solution offered by the literature was linking hierarchies (see e.g. Jackendoff 1972; Pinker 1984; Grimshaw 1990; Kiparsky 1987; Bresnan and Kanerva 1989), where the mismatch is typically resolved by assuming the existence either of a canonical or of a non-canonical linking hierarchy. Such analyses proved not without problems in the domain of acquisition (see Pinker 1984, 1989; Bowerman 1990). Instances of varying mapping of Experiencers and Instruments also remained difficult to capture.

It should, therefore, not come as a surprise that by the beginning of the 1990s the achievements of theta theory were considered inadequate (Jackendoff 1987; Rappaport and Levin 1988; Dowty 1991). This led among other things to recurring attempts to eliminate the traditional θ-roles, deriving them by means of syntactic functional categories or syntactic feature-sets. This, in turn, has placed the controversy regarding the division of labour between the lexicon and the syntax in the limelight of linguistic theory.

Reinhart’s Theta System takes a different perspective—and to our mind a substantial step forward—concerning the investigation of these intriguing issues. The framework has undergone several developments in Reinhart’s texts and presentations on the topic (1991; 1996; 2000; 2001; 2002; 2005; 2006). Reinhart (forthcoming, b) is a posthumous publication, which introduces and presents the Theta System in the most exhaustive way. The present introduction offers a short tour into the Theta System, aiming to help the reader to evaluate the merits of the Theta System project with respect to some of the core issues at the relevant interfaces, and to be able to understand the papers in the volume from a wider perspective on the system. Importantly, the papers, although relevant to the system and to each other, are autonomous units that do not assume preliminary knowledge of the Theta System.

The next section presents the workings and the underpinning of the Theta System. Section 3 gives a brief overview of the contributions in this volume.

1.2 The Theta System

1.2.1 The transitive–unaccusative alternation: puzzles

Reinhart’s initial empirical domain of interest (see Reinhart 1991; 1996; 2000) is the transitive–unaccusative alternation (also referred to as the causative–anticausative alternation). In the quest for the definition of the set undergoing the alternation, she examines three possibilities: (i) an aspectual definition of the set of unaccusative alternatives, (ii) a thematic definition of the set of unaccusative alternatives, and (iii) a thematic definition of the set of transitives undergoing the alternation.
The first two definitions attempt to find the common denominator of the set of unaccusative verbs, which, in turn, should imply that they have to assign their sole role VP-internally. The aspectual definition takes the event encoded by the verb as the defining property; eventive intransitives—not statives (activities and states)—are unaccusatives (e.g. van Valin 1990; Borer 1994). Reinhart argues against this option, showing that tests distinguishing between eventive and statives (e.g. sequence entailments) prove that not only eventives (e.g., fall, break) but also activities (e.g. spin, develop) are members of the unaccusative set. The thematic definition identifies the Theme/Patient theta-role as the common denominator. If the Theme role is mapped-(VP)-internally across the board (independently of how many roles the verb assigns), it follows that all intransitive verbs with a Theme role on their grid must map this role internally. Reinhart also rejects this option, on empirical grounds. She points out that there is a set of unergative verbs—the so-called emission verbs, e.g. glow, sparkle, buzz (Levin and Rappaport-Hovav 1995)—whose subject fails diagnostics of internality, although it is arguably a Theme.

Having explored the possibilities for capturing regularities in the set of unaccusative verbs, Reinhart turns to the examination of the transitive alternatives to these verbs. She uncovers a puzzling problem of selection, observing that the transitive alternative of unaccusatives can have an Agent, Cause, or Instrument as its external role (1), unlike the subject of other transitive verbs (e.g. read), which do not have an unaccusative counterpart (2).

(1)  a. Max[Agent]/a gust of wind[Cause]/a key[Instrument] opened the window.
     b. The window opened.

(2)  a. Max[Agent]/*interest[Cause]/*the glasses[Instrument] read the book.

As mentioned, the standard assumption has been that lexical entries specify not only the number of \(\theta\)-roles they select, but also their thematic label. But if that is all we have in order to account for \(\theta\)-selection, then the transitive alternate of unaccusatives appears to select three different external \(\theta\)-roles, as illustrated in (1a). How is this information stored? One option is that verbs such as open are listed as three lexical entries. Another option—in line with the lex parsimoniae—is that Agent, Cause, and Instrument are, in fact, different instantiations of the same role type, which allows for three different interpretations (modulo context).

Reinhart originally aimed at finding a solution for the selection problem just discussed, and solving the mapping problem of unaccusatives, as well as other predicates (see Reinhart 1991; 1996; 2000). But it ultimately developed into building up a system that aids the understanding of the interface between the system of concepts and the computational system, directly, and the Inference systems, indirectly.
1.2.2 Building blocks of the framework

The Theta System is envisaged as the central module of the mental system of concepts. It consists of the following components:

(3) a. Lexical entries, which are coded concepts, with features defining the $\theta$-relations of verb-entries (and other categories).

b. Marking procedures, which ‘prepare’ verbal (and other) entries for the syntactic derivation: determine merging properties of arguments (i.e. determine which arguments merge externally and which internally) and assign an ACC(usative) feature to the verb in the relevant cases.

In addition, the system utilizes a set of lexical arity (valence changing) operations. That is, it advocates an active lexical component, which allows for manipulation of $\theta$-grids by arity operations.

This section offers a brief presentation of the Theta System. Section 1.2.2.1 presents the feature composition proposed by Reinhart for $\theta$-relations (roles). Section 1.2.2.2 discusses the mapping of verbs onto syntactic structure, based on the feature makeup of their roles. Finally, section 1.2.2.3 discusses the advantages of some of the basic tenets of the Theta System (e.g. directionality of derivation) beyond the mapping puzzles and basic issues of $\theta$-selection presented in the two subsections that precede it.

1.2.2.1 $\theta$-relations: feature clusters

The Theta System views $\theta$-relations and aspect as two independent systems that have some interface, causality being relevant for both. In concert with Dowty (1991), Reinhart does not view $\theta$-roles as primitives.1 In the Theta System theta roles are decomposable in terms of primitive features.2 These features have an impact on both the syntactic and semantic components. The feature composition of clusters determines their syntactic mapping. In addition, it is legible to the inference system: it is not erased by the syntactic engine, but passed on through the derivation. All the $\theta$-roles are formally coded in terms of two binary features: $+/-c$ (cause change) and $+/-m$ (mental state).

Clusters in the Theta System encode the basic causal relationships. The pivotal importance of causality and sentience (mental state) are recognized in many—if not all—works on argument structure (see e.g. Grimshaw 1990; Jackendoff 1990; Dowty 1991). The reasons why this state of affair holds is perhaps also not surprising.

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1 See Marellj (2004) for a comparison of the Theta System and Dowty’s system; Marellj shows how some of the relevant results of Dowty’s system can be translated and captured in Reinhart’s system.

2 Note that the decomposition of $\theta$-roles in terms of features is already addressed in Zaenen (1988) and Rozwadowska (1988).
As pointed out by Dowty, ‘we concern ourselves all the time; both in everyday life and in the courts of law, sometimes to a painstaking degree, with whether an act was really volitional or not, with whether something really caused something or not, whether somebody was really aware of a state or an event or not’ (Dowty 1991: 575).

Before turning to the full set of clusters that these features give rise to, let us get the feel of their use. The feature $c$ determines whether or not the argument in question is necessarily responsible for causing the event denoted by the verb. Both Agent and Cause arguments bring about the denoted event and are therefore positively valued regarding the feature $c$, namely, they are specified $+c$. The difference between them is that agency involves properties of volition and intention. These properties are captured by the feature $m$, which determines whether or not the mental state of the argument in question is relevant to the event denoted by the verb. Agents have a $+m$ specification as their mental state is relevant for the event they take part in (are participants in), while the mental state of Causes can be relevant or irrelevant to the event, and hence they are unspecified with regard to the feature $m$. Thus, the Agent corresponds directly to the $[+c+m]$ cluster. Cause is $[+c]$; it is unspecified for mental state, which means it can be realized by an inanimate Cause argument (a natural force, ambient condition, and the like), an Instrument, or an Agent. The difference between an inanimate Cause argument and an Instrument is that the latter never causes the event by itself but only in association with an explicit or implicit agent.

The formula $[-c+m]$ is a faithful formalization of the perception of the Experiencer role. A participant standing in that role-relation to the event is perceived as not causing the event (not standing in a cause relation to the event); rather the event concerns this participant’s mental state. In contrast, the Theme is a participant whose mental state is irrelevant to the event, nor does it trigger the event in question; its feature combination is therefore $[-c-m]$.

The complete set of feature clusters and their more traditional role labels are given in (4). The ‘pairing’ between the clusters and $\theta$-role labels in (4) is for expository purposes only. Many of the clusters have varying contextual interpretations. It is nevertheless convenient to have some proto-names for the clusters. Therefore, they are labelled here by the role that they are most typically related to. Below, the clusters and their nature are further commented on.

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3 Marelj (2002) proposes a principle of full interpretation of $\theta$-roles, which requires that underspecified clusters be interpreted as fully specified at the level of interpretation. The requirement is a subject to the Non-Identity Constraint (Marelj 2002), which bans the co-realization of two identical clusters at all relevant interface levels. The Non-Identity Constraint is comparable to the Uniqueness Constraint of Carlson (1998), after Bresnan (1982b), or the Thematic Diversity of Pesetsky (1995) (see Marelj 2002; 2004 for elaboration).
### (4) $\theta$-clusters

<table>
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<tr>
<th>Cluster</th>
<th>Traditional label</th>
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<tbody>
<tr>
<td>a. $[+c+m]$</td>
<td>Agent</td>
</tr>
<tr>
<td>b. $[+c-m]$</td>
<td>Instrument</td>
</tr>
<tr>
<td>c. $[-c+m]$</td>
<td>Experiencer</td>
</tr>
<tr>
<td>d. $[-c-m]$</td>
<td>Theme (Patient)</td>
</tr>
<tr>
<td>e. $[+c]$</td>
<td>Cause</td>
</tr>
<tr>
<td>f. $[+m]$</td>
<td>Sentient</td>
</tr>
<tr>
<td>g. $[-m]$</td>
<td>Subject matter/target of emotion (typically oblique)</td>
</tr>
<tr>
<td>h. $[-c]$</td>
<td>Goal/benefactor (typically dative/PP)</td>
</tr>
<tr>
<td>i. $[\emptyset]$</td>
<td></td>
</tr>
</tbody>
</table>

(5) summarizes the notation used in the Theta System:

#### (5) Notation

a. $[a] = $ Feature cluster $a$.

b. $/a = $ Feature (and value) $a$.

\[\text{e.g. the feature } /+m \text{ occurs in the clusters } [+c+m], [-c+m], \text{ and } [+m] \]

c. $/[a] = $ A cluster one of whose features is $/a$.

\[\text{e.g. } /[c] \text{ clusters are } [-c+m], [-c-m] \text{ and } [-c] \]

d. $[+] = $ A cluster ALL of whose features have the value $+$

\[\text{e.g. } [+] \text{ clusters are } [+c+m], [+c], [+m] \]

d. $[-] = $ A cluster ALL of whose features have the value $-$

\[\text{e.g. } [-] \text{ clusters are } [-c-m], [-c], [-m] \]

The clusters (4a–d) are fully specified, with a value for both features. As mentioned, the $[+]$ cluster $[+c+m]$ (a) has a fixed $\theta$-role interpretation as Agent, and the $[-]$ (all minus) cluster $[-c-m]$ (d) also corresponds stably to what has been labelled the Theme (Patient) role. The 'mixed' clusters (with both $+$ and $-$ values) (b and c) are more varied in their role interpretation. They most typically correspond to the Instrument and Experiencer, respectively (they also have some related uses which are not covered by any of the existing $\theta$-role labels—see e.g. Potashnik, Chapter 10 below, and Horvath and Siloni 2011).

The underspecified clusters in (4e–h), which are referred to as 'unary clusters', have an even greater range of interpretation. A verb selecting a $[+c]$ (Cause) cluster can be realized by an Agent, (inanimate) Cause, and Instrument argument. The feature-value $[+m]$ has not been identified as an independent $\theta$-role before. In the Theta System it is labelled Sentient. Arguments with this feature cluster are the subjects of verbs such as *see*, *hear*, *love*,
know, believe, which have previously been viewed as instances of the Experiencer role. In their interpretation, Sentients \([+m]\) and Experiencers \([-c+m]\) are hard to tease apart. Syntactically, \([+m]\) differs from \([-c+m]\) since it always merges externally, unlike the standard Experiencer, which has varying realizations (see 1.2.2.2).^4

The unary \([-\] \) clusters \((4g, h)\) have the widest range of thematic realizations. They always merge as internal arguments, and are usually introduced by a preposition (or bear dative/oblique case). The syntactic correlate is that a DP realizing such clusters cannot check accusative case, as will be discussed in section 1.2.2.2. The feature-value \([-m]\) corresponds to the subject matter/target of emotion role, discussed by Pesetsky (1995).^5

Unlike the \([-c-m]\) (theme), \([-m]\) can, but does not have to, be interpreted as causing the event. Thus, for instance, the argument her health in Lucie worries about her health is a \([-m]\) argument; it can, but does not have to, represent also the cause of the worry. Whether or not it is interpreted as the cause depends on the context. Possibly, for example, it is the doctor who is the cause of her worry. If an argument cannot be interpreted as standing in the cause relation to the event, it must be specified as \([c-\] \), as is the case with the goal, e.g. to Lucie in Max sent a book to Lucie. The mental state of the goal can be relevant or irrelevant to the event; hence, it corresponds to \([-c]\), underspecified with regard to the feature /\(m/\) (for discussion and elaboration, see Mare\(\text{l}j\) 2002; 2004).

The system further allows the empty list \([\emptyset]\) cluster—fully underspecified with respect to both /\(c/\) and /\(m/\). Mare\(\text{l}j\) (2004) has argued that the empty role is operative in lexical middle-formation. Ackema and Mare\(\text{l}j\) (Chapter 9 below) explore its relevance for the theta-grid of light verbs, and Siloni (forthcoming) has suggested that lexical reciprocal verbs utilize the \([\emptyset]\) cluster.

With the above classification of roles, the selection puzzle that transitive verbs of the open type raise (see (1) above and the related discussion) is immediately solved. Such transitives— unlike read or write (2)— select a \([+c]\) role. Since the mental state of \([+c]\) is unspecified, it can be interpreted as an Agent, a Cause (natural force, ambient condition), or an Instrument, modulo the context. Moreover, this also captures the distinction between verbs that have an unaccusative alternative (the open type), and

---

^4 Though in many instances it is difficult to tease apart Sentients from Experiencers, there are independent reasons to assume that the former exist. Verbs of perception like see and hear are claimed in the system to be \([+m]\) verbs. Notice that \([+m]\) coding should, in principle, allow this role to be interpreted not only as Experiencer \([-c+m]\), but also as \([+c+m]\)—roughly, an Agent. Whereas in most contexts, ‘seeing’ is something that ‘happens’ involuntary, there are also cases in which the Perceiver is deliberate, or at least active, in bringing about the eventuality in question, as in He saw her with the binoculars. The fact that we can license an Instrument (recall that Instru\(\text{ments/}\) are dependent on the presence of an implicit or an explicit Agent) seems to suggest that this kind of role is indeed different from the canonical Experi\(\text{encer/}\), whose participation in the event is restricted to its mental state being relevant without any further involvement in bringing the state about.

^5 Pesetsky distinguishes between two roles: subject matter, which is the role he attributes to verbs such as worry (the subject matter of the worry), and target of emotion (the argument that is evaluated by the experi\(\text{encer/}\) as part of ‘the emotional episode’), which is attributed to verbs such as anger. These two types of role are usually lumped together by philosophers under the cover term ‘object of emotion’. In the feature system, they both correspond to the \([-m]\) cluster.
verbs that do not. The latter select an Agent [+c+m] cluster, while the former select a Cause [+c] role.

The set of [+c] transitive verbs is coherent across languages, modulo a small number of sporadic gaps, which can be filled or created in the history of a language (e.g. the transitive arrive does not exist in Modern Hebrew, but is attested in earlier stages). We resume discussion of these gaps in section 1.2.3.

Still, the fact that we have identified the set of unaccusative verbs as having a [+c] transitive alternate does not yet explain why their Theme argument needs to merge internally, unlike the theme argument of theme-unergative verbs, such as glow. Section 1.2.2.2 discusses the way the Theta System handles mapping.

Prior to that, however, let us also briefly discuss what properties of the concept system enable its interface with the inference system (through the computational system). For this to be possible, the $\theta$-features must be legible also to the inference system.

First we need some approximation of what causal perception is. We are talking here about perception of eventualities in the world and not about language. Shen (1985), based on work on causality perception by Rumelhart (1975) and Miller and Johnson-Laird (1976), defines three causal relations that humans use in order to organize their perception of eventualities: The relation enable holds when one event is perceived as a necessary condition for the occurrence of the second. In (the events reported in) (6a), Max could not have drowned unless he had entered the swimming pool. But it is not a sufficient condition, since many people enter swimming pools without drowning. The relation cause holds when the first event is conceived as a sufficient condition for the second. The glass falling in (6b) is sufficient condition for it to break, keeping in mind that this is a perception-driven, and not the logical concept, of sufficient conditions. But it does not seem to be a necessary condition, since there are other ways a glass could break. A cause relation holds also when one event is both a necessary and a sufficient condition for another event. The relation motivate holds when either enable or cause hold, and in addition, a mental state mediates the events. In (6c), being depressed is a sufficient condition for jumping off the roof (cause), but it is a mental state condition.

(6)  a. Max entered the swimming pool and drowned.
    b. The glass fell on the floor and broke.
    c. Max was depressed, so he jumped from the roof.

Ehrich (2002) mentions that Hume’s definition of the relation cause (further developed by Lewis 1973) is that ‘a given event $e_1$ is to be considered the cause of a second event $e_2$, iff $-$ ceteris paribus $-$ $e_2$ wouldn’t have happened, unless $e_1$ had happened before’. In other words, cause is defined as a necessary condition. Note that in the present system this corresponds to the enable relation. The point is that in our actual perception of causality, we would not describe this relation as cause (e.g. we would not say that Max’s entering the pool caused him to drown), unless the first event is also perceived as a sufficient condition for the second.
We may note now that there is a certain correlation between these relations and the \( \theta \)-relations we have been assuming. Suppose Max wants to peel an apple with a knife. The availability of an apple is a necessary condition for the execution of his will, but not a sufficient one, that is, the *enable* relation holds (an apple alone does not lead to its peeling). The availability of a knife, on the other hand, is a sufficient condition, more precisely, it is a subset of the sufficient conditions, which need to include also Max as the Agent. So the *cause* relation holds. But the fact that Max is, say, in the park at the time of his desire, and that it is morning, are neither necessary nor sufficient conditions for the execution.

More specifically, the idea is that a \( /+c \) feature corresponds to the *cause* relation and is associated with a participant whose relation to the event denoted by the verb is perceived as providing (by its existence or actions) a sufficient condition for that event to take place. A \( /+m \) feature is associated with a participant whose mental state is relevant for the event and corresponds to the *motivate* relation. As in the case of motivate, it does not, itself, determine the causal relation of the argument to the event (that is, whether it provides a sufficient condition). The crucial question in identifying the \( \theta \)-cluster of an argument is whether it could serve as a *cause*, namely, form a sufficient condition or be a member of a set of such conditions. The latter instance arises in the case of the Instrument role, which does not provide a sufficient condition alone. However, the set \{Agent, Instrument\} together forms a sufficient condition. The relation *enable* does not correspond to any positively valued feature: \([-c-m]\) is an enabling condition.

1.2.2.2 *Mapping* Since Grimshaw (1979; 1981), Pesetsky (1982), and Chomsky (1986), the hope has been that mapping/linking can be explained as a consequence of semantic selection aided by principles of UG that map semantic categories onto syntactic categories and syntactic positions. The way verbal concepts are formally coded in the Theta System reflects the view of the ‘epistemological priority’ (Chomsky 1995a) of the primitives of semantic selection (i.e. theta-roles) over the primitives of c-selection (i.e. syntactic categories), as originally proposed by Pesetsky (1982).

In the Theta System, linking is deducible from the verb’s semantic selection (i.e. theta-roles) via principles of UG that map semantic categories onto syntactic ones. The mapping procedure of the system includes a marking operation that ‘prepares’ entries for merging (7) and specific merging instructions (8). The system adopts the notation of Williams (1981), where merging instructions are built into the lexical entry by indices: 1 marks the external role, and 2 an internal one. Of course, the lexicon marking of indices does not apply individually to each verb, but is uniformly determined by the feature composition of the verb’s roles/clusters as detailed in (7).
Lexicon marking

Given an \( n \)-place verb-entry, \( n > 1 \)

a. Mark a \([-]\) cluster with index 2.
b. Mark a \([+]\) cluster with index 1.
c. \( V \) with a \([+]\) cluster and a fully specified cluster \([/a/ -c]\) is marked for \( \text{ACC} \).

Merging instructions

a. When nothing rules this out, merge externally.
b. An argument realizing a cluster marked 2 merges internally; an argument
   with a cluster marked 1 merges externally.

The feature clusters fall into the three classes given in (9).

\[\]

\( -\) clusters: \([-c-m], [-c], [-m] \)

\( +\) clusters: \([+c+m], [+c], [+m] \)

'mixed clusters': \([-c+m], [+c-m] \)

\( -\) clusters as in (9a) are marked with index 2 by (7a), and \( +\) clusters as in (9b) with
index 1 by (7b). Importantly, one-place verbs do not undergo any marking. Economy
underlies the intuition behind that: since the external position must always be filled,
arguably on EPP grounds, it is less economical to derive this in two steps (first merge
internally and then remerge/move), when a one-step derivation is allowed.\(^7\) One-
place entries simply map externally. This is also the reason why in general external
merger is preferred, if possible (8a). Finally, the Theta System determines whether or
not a verb carries the accusative case feature based on the clusters it selects. This is
handled in a systematic fashion by the marking procedure, as detailed in (7c).

Lexical operations are assumed to follow marking and affect case specification:

Generalizations regarding lexical operations

a. Lexical operations follow marking.\(^8\)
b. Lexical valence reducing operations reduce the \( \text{ACC} \) feature.

Thus, the present system captures mapping on the basis of the feature values of
clusters. As is clear from the table in (11), the system gives rise to three different
cluster types: feature clusters that obligatorily merge internally (11a), feature clusters
that merge only externally (11b), and additional feature clusters that are not marked,
and are therefore free to merge in either position (11c), depending on whether there is
another argument that obligatorily merges externally.

\(^7\) This preference—known as the Merge-over-Move preference—is also standardly assumed in the
Minimalist Program (see Chomsky 1995a; 1998), where the timing of expletive insertion was considered
as a primary empirical motivation to assume that Merge is cheaper than Move.

\(^8\) The ordering specified in (10a) is not a crucial trait of the system. It can be replaced by constraining the
marking instructions to apply to any \( n \)-place verb entry where \( n > 1 \) and there is no \( n+1 \) verbal instantiation
of the same concept, where \( n \) is a proper subset of \( n+1 \) (Siloni 2002).
Mapping summary

<table>
<thead>
<tr>
<th>Type of cluster</th>
<th>Clusters</th>
<th>Marking</th>
<th>Mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>([-c\text{–}m]) (Theme)</td>
<td>2</td>
<td>Internal</td>
</tr>
<tr>
<td></td>
<td>([-c]) (Goal)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>([-m]) (Subject matter...)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>([+c\text{+}m]) (Agent)</td>
<td>1</td>
<td>External</td>
</tr>
<tr>
<td></td>
<td>([+c]) (Cause)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>([+m]) (Sentient)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>Mixed</td>
<td>None</td>
<td>If a [+\text{]} cluster is present, internal; otherwise, external</td>
</tr>
<tr>
<td></td>
<td>([-c\text{+}m]) (Experiencer)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>([+c\text{–}m]) (Instrument)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Since there is only one external argument per verb, it follows that no lexical entry can realize more than one [+\text{]} cluster at the same derivation, e.g. both an Agent and a Cause; this is an uncontroversial consequence. The lexicon marking operation does not impose any merging order among the internal [-\text{]} roles (which are all marked here with index 2, regardless of how many of them the verb has). However, other considerations of the computational system may do so. Marelj (2005) and Preminger (2006) argue that internal arguments can merge in either order modulo case considerations.

There are two feature clusters that have mixed values, namely those corresponding to Experiencers and Instruments. Hence, they are not assigned any index. This means that these roles may have varying syntactic realizations. In such cases, the merging instruction (8a) determines that if nothing prevents this (e.g. there is no argument marked 1), these arguments merge obligatorily as external arguments. For the mapping of the empty role, see Ackema and Marelj (Chapter 9 below).

To make things more concrete, consider transitive lexical entries such as open (\([+c\text{]} [-c\text{–}m]\)) and write (\([+c+m] [-c\text{–}m]\)). They are marked for the accusative feature by (7c), their [+\text{]} role is marked with index 1 by (7b), and their [-\text{]} role with index 2 by (7a). Hence, their [+\text{]} role is merged externally; their [-\text{]} role is merged internally and checks the accusative feature of the verb.

Having briefly presented the way the system deals with the syntactic mapping of Agentive and Causative transitive verbs, let us see now how the system tackles some of the more notorious mapping puzzles. Section 1.2.3 discusses the solution that the Theta System offers to the mapping of unaccusatives versus Theme-unergatives. It also shows that the operation forming unaccusatives is also responsible for the formation of subject-Experiencers.
1.2.3 Decausativization: Theme-unaccusatives/unergatives and subject/object-Experiencers

The Theta System enables us to solve the selection problem that transitive verbs such as open pose (see 1.2.2.1). Such verbs allow an Agent, Cause, or Instrument external role, because they select a [+c] cluster, which is unspecified for mental state and therefore realizable by each of the three. The system also allows defining the set of intransitive unaccusatives: intransitives that have a transitive alternate with a [+c] role on their grid are unaccusatives.

Following proposals by Chierchia (2004) and Levin and Rappaport Hovav (1995), Reinhart argues that the derivation responsible for the transitive–unaccusative alternation takes a transitive input and forms an unaccusative output (Rappaport Hovav and Levin, Chapter 6 below, offer a different view). Specifically, she argues that the unaccusative output is derived by a lexical operation reducing the [+c] role of the transitive alternate altogether.

Reinhart was of course aware that it has often been argued that total reduction of a role is in fact illicit (see e.g. Koontz-Garboden’s (2007; 2009) recent monotonicity hypothesis, which disallows operations deleting roles/operators from lexical-semantic representations). Let us then see why she believed reduction was a licit lexical operation. Importantly, according to Reinhart, lexical information does not involve (ordered) λ-formulas, e.g. \( \lambda y\lambda x\lambda e(\text{break}(e) \& \text{Agent}(e, x) \& \text{Theme}(e, y)) \). Lexical information includes formal, semantic, and thematic information (θ-roles). Let us explain this.

The order of the \( \lambda \)-operators in a semantic representation necessarily reflects the order of merging, i.e. structural hierarchy. Structural hierarchy, in turn, is not always dictated by lexical information only. Case considerations, for instance, may affect the order of merging (see 1.2.2.2). Hence, semantic representations must be read off (composed from) syntactic structure. (Attempting to build the full argument hierarchy into the lexicon would amount to duplicating the syntax in the lexicon.)

Eliminating an argument from a semantic representation would indeed be logically illicit. But if lexical entries do not involve \( \lambda \)-formulas, nothing blocks role reduction in the lexicon, which forms a new lexical entry (derivationally related to the input). Dimitriadis (Chapter 12 below) provides more elaboration and argumentation along these lines.

The advantages of adopting a reduction operation are discussed in detail by Horvath and Siloni (2011) and summarized below. Let us first see how the Theta System derives the mapping of one place Theme-unaccusatives and one-place Theme-unergatives. Reinhart and Siloni’s (2005) specific formulation of the operation deriving unaccusatives, which they label ‘Decausativization’ (‘Expletivization’ in Reinhart’s 2002 terms), is given below.
Decausativization: reduction of a [+c] role

\[ V_{\text{ACC}} (\theta_{[+c]}, \theta_j) \rightarrow V (\theta_j) \]

When the Decausativization operation applies to transitive entries such as *open*, the output is an unaccusative verb, as schematized in (13). By (10a), Decausativization applies to the marked entry. Hence the role remaining after the [+c] reduction is marked by index 2. The index is legible to the computational system, which maps the corresponding role internally by (8b). Thus, the resulting intransitive is unaccusative (13c). As stated in (10b) above, lexical valence reducing operations reduce the ACC feature of the verb; hence the remaining role ([-c–m]) is associated with nominative case. In languages that morphologically mark arity operations, such as Romance and Slavonic languages or Hebrew, the output tends to bear ‘reduction’ morphology, typically, the clitic *se/si* in Romance and Slavonic and the *hitpa‘el* template in Hebrew.

(13) Unaccusatives: break, open, close

a. Decausativization input: \( V_{\text{ACC}} [+c], [-c–m]_2 \)
b. Decausativization output: \( V [-c–m]_2 \)
c. The door\(_k\) opened \( t_k \)

This solves the mapping problem posed by the unaccusatives. Underived intransitives (14), in contrast, regardless of the thematic role they select (be it an Agent (14a) or a Theme (14b)), are not subject to lexical marking because they are one-place entries (12). Hence, by (8a), they map their sole role externally (14c, d).

(14) a. Agentive unergatives: *walk*, *run*, \( V [+c+m] \)
b. Theme-unergatives: *glow*, *tremble* \( V [-c–m] \)
c. Max ran.
d. The diamond glowed.

Thus, quite like Agentive intransitive verbs (14a), underived Theme intransitive verbs always map externally. In contrast, derived Theme intransitive are unaccusatives. It is their derivational history that determines that their Theme argument is merged internally.

Decausativization (12) applies to any transitive entry that has a Cause, a [+c] role on its grid. When applying to an object-Experiencer verb like *worry* (15a), it derives a subject-Experiencer verb (15b):

(15) a. The doctor/the world/intimidations\(_{[+c]}\) worried Max\(_{-c–m}\)

\[ \text{Cause} \quad \text{Experiencer} \]

b. Max\(_{-c–m}\) worried

\[ \text{Experiencer} \]

Various researchers (see Pesetsky 1995; Tenny 1998; Marelj forthcoming) have provided evidence that subject-Experiencer derivations are syntactically unergative.
This being the case, we have a mapping puzzle at hand; the same Experiencer role sometimes maps internally (15a) and sometimes externally (15b). The Theta System derives this variation straightforwardly. Recall that the Experiencer internal makeup is \( [-c+m] \), a mixed cluster. Being a mixed cluster, it is exempt from the marking in the lexicon (7). As a consequence, after \([+c]\) reduction, this cluster is mapped externally, by (8a). Thus, the varying mapping of Experiencers (15) is straightforwardly captured in the Theta System.

Note further that the advantages of assuming Decausativization go beyond resolution of the mapping puzzle presented above. First, under the Decausativization approach to unaccusatives, the fact that the set of one-place entries (intransitives) splits into a subset of unaccusatives and a subset of unergatives is captured. Whereas the former are derived by \([+c]\) (Cause) reduction, the latter are underived–basic monadic entries. Regardless of whether their sole argument is an Agent or a Theme, they are syntactically unergative.

As mentioned in section 1.2.2.1, the transitive counterpart of certain unaccusatives may be missing idiosyncratically in a given language. However, if we look across languages, an overwhelming majority of unaccusative verbs (possibly all) do have a transitive alternate in some language or another or in earlier stages of the language. Reinhart assumes that in such cases the unaccusative entry is derived from an input frozen in the lexicon (unable to be mapped onto syntactic structure). Horvath and Siloni (2008a) define the notion of frozen input and suggest theoretical motivation for its existence. Fadlon (Chapter 8 below) provides evidence in favour of the psychological reality of frozen lexical entries.

Secondly, it is straightforward why Agentive transitives (write) do not undergo reduction as their external role is not a cause \([+c]\), but an Agent \([+c+m]\). Since such verbs do not have an unaccusative alternate, the contrast between (1b) and (2b) follows. Last but not least, Horvath and Siloni (2011) show that the Decausativization approach allows explaining why the transitive member of the unaccusative and Experiencer alternation must have a \([+c]\) (Cause) role; in other words, why transitive verbs with an Agent (or Sentient/Experiencer) cannot undergo reduction. They suggest that a cognitive principle underlies the ban against reduction of roles involving a mental state, /+m.

(16) Conceptualization of eventualities cannot disregard participants (roles) whose mental state is relevant to the eventuality (i.e. specified /+m).

Indeed, conceptualization of eventualities triggered by a cause is possible even in the absence of the Cause. Humans can conceptualize the eventuality open abstracting away from the cause of the opening event (although every opening event is caused by something). In contrast, in conceptualization of eventualities brought about by Agents, humans are unable to disregard the causing entity; they perceive it as an inherent part of the eventuality. Thus, humans’ cognition is unable to envision the
eventuality write without a writing entity. Under reduction, it immediately follows from (16) that the transitive alternate of unaccusatives must have a Cause external role \([+c]\), as (16) bans reduction of a mentally involved causer, that is, an Agent \([+c+m]\). See Rappaport, Hovav, and Levin (Chapter 6 below) for a different view.

1.3 Volume overview

Tanya Reinhart (1943–2007) did not get to pursue the Theta System any further. Nonetheless, there has been continual research on the characteristics of the system, evaluations of its merits and drawbacks, and proposals for refinement. The goal of this volume is to presents the Theta System, examine its underpinnings, explore its advantages, and suggest further developments and improvements. Though an overview of alternative proposals to argument structure is beyond the scope of this volume, the presentation and critical examination of and the comparison with alternative proposals are not absent from it. In all its aspects, the volume is multidimensional and rich. Contributors include not only researchers adhering to different frameworks but also researchers working in different linguistic fields (be it semantics, syntax, morphology, or language acquisition). The book is an important contribution to linguistic research as it presents and evaluates a relatively new framework that successfully deals with kernel issues of linguistics. Furthermore, the fact that it is actively engaged in a dialogue with both the competing lexicalist and syntactic approaches on a broad array of lexico-semantic issues gives this book an extra dimension. In empirical terms, the volume not only examines some of notorious puzzles from a new theoretical perspective, but also brings new data and findings to light.

Discussing the linguistic expression of causation, Ad Neeleman and Hans van de Koot (Chapter 2) argue that natural language predicates involve a causing event neither in their lexical-semantic representation nor in their syntax. This goes against much recent literature that decomposes predicates into their meaning ingredients, including a causing event for causal predicates. The authors convincingly argue against the arguments found in the literature in favour of event decomposition (Pylkkänen 2008; Ramchand 2008). Among other things, they reject the common claim that (simplex) causal predicates must express direct causation (Fodor 1970; Katz 1970; Bittner 1999; Wolff 2003; and Rappaport Hovav and Levin, Chapter 6 below). This claim, if correct, would imply that causal predicates have to include a causing event, as in its absence, it is impossible to require that it be contiguous to anything. Causal predicates, according to the authors, code a crucial contributing factor (CCF) (comparable to the \([+c]\) cluster) and the culmination of an event in an end state or a resultant activity. The effects attributed to direct causation are derived using the notion of accountability, which requires the presence of the /m feature and expresses what might be described as responsibility for the caused event.
Martin Haiden (Chapter 3) defends the notion of $\theta$-role. Haiden explicitly argues against lexical event decomposition. Inter alia, he argues that the syntactic realization of roles calls for the assumption of two orthogonal scales of prominence: causation and intentionality. But decomposed phrase structures do not easily lend themselves to the expression of multiple, orthogonal scales of prominence. Haiden offers a cognitive foundation for the features composing $\theta$-roles under the Theta System. He argues that these features encode the explanatory constructs of a modular theory of event perception: $/c$ encodes causation, and $/m$ encodes intentionality.

‘Combine’ is suggested by Edwin Williams (Chapter 4) as a unique, parameterized, generative function in grammar. Williams surveys principal findings in the domain of head movement (including affix hopping), mirroring and non-mirroring effects, and theta structure to substantiate his proposal. Further, he argues that there must be two different generative systems in which Combine is operative: (i) the phrasal system called ‘syntax’ (subsuming Merge), and (ii) the word system called ‘derivational morphology’. He thus opposes syntactic decomposition approaches, which advance a single syntactic system.

Hagit Borer’s contribution (Chapter 5) is a detailed study of the properties of derived -ing nominals versus those of -ing synthetic compounds. In particular, Borer meticulously shows that while -ing nominals are compositional and have the event structure, -ing synthetic compounds do not. She further argues that these contrasts may only be accounted for by a ‘strong’ syntactic approach to the derivation of complex words. In particular, they can only be accounted for under complete syntactic event decomposition, which severs not only the external but also the internal argument(s) from the root.

Malka Rappaport Hovav and Beth Levin (Chapter 6) take a middle-of-the-road approach. They argue that agentive verbs such as write, which do not have an anticausative (unaccusative) alternate, are lexically specified for two arguments: a Theme and an Agent. This hypothesis is supported by the fact that these verbs impose selectional restrictions on both arguments. Transitives that do alternate do not impose such a selectional restriction on the external role appearing with them (as shown by Reinhart’s work). Rappaport Hovav and Levin take this to indicate that they are syntactically (de)composed. That is, the external role appearing with them is not lexically selected, but added syntactically to the basic monadic anticausative. This view of the alternation departs from Reinhart’s approach and from their own 1995 view, which derive the anticausative member from the transitive one. The authors argue that their present proposal better captures certain distributional properties of the alternation, i.e. why certain alternating verbs do not always permit both alternates for every choice of theme and why other verbs have unexpected causative uses. Under their approach, a transitive variant exists when the introduced cause role meets a direct causation condition (but see Neeleman and van de Koot, Chapter 2). They further argue that merger of the cause is obligatory when the change of state is properly contained within the causing event (hence, in such cases, there is no unaccusative alternate).
Both Reinhart and Rappaport Hovav and Levin (Chapter 6) believe that the anticausative alternate is devoid of any information regarding its cause. It is well known that anticausative structures fail standard diagnostics identifying an implicit argument. Nonetheless, it has been argued that the anticausative contains a causal ingredient in its lexical-semantic representation (Chierchia 2004; Koontz-Garboden 2009) or in the syntactic tree (e.g. Alexiadou and Anagnostopoulou 2009; Alexiadou, Anagnostopoulou, and Schäfer 2006; Kallulli 2006; 2007). One of the common arguments in favour of this approach relies on the fact that anticausative structures allow for the insertion of cause adjuncts (PPs, ablatives, and the like) across languages. These adjuncts are argued to be licensed by the putative cause element that the anticausative involves.

György Rákosi (Chapter 7) puts this argument under scrutiny in a study of ablative causes in Hungarian. Rákosi shows that ablative causes can also appear outside anticausative constructions, but with a contribution that appears to be constant across the board. He argues that these causers introduce causation by themselves, and are not licensed by a presumed underlying cause ingredient of the main predicate. If so, then their availability with anticausatives cannot serve as an argument that anticausatives involve a cause ingredient. Rákosi’s analysis distinguishes between low and high ablatives. The former, he argues, along lines proposed by Reinhart (2006), are thematic adjuncts (Marelj 2004; Rákosi 2006), while the latter are adjuncts merged in the left periphery of clause structure. His analysis is anchored in the Theta System.

Beyond the distributional properties observed by Rappaport Hovav and Levin (Chapter 6), it is well known that there are sporadic gaps in the anticausative alternation across languages. As mentioned in section 1.2.2.3 above, Reinhart argues that Decausativization in these cases operates on an entry unavailable to syntactic merging, an entry ‘frozen’ in the lexicon. This assumption has often been criticized as an ad hoc, unfalsifiable theoretical tool to be avoided (see e.g. Borer, Chapter 5).

Julie Fadlon (Chapter 8) argues that frozen entries are not unfalsifiable theory-internal constructs. Her chapter reports the results of a psycholinguistic experiment she designed to test the psychological reality of frozen entries. The experiment tested the cognitive accessibility of the Cause upon use of three types of unaccusatives in context. The results show a three-way split, from most accessible to less accessible, between: (i) verbs whose transitive alternate is an actual word in the vocabulary, (ii) verbs whose transitive alternative is argued to be a frozen entry, and (iii) verbs systematically lacking a transitive alternative across languages. The fact that the Cause is cognitively more accessible with verbs of type (ii) than those of type (iii) suggests that the former have a (frozen) transitive alternative in the lexicon, unlike the set in (iii).

Peter Ackema and Marijana Marelj, Joseph Potashnik, and Aya Meltzer-Asscher elaborate on proposals comprised in the Theta System. Their contributions provide
support for and refine various aspects of the Theta System. Peter Ackema and Marijana Marelj (Chapter 9) explore the empty role option offered by the Theta System. They argue that the empty list cluster is not a conceptual artefact of the Theta System, but a basic theta-role on the grid of light verbs. They use the verb HAVE as their case study. They argue that, in all its guises, it is a light verb. Under the assumption that there is only one HAVE, formalized in terms of $[\emptyset]$ on its grid, they derive all the various uses of HAVE. They advance an unergative analysis of HAVE and derive its inability to passivize, using a general constraint banning passivization of light verbs in general.

Joseph Potashnik (Chapter 10) argues that the assumption that the procedure of lexicon marking (6) does not apply to underived monadic predicates is superfluous. His study examines the class of emission verbs analysed by Reinhart as Theme- unergatives (see 1.2.1 and 1.2.3). He suggests an alternative account for their (external) mapping, and analyses the transitive alternation some of them exhibit. Potashnik tests the thematic nature of the sole role of emission verbs by means of an experiment he designed to diagnose a causal implication. Based on the experimental results, Potashnik argues that the internal makeup of the subject of emission verbs is $[+c \text{-} m]$. Hence, on the Theta System it is predicted to merge externally, by (7), rendering unnecessary the exemption of monadic predicates from the lexicon marking. Further, he argues that the transitive alternation attested by some emission verbs is nonderivational, and predicted by the Theta System, as discussed by Reinhart (2002; forthcoming, b) with regard to the so-called manner verbs (e.g. drill).

Aya Meltzer-Asscher (Chapter 11) offers a comparative study of verbal passives. As is well known, the demoted argument in verbal passives is semantically accessible (unlike that of unaccusatives, as discussed above). Based on a meticulous comparison of passives in English versus Hebrew, Meltzer-Asscher argues that the syntactic accessibility of the implicit argument may differ across languages: in English it is syntactically accessible, but not in Hebrew. She suggests that in English the external role is assigned to an empty category in the syntax (along lines proposed by Baker, Johnson, and Roberts 1989, Borer 1998, and Collins 2005). In Hebrew, in contrast, it is assigned at the level of interpretation (as suggested by Horvath and Siloni 2008b) to a variable bound by an existential operator (Chierchia 2004; Reinhart 2002; forthcoming, b). Meltzer-Asscher shows that passives in Hebrew exhibit thematic restrictions unattested in English, which are easily derivable from her analysis cast in the Theta System approach.

Alexis Dimitriadis (Chapter 12) proposes event semantics for the Theta System. He develops a semantic implementation of the system’s primitives, based on a straightforward embedding of the system in the event semantics of Davidson (1967) and Parsons (1990). In the model he proposes, the $\theta$-role inventory of a stored lexical entry is a set of unordered feature clusters. Only at a later stage are the clusters conjoined into a single model-theoretic function that expresses the verb’s denotation.
This architecture turns out to account in a natural way for certain distributional asymmetries between various arity operations. In particular, certain arity operations seem to be able to apply in certain languages in the lexicon and in others in the syntax (see Reinhart and Siloni 2005; Mareš 2004; Siloni 2008; forthcoming), while other operations are restricted to the lexicon (Decausativization). It turns out that arity operations applying in the syntax are exactly those that can be expressed as basic manipulations of the corresponding semantic denotation.

Under the Theta System, a small set of mapping instructions capture the distinct mapping of predicates, based on the internal makeup of their clusters and the derivational history of the predicate. The thematic properties of unaccusatives and their transitive alternates are taken to be universal. A priori, then, it is expected that children map unaccusatives correctly from the outset. However, Borer and Wexler, in their influential (1987) study of maturation, have argued that A-movement is not operative at the early stages of acquisition. Subsequent studies have argued that unaccusatives projecting a preverbal subject are misanalysed as unergatives by children at the early stages, as they fail to apply A-movement (e.g. Babyonyshev et al. 2001; Borer and Wexler 1992; Wexler 2004). João Costa and Naama Friedmann (Chapter 13) report the results of a dozen experiments—seven structured tests of sentence repetition and story retelling, and five different analyses of spontaneous speech corpora—conducted to assess the production of unaccusatives and unergatives by children acquiring Hebrew and European Portuguese. The results indicate that children younger than two years already have A-movement, distinguish between unaccusatives and unergatives, and correctly project their syntactic structure, in accordance with the predictions of the Theta System.
The Linguistic Expression of Causation

AD NEELEMAN AND HANS VAN DE KOOT

Causal relations are imposed by humans on the input from the world, and the linguist’s task is to understand what it is about language that enables speakers to use it to describe their causal perception. (Reinhart 2000: 38; forthcoming, a)

2.1 Introduction

The main claim of this chapter is that causation, as commonly understood in the philosophical and psychological literature, is not fully expressed in natural language predicates. The standard scheme for causation matches neither the syntactic structure projected by causative predicates nor their lexical semantics. What a predicate can do is emulate causation by other means, albeit imperfectly.

As a point of departure, we should provide a definition of causation. Any theory of causation (in the general sense, rather than the narrow linguistic sense) adopts the clauses in (1a) and (1b) below. In addition, a dependency must hold between the causing event and the caused event, in that the caused event takes place as a consequence of the causing event. Perhaps the best-known formulation of this dependency is due to Lewis’s (1973) counterfactual theory of causation, which can be summarized as in (1c).

This paper owes much to discussions with Robert Truswell on the linguistic expression of causation. These took place between September 2004 and June 2007, and Rob had the mistaken impression that they were about the content of his forthcoming PhD dissertation. We would like to thank Zheng Shen for pointing out an error in our analysis of instruments, Reiko Vermeulen and Misako Tanaka for helping us gather native speaker judgements of the Japanese examples in section 2.5, and Satu Manninen and Jyrki Tuomainen for providing judgments of the Finnish examples in that same section. The various scenarios in section 3.3 were discussed with Emily and Jessica van de Koot and Nadja Rajgelj, among several others. We are also grateful to two anonymous reviewers for their thoughtful feedback, and to the editors of this volume for the opportunity to honor Tanya Reinhart in this way. Her work is a lasting inspiration.
Causation is a relation between two events: a causing event and a caused event. Causation has a temporal dimension: the causing event must precede the caused event. Causation is counterfactual: if the causing event had not occurred, the caused event would not have occurred either.\footnote{A less intuitive but more adequate formulation of the counterfactual condition would read: ‘If the caused event did not occur, then it must be the case that the causing event did not occur either.’}

There are numerous complications with the exact formulation of the dependency between caused event and causing event. We will mostly ignore these, as the clauses in (1a) and (1b) are sufficient to develop our argument.

It is important to realize that theories of causation are not theories about the world, but theories about human psychology and in particular about how humans understand the world. Consider a simple example. Suppose that a window breaks as a result of John swinging a hammer against it. Humans have the intuition that John’s swinging the hammer caused the window to break, but that it is absurd to claim that John’s mother meeting John’s father caused the window to break. However, if John’s mother had not met John’s father, the window would not have broken either. In other words, the definition of causation in (1c) cannot make a distinction between the two claims under discussion, even though we clearly consider one true and the other false. This disconnection between the definition in (1c) and human intuitions about causation is widely regarded as a problem for counterfactual theories, demonstrating that theories of causation are concerned with our understanding of the world and not with the world itself. If the theory of causation were intended as a theory of physical reality, human intuitions would be discarded as irrelevant and possibly misleading. It seems reasonable, then, to construe causation as one of the principles involved in the construction of our mental model of reality (see Johnson-Laird 1983 and subsequent work for discussion of mental models; see also Haiden, Chapter 3 below).

It is equally important to realise that causation is not a linguistic notion. That is, language can be used to talk about causation, but causation exists as a psychological tool for understanding the world independently of language. One argument for this comes from the observation that causal reasoning can be spared in aphasic patients. Varley (2002) demonstrates this using the performance of two patients with severe grammatical impairments on a series of reasoning tasks (see also Varley and Siegal 2002). Both patients showed profound disruptions of propositional language. Nonetheless, one patient showed well-preserved performance on all tasks; the second patient was capable of sophisticated causal reasoning, but had difficulties on tasks requiring hypothesis generation and testing.
A further argument to the same effect can be based on the behaviour of pre-linguistic children in experiments involving animations of objects moving across a surface. Such experiments show that six-month-old babies can distinguish (some) causally sound interactions between objects from impossible interactions (see e.g. Leslie 1984b; Leslie and Keeble 1987; Oakes 1994). This implies that at least some causal relations are recognized before language is acquired.

By their very nature, mental models contain a lot of very fine-grained information. It is therefore trivially true that no single linguistic expression can convey the richness of a mental model. A lot of information must be left out. In order to demonstrate this, let us return to the situation in which John swings his arm holding a hammer, and the hammer hits a glass pane that shatters upon impact. A little reflection will reveal that the causing event is quite complex. Many factors enter into the equation, including the speed with which Johns swings the hammer, the mass of the hammer, the strength of the glass, and the point of impact on the surface of the glass pane. Whether or not the glass will break can only be predicted accurately once the values for all these factors are known. We summarize the situation in (2).

(2) Contributing factors in causing event

A speaker who utters the sentence *John broke the window* may have a mental model that corresponds to (2), but the sentence itself evidently does not convey all the information accessible to the speaker. This raises the question to what extent information about causal relations is represented in linguistic expressions. Our suggestion is that the cause relation is not a primitive of the linguistic system, but that language emulates causation by using two other primitives. More concretely, we
suggest that what causative verbs encode are (i) a crucial contributing factor (henceforth CCF) and (ii) the culmination of an event in an end state (in the case at hand, the state of the pane being broken) or a resultant activity (as in an example like John spun the bottle, which means ‘John caused the bottle to rotate’). Although many predicates combine (i) and (ii), (i) is also found in a subset of predicates that are stative (and therefore non-causative). Moreover, (ii) is expressed in the absence of (i) in various unaccusative verbs. In fact, we assume that (i) could not be present in unaccusative verbs, as a CCF can only be realized as an external argument. (This assumption is comparable to Reinhart’s (2002) claim that [+c] arguments must be merged externally.)

(3) A CCF argument must be merged externally.

There is ample evidence that verbs may express states resulting from events, and factor (ii) is therefore hardly controversial. However, we should explain in more detail what we mean by factor (i). Given the complexity of the mental model (and the complexity of reality), a speaker must decide which factor is essential in a causal relation (the CCF) and which factors fall in a ceteris paribus category. For example, suppose that several burglars use a hammer in an attempt to break a particularly strong window, and that only the most muscular of them—John—succeeds. This situation can be described by saying that John broke the window, where John is presented as the crucial contributory factor. It would be odd to say that the hammer broke the window. On the other hand, if John was alone and tried to break the window first by using a brick, then by using a piece of timber, and finally by using a hammer, succeeding only in the last attempt, then the situation may be described quite naturally by saying that the hammer broke the window. In doing so, the choice of instrument is presented as the crucial contributory factor.

In summary, we propose that the linguistic representation of causative verbs (or more specifically their lexical semantics) can be characterized as in (4a). On this characterization, a sentence like The hammer broke the window can be paraphrased as ‘The hammer was the crucial contributing factor in the event that culminated in the window being broken’. This proposal is to be contrasted with theories that claim that natural language predicates may transparently express causation. Such theories entail that verbs like break are associated with the structure in (4b) at some level of representation, so that the example at hand can be paraphrased as ‘Some event involving the hammer was the cause of the window becoming broken’.

(4) a. \( \lambda y \lambda x \left[ [e \ x \ [s \ldots y \ldots]] \right] \ & \ x = \text{CCF} \)

b. \( \lambda y \lambda x \left[ e \ \text{CAUSE}([e_1 \ldots x \ldots], [e_2 \ldots [s \ldots y \ldots]]) \right] \)

2 In what follows, we will only talk about end states. We do so on the understanding that causative verbs encoding a resultant activity behave in much the same way as those encoding a resultant state.
The opposition between (4a) and (4b) is reminiscent of the distinction between theories that treat causal predicates as bi-eventive (see Parsons 1990 and Pytkkanen 2008) and theories that postulate a \textit{cause} theta-role (see Doron 1999 and Reinhart 2000; 2002; forthcoming, a). Indeed, we side with the latter, but it is important to make clear what this choice entails. There is no disagreement regarding the claim that causation as a tool for understanding the world is a relation between events. The question under discussion is whether this relation is fully realized in the semantics of causative verbs: we claim, following suggestions by Reinhart, that this is not the case. Given that causes must be events, it is somewhat misleading to use the label \textit{cause}—or the feature [+c]—for the external \(\theta\)-role of verbs like \textit{break}. Indeed, it is clear from Reinhart’s work that for her the feature [+c] is a convenient shorthand not to be confused with the notion of causing event. In particular, [+c] arguments may also be specified as [+m], and clearly events cannot have a mental state. We replace [+c] arguments by CCFs precisely to avoid any such confusion.3, 4

Note the limited scope of our hypothesis. We are claiming that natural language predicates encode only certain aspects of causation. We are \textit{not} claiming that it is impossible to use language to speak about causation or about causing events. For example, it is possible to enrich a sentence like \textit{John broke the window} with a modifier indicating what it was that John did that resulted in the window being broken. The above scenario, for example, may be described by saying that \textit{John broke the window by swinging a hammer against it}. It seems reasonable to classify the event expressed by the adjunct as a causing event. On the theory in (4b), the modifying clause could be interpreted as specifying \(e_1\) (giving rise to a formula like ‘\ldots & \left[\text{PRO swing a hammer against it}\right]\’). On our proposal, the modifier would explicitly \textit{introduce} the modifying event, giving rise to a formula like ‘\ldots & \textit{CAUSING-EVENT}(e, \left[\text{PRO swing a hammer against it}\right])’. This type of semantics is on a par with that usually assigned to temporal and locational modifiers on a neo-Davidsonian view.5 In fact, there is some evidence that this may be a better analysis than one based on specification of a pre-existing causing event in the verb’s lexical semantics. \textit{By}-phrases of the relevant type can be added to unaccusative verbs that appear to lack a causative interpretation in

3 The idea that agent is a more complex notion than \textit{cause/CCF} can also be found in other frameworks; see for example Talmey (2000: ch. 8).

4 In view of this, integration of the proposal developed here with Reinhart’s framework would merely require introduction of a \([\pm \text{ CCF}]\) feature. We could then simply adopt Reinhart’s mapping system unaltered, thereby preserving insights into experiencer predicates and so on. However, since the goal of our chapter is to defend a particular conception of the linguistic expression of causation, we cannot discuss which mapping system would be an optimal match with our proposal.

5 On the neo-Davidsonian view, verbs denote predicates of eventualities as do \textit{VP}-adverbs. Semantically, modification of \textit{VP} is expressed through coordination, as in the semantics in (i) below (see Parsons 1990).

(i) Mary walked quickly; \(\exists e \left[\text{walk}(e, \text{Mary}) \& \text{quickly}(e) \& e < \text{present}\right]\)
their absence. There is no sense of causation in (5a), for example, but there clearly is in (5b) (see section 2.5 for further discussion of causative adverbials).6, 7

(5) a. Little Orson grew into a big man.
    b. Little Orson grew into a big man by eating John McCann’s Steel Cut Irish Oatmeal.

To repeat, we admit that it is possible to give information about the causing event, but deny that the causing event is represented in the semantics of the verb.

One striking observation in support of the representation in (4a) is that cross-linguistically causative structures allow, and sometimes require, a surface realization in which the external argument of the causative predicate refers to an individual rather than an event.8 That is to say, while causation is a relationship between something that happens and another thing that happens, natural language predicates often represent it as a relationship between an individual and something that

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6 Throughout this paper we assume that unaccusatives do not have a causative interpretation, simply because there is no evidence to suggest that they do (see also Rákosi, Ch. 7 below). As Reinhart (2000) discusses at some length, The door opened does not mean ‘The door opened itself’. Related to this interpretive fact, there are well-known differences between unaccusatives and passives (see e.g. Roeper 1987; Levin and Rappaport Hovav 1995; Reinhart 2000; 2002). Moreover, omitted objects often have a restricted interpretation (John drinks means that John drinks alcohol, John smokes means that he smokes tobacco, etc.). No similar saturation effect is ever found with the suppressed external argument of an unaccusative verb. Of course, anything that happens in the world will have some cause, including the events described by unaccusative verbs. But if this is enough to classify a verb as causative, it leads to the conclusion that every verb describing an event is causative. We do of course know that Chierchia (1989), Levin and Rappaport Hovav (1995), and Reinhart (2000; 2002) argue that unaccusatives are derived from causatives. There are clear advantages to an analysis along these lines: it explains why in causative-unaccusative pairs it is often the unaccusative verb that is morphologically marked. However, an analysis along these lines does not necessarily imply that the causative semantics of the base form is inherited by the output of the operation of reduction. In fact, it is explicitly argued in Reinhart 2002; forthcoming, a; and Reinhart and Siloni 2005 that the operation deriving unaccusatives from their transitive alternatives reduces the [+c] role altogether (no residue of the causative semantics remains).

7 An anonymous reviewer raises the question whether there are adverbials that introduce a CCF (rather than a causing event), pointing to pairs like (i, ii):

(i) The gale-force wind broke the window.
(ii) The window broke from the gale-force wind.

Although such adverbials could exist in principle, we are not persuaded of their existence by the above examples. This is because the gale-force wind describes an event, and it is entirely possible that this event is a CCF in (i) but the causing event in (ii). In fact, the contrast between (iii) and (iv), where the gale-force wind is replaced by a non-eventive DP, suggests that such an analysis might be on the right track.

(iii) John/the stone/the hammer broke the window.
(iv) *The window broke from John/the stone/the hammer.

8 This was in fact observed by Reinhart (2002), who suggested that [+c] arguments allow a range of realizations (including as events/states), whereas [+c +m] arguments must be individuals:

(i) John/the storm blew out the candle.
(ii) John/*hunger ate the banana.
happens. This is easily understood if causative predicates have the semantic representation in (4a), as a CCF can either be an individual or an event. Proponents of the view that causing events are linguistically represented might argue that their approach is corroborated by the existence of sentences in which a causative verb takes an event as its external argument. In particular, they could argue that the causative verb in such sentences must have the lexical semantic representation in (6).

\[
\lambda y \lambda e_1 \text{CAUSE}(e_1, [e_2 \ldots [s \ldots y \ldots]])
\]

There are two serious problems with this proposal. First, the availability of (6) would predict that there are causative verbs that require an external argument that is an event (that is, verbs for which (6) is the only lexical semantic representation, rather than one that exists alongside (4b)). However, we are not aware of any verb in any language that has this property. Second, we will argue in section 2.5 that, even when a verb does take an event as its external argument, that event fails diagnostic tests for a causing event. In other words, the representation of the relevant verb must still be as in (4a)/(4b), rather than as in (6).

This leaves us with (4b) as the most plausible representation of causative verbs on the view that they encode a causing event. Indeed, much of the literature takes (4b) to be correct. For example, Hale and Keyser (1993), Ramchand (2008), and Pylkkänen (2008) all argue that there is a functional head that introduces a causing event as part of its semantics. The external argument is construed as one of the participants of this event. On our view, such an approach, while certainly feasible, requires independent evidence justifying the additional structure in (4b) as compared to (4a).

It is not so easy to imagine what kind of evidence could support the presence of a causing event ‘hidden’ in the lexical semantics of a causal predicate, as such hidden events are unlikely to be accessible to linguistic tests (see section 2.5 for a discussion of relevant tests). However, on closer inspection the literature does appear to contain strong evidence in favour of the linguistic encoding of causing events. There is very general agreement that causative constructions come in mono-clausal and bi-clausal variants, exemplified in English by *John killed Bill* and *John caused Bill to die*. Of these, the first is taken to express ‘direct’ causation, while the second is taken to express ‘indirect’ causation. Direct causation can be defined as a causative relation between contiguous events: no third event is allowed to intervene. Such a condition cannot be imposed if causative verbs have a semantic representation as in (4a). Given that (4a) lacks a causing event, it is not possible to require that this causing event be contiguous to anything. Consequently, our proposal can only be upheld if the claim that simple causatives express direct causation is wrong. By contrast, if the literature is correct and a condition of direct causation holds of simple causatives, this would only be compatible with the representation in (4b), which does contain a causing event.

We therefore begin by exploring, in section 2.2, the evidence supporting the claim that mono-clausal causatives express direct causation.
2.2 The paradox of direct causation

It is widely accepted that, at least in English, simplex predicates expressing causation must express direct causation (see: e.g. Fodor 1970; Katz 1970; Bittner 1999; Wolff 2003; and Rappaport Hovav and Levin, Chapter 6 below). The claim is nicely illustrated by Katz’s Wild West story about a sheriff whose six-shooter is faultily repaired by the local gunsmith. As a result, his weapon jams at a critical moment and the sheriff is gunned down. Katz concludes: ‘clearly, the gunsmith caused the death of the sheriff, but equally clearly, the gunsmith did not kill him.’ In other words, there is a causal chain from the gunsmith’s faulty repair to the sheriff dying, but there is reluctance in most native speakers to construe the gunsmith’s faulty repair as the immediate cause of that event.

The intuition appears clear, at least at first sight, and meshes well with the observation in Fodor (1970) that the causing event is not accessible for separate adverbial modification. Fodor’s observation is based on the contrast in (7), to which we return below. What the data in (7) are meant to show is that while complex predicates tolerate separate temporal modification of subevents, simplex predicates do not.

(7)  
   a. John caused Bill to die on Sunday by stabbing him on Saturday.
   b. *John killed Bill on Sunday by stabbing him on Saturday.

Many researchers have concluded from these facts that causative verbs in English encode direct causation. Direct causation can be defined in a variety of ways, but subtleties aside it differs from regular causation in requiring a very tight relation between the causing event and the caused event/resultant state. In particular, there cannot be a causal chain leading from the causing event to an intermediate event that in turn gives rise to the caused event. As a consequence, the causing event and the caused event are temporally contiguous (demonstrated by the contrast in (7)) and no intervening agents can exist (demonstrated by Katz’s Wild West story).

As explained in the introduction, these generalizations are important. If it is the case that simplex causative verbs are subject to special conditions that mention the causing event, then that event must be represented in the semantics of those verbs in the first place. Our reply to this challenge is to argue that the generalizations used to support the claim that simplex causatives are direct causatives are incorrect.

To begin with, it is certainly possible to use simplex causative verbs to describe situations in which the supposed causing event is separated from the caused event by intermediate events (see also Talmy 2000: ch. 8). Take a headline like ‘NHS supplies chaos killed my brother’. This headline would be appropriate for a story that relates how sloppiness in ordering supplies led to the unavailability of certain antibiotics, which in turn meant that a patient who had developed complications after a kidney transplant could not be treated and died. In the same vein, Katz’s story above can be
summarized as ‘The gunsmith’s negligence killed the sheriff’. Clearly, it would be a stretch to characterize either of these situations as involving direct causation, as one cannot reasonably speak of temporal contiguity between the causing event and the caused event: the two are separated by a potentially complex chain of intervening events.

Although the standard claim is that simplex causatives cannot be used to describe situations of indirect causation, the fact of the matter is that such usage is possible with many of these verbs. We give some representative examples below.9

(8) a. As usual, a kind word with the manager opened the door to the Stardust nightclub.
   someone speaks to manager → manager speaks to doorman → doorman opens door

b. Opening bus lanes to motorcycles will redden the streets of London with cyclists’ blood.
   opening of bus lanes → increase of accidents → cyclists’ blood on London streets

c. The launch of new iPhone contracts in May has dramatically enlarged T-Mobile’s UK market share.
   availability of contract → people enter contract → improved market share

d. A slip of the lip can sink a ship.
   loose talk → information obtained by spy → spy informs foreign navy → submarine torpedoes ship

e. Anglican Church says overpopulation may break eighth commandment.
   overpopulation → poverty → theft → theft breaks eighth commandment

f. A large fleet of fast-charging cars will melt the grid.
   many electric cars on roads → many cars charging simultaneously → high electricity demand → heating of electric cables → melting of the grid

All of these examples are compatible with situations that involve a non-trivial chain of causation, as indicated. In fact, in most cases this is the only way to make sense of the example. For instance, there is no sense in which the slip of the lip mentioned in (8d) could directly cause a ship to sink. Moreover, the situation described by the sentence in (8d) does not require temporal contiguity. Each sub-event in the scenario described by the example may be temporally separated from other sub-events. For

9 Example (8d) is the title of a 1943 Duke Ellington song. Example (8e) was taken from http://news.mongabay.com/2010/0608-hance_anglican.html on 21/9/2010. Example (8f) was taken from http://www.lowtechmagazine.com/2009/03/fast-charging-electric-cars-off-peak-grid.html on 21/9/2010. Rob Truswell (p.c.) points out that many of the examples in (8) have event descriptions as subjects. We do not think that this is a condition for licensing extended causal chains for lexical predicates. See (37) for some relevant examples.
example, the slip of the lip may take place in May, whereas the resulting attack on the convoy may take place in September. Similar observations can be made about the other examples.10

Although the data above are problematic for the view that simplex causatives express direct causation, they are fully compatible with the hypothesis that causative predicates do not encode a causing event, but instead identify a CCF. By its very nature the notion of CCF is highly flexible, and we therefore expect that the event with which it is associated can be separated from the resultant state by an arbitrary number of intermediate events as long as the various aspects of these events can be considered as belonging to the *ceteris paribus* category. Of course, the data are compatible with a theory that assumes the presence of a causing event but abandons the claim of direct causation. However, adopting such a position would be tantamount to giving up the strongest positive evidence in the literature for the presence of a causing event.

What about the argument for direct causation that could be based on Fodor’s (1970) observation that causative verbs are impenetrable for adverbial modification? Our take on Fodor’s generalization is as follows. The example in (7a) is grammatical because *on Sunday* modifies the caused event, while *on Saturday* modifies the causing event. There is no contradiction between these temporal specifications; they meet the condition that the causing event precede the caused event. However, it is important to note that even in a complex causative construction, the logic of causation imposes restrictions on the scope of temporal modifiers. Consider the example in (9), which is ambiguous: *on Sunday* can modify *die* or the macro-event *cause to die*. Crucially, the second of these readings is unavailable in (7a), because it would imply that the causing event (the stabbing) precedes the macro-event (cause to die). This is clearly incoherent, as the causing event must be part of the macro-event. (That is, the causing event is the prefix sub-interval of the macro-event and the beginning of this prefix sub-interval cannot precede the beginning of the macro-event.)

(9) John caused Bill to die on Sunday.

The ungrammaticality of (7b) can be explained in exactly the same way as the absence of the wide-scope reading of *on Sunday* in (7a). Because (7b) is mono-clausal, *on

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10 One could consider attempting to account for the data in (8) by adjusting the definition of direct causation. In fact, some such adjustments have been proposed in the literature (see esp. Wolff 2003). However, neither the notion of ‘granularity’ nor the enabling relation discussed by Wolff are sufficient to reconcile the data with the claim that simple causatives express direct causation.

An anonymous reviewer suggests that violations of the requirement of direct causation may be tolerated in certain contexts, such as headlines and non-episodic sentences. There are two reasons to be sceptical of this suggestion. First, not all problematic examples can be classified as belonging to these categories (see e.g. (8c)). Second, there is no particular reason why lexical semantic restrictions should be responsive to linguistic context or register. It is of course possible that there are other ways of defining direct causation that have the desired effect, but we will leave it to proponents of the relevance of this notion to linguistics to demonstrate this.
Sunday can only be construed as modifying the macro-event.\textsuperscript{11} This entails that the causing event must also have happened on Sunday. However, according to the information given in the adjunct, the causing event took place on Saturday. This is a contradiction.

Crucially, the ungrammaticality of (7\textsuperscript{b}) cannot be attributed to the fact that a separate temporal specification is given for the causing event. Such a separate temporal specification is admissible as long as it falls within the temporal specification of the macro-event. For example, in (10), the macro-event takes place on Sunday, which allows for the causing event to take place in the morning, with the caused event potentially taking place much later that same day. This possibility is brought out by the continuation in parenthesis.

\begin{enumerate}
\item \textit{(10)} John killed Bill on Sunday by stabbing him in the gut just after breakfast. (He died at five past ten in the evening, after having been rushed to hospital and having been operated on for several hours.)
\end{enumerate}

In this respect there is no difference with complex causatives, which also allow a matrix adverbial to specify an interval that includes the causing event (as well as the caused event).\textsuperscript{12}

\begin{enumerate}
\item \textit{(11)} Last Sunday John caused Bill to die in the afternoon by stabbing him in the gut just after breakfast.
\end{enumerate}

In conclusion, the only difference between simplex and complex causatives is that the latter syntactically project a constituent that expresses the caused event. As a consequence, complex causatives allow temporal modification of the caused event, while simplex causatives do not. However, there is no requirement of temporal contiguity between the causing event and the caused event in either simplex or complex causatives. The only requirement for which there is any evidence is that a temporal interval specified for the macro-event must include both the causing event and the caused event.

This conclusion supports our earlier rejection of the claim that simplex causatives express direct causation. But rejecting direct causation seems to go against the intuition that an account of Katz’s example above must refer to some notion of direct involvement. In the sentence \textit{The gunsmith killed the sheriff}, the gunsmith seems to be directly involved in the bringing about of the sheriff’s death; this is not true of \textit{The gunsmith caused the sheriff to die} (or of \textit{The gunsmith’s negligence killed}

\textsuperscript{11} This is of course the core of Fodor’s argument against syntactic decomposition of lexical causatives (see also Haiden, Ch. 3 below; Williams, Ch. 4 below; and Horvath and Siloni 2011; see Borer, Ch. 5 below, for arguments in favour of syntactic decomposition).

\textsuperscript{12} The analysis of temporal modification in causative environments proposed here carried over to the other types of modifier discussed in Fodor (1970).
the sheriff). In other words, at this point we have seen that there is no evidence for the notion of direct causation, but we are left without an account of the ‘Katz effect’.

Our proposal is that this effect comes about not so much because of a condition of direct causation but rather because natural language encodes accountability for certain states of affairs through a rule that mentions the feature [+m]:

(12) **Accountability**

The referent of a DP specified as [+m] is held accountable for the action expressed by the verb if and only if it is the CCF argument of that verb.

The effects of Accountability of course depend on the distribution of [+m]. We assume that all DPs that refer to entities with a mind have the feature [+m]. A subset of causative verbs selects a [+m] CCF, while other causative verbs allow merger of CCFs both with and without the feature [+m]. Therefore, an argument may carry [+m] even if it is not assigned a [+m] θ-role.

This proposal is clearly similar in spirit to Reinhart’s analysis of AGENTS as [+c+m] arguments (see Reinhart 2000; 2002; forthcoming, a), with the proviso that we replace the feature [+c] with the notion of CCF. An agent, on Reinhart’s view, is a cause with a mental state, and having a mind is a precondition for being held accountable for anything.

In the next section, we develop this suggestion in more detail.

### 2.3 Explaining the Katz effect

Let us insert an anachronistic element in Katz’s Wild West story. Following the demise of the sheriff, the gunsmith visits the local psychoanalyst because he is struggling with feelings of intense guilt. Indeed, although no one has accused him of anything, he maintains that he killed the sheriff, something the psychoanalyst tries to get to the bottom of. So, a typical exchange might include the following:

(13) **Gunsmith:** I killed the sheriff.

**Psychoanalyst:** You can’t be sure you killed the sheriff. It may have been a *Fehlleistung*. But then again you could also have made an honest mistake when you repaired the gun.

What does this exchange show? To begin with, it shows that the Katz effect cannot be absolute. If it were, the conversation in (13) would be incoherent: the gunsmith would knowingly utter a falsity. In fact, there is no reason to think that the gunsmith and his analyst disagree about the meaning of *I killed the sheriff* or about what actually happened. Rather, what they are discussing is whether the gunsmith can be held responsible for what happened. The gunsmith feels that he is responsible; the psychoanalyst is not so sure. Therefore, the disagreement is about whether the
attributor of accountability in the gunsmith's mental model is appropriate to the situation. This is a first indication that the notion of accountability rather than the notion of direct causation is relevant to the Katz example.

Why then do we normally reject the sentence The gunsmith killed the sheriff as a description of Katz's Wild West story? Not because the story implies indirect causation or an extended chain of causation between the gunsmith's actions and the sheriff's death, but rather because the story does not invite us to hold the gunsmith responsible for the sheriff's death. Indeed, the Katz effect disappears if we slightly change the story.

Suppose the gunsmith has held a long-standing grudge against the sheriff and has been pondering how to bring about his death without drawing attention to himself. One day the sheriff brings his gun in for servicing and the gunsmith sees his chance. Knowing that the sheriff always gets involved in gunfights with unsavoury characters, he decides to sabotage his gun. Sure enough, the next day there is another gunfight, and as a result of the gunsmith's action, the sheriff's weapon jams at a critical moment and he is gunned down. Given this scenario, it would be perfectly natural to answer the question Who killed the sheriff? by saying The gunsmith killed the sheriff. As in our earlier adjustment of Katz's story, this cannot be due to the scenario involving direct causation: the causal chain of events is identical to that in Katz's original story. The crucial difference is that in our adjusted story the gunsmith has the intention of causing the sheriff's death, and intentionality implies accountability.13

These observations are sufficient to demonstrate that the Katz effect cannot be used as an argument for direct causation (and thus indirectly for the presence of a causing event). However, there is more to be said about restrictions on accountability and the Katz effects they give rise to. In particular, there is evidence to support a distinction between at least three types of causative predicate with respect to the degree of 'direct involvement' they require of the external argument: (i) complex causatives like cause to die, (ii) simplex causatives like kill, and (iii) causatives implying the use of an instrument, such as shoot. This three-way distinction can be understood in terms of conditions on [+m] CCF arguments, but must remain unexplained in theories that account for Katz effects in terms of direct causation.

The weakest relation between an external [+m] argument and a resultant state is found with complex causatives. In any relevant variant of Katz's Wild West story it is possible to maintain (14).

13 See also Haiden (Ch. 3 below) on the relevance of intentionality to the perception of causality. To be sure, we do not assume that intentionality is encoded in the Theta System. Rather, we use intentionality here and below to guarantee accountability. The logic of the argument is that it is not possible to shirk responsibility for one's intentional actions. Thus, intentionality implies accountability, and accountability implies a mental state. The reverse implications do not hold.
The gunsmith caused the sheriff to die.

Recall that the referent of a DP specified as [+m] is held accountable for the action expressed by the verb if and only if it is the CCF argument of that verb. In (14) the gunsmith is the external argument of cause, but not an argument of die. Therefore, the accountability of the individual it denotes is limited to the causation event—it excludes its resultant state. In other words, although it is undeniably true that the gunsmith did something that contributed to a chain of events that culminated in the sheriff’s death, the example in (14) does not imply that gunsmith is accountable for the resultant state itself. Therefore, this example is compatible with situations in which the gunsmith is merely negligent but not guilty of manslaughter or murder.

As we have already seen, the relation between an external [+m] argument and a resultant state is stricter in a simplex causative like (15).

The gunsmith killed the sheriff.

For this example to be felicitous, the gunsmith must be accountable for the entire macro-event, which of course includes its resultant state. This is because the subject is the external argument of kill, which describes the macro-event. The consequence is that there is some sense of direct involvement in the coming about of the resultant state, but by no means anything resembling direct causation, as in principle the chain of events leading to the resultant state is unbounded. Therefore, capturing the Katz effect associated with examples like (15) requires that we are more precise about the circumstances under which we attribute accountability to a person. We propose that there is a locality effect in the computation of accountability. A person cannot be held responsible for a resultant state if there is an intervening agent in the mental model whose decisions are interpreted as instrumental in bringing about that resultant state. This idea can be stated as in (16).

Local Accountability Assignment (LAA)

Consider a mental model that contains a causal chain of events $e_1, e_2, \ldots, e_z$. If an individual who is a participant in $e_i$ is held accountable for a subsequent event $e_{n+m}$, then no individual who is a participant in $e_i$, where $e_i$ intervenes between $e_n$ and $e_{n+m}$, can be held accountable for $e_{n+m}$.

There are some parallels between our notion of accountability and the notion of direct causation in Wolff (2003). However, Wolff’s definition does not readily account for the examples in (8). For instance, in (8d), a slip of the lip, the spy’s activities, a submarine firing torpedoes, and the ship sinking are all events at comparable level of granularity, and yet the sentence can express this extended causal chain.

LAA implies that for any caused event there can be only one accountable party. However, in a causal chain there can be multiple accountable parties, each responsible for the results of their actions up to and including the event involving the next accountable party. For example, in the story involving Bronco discussed below, Bronco is accountable for the sheriff’s death, but the gunsmith is accountable for the sheriff’s gun jamming and for Bronco having the choice between shooting and not shooting the sheriff.
The condition in (16) does not forbid ascription of accountability ‘across’ participants of an intervening event in a causal chain, as long as such participants fall into the ceteris paribus category. That is, their actions must be taken for granted, and cannot be interpreted as what distinguishes the situation under scrutiny from comparable situations. This explains why the gunsmith in (13) can maintain that he killed the sheriff: he takes the actions of the outlaws (as well as those of the sheriff himself) as given, and therefore he can select himself as the accountable individual without violating LAA. The same is a precondition for using (15) as a description of the scenario in which the gunsmith intentionally sabotages the sheriff’s six-shooter.

We can demonstrate the effects of LAA by further modifying this second scenario in such a way that the shooter is presented as someone deciding on the sheriff’s fate. As we will see, this modification triggers a radical shift in our judgement of the felicity of (15). Suppose that the unsavoury character in the crucial gun fight—let’s call him Bronco—notice that the sheriff’s gun doesn’t work. The unwritten code of the Wild West militates against shooting an unarmed opponent. Bronco therefore hesitates what to do next, but, being the unsavoury character that he is, he does in the end take aim and shoot the sheriff. On this modification of the story, the question *Who killed the sheriff?* cannot be answered by saying *The gunsmith killed the sheriff*, even though the gunsmith had every intention of causing the sheriff’s death and his actions were instrumental in bringing about this resultant state. This is because (15) ascribes accountability to the gunsmith, while in the mental model there is an individual—Bronco—who participates in an event closer to the resultant state and whose actions cannot be interpreted as falling in the ceteris paribus category. This closer agent therefore blocks ascription of accountability to the gunsmith, while LAA requires the external argument of (15) to be accountable for the killing event. As a consequence, (15) does not fit the context (although (14) would, of course).

In sum, context can determine accountability for certain events in the mental model. In the scenarios discussed above, the assignment of accountability shifts up and down the causal chain depending on the perceived intentions of the participants, with corresponding variation in the degree of ‘direct involvement’ required of the CCF argument of the causative verb. This variability confirms that restrictions on the interpretation of causative predicates have little to do with the notion of direct causation.

There is a third class of causative predicate that imposes a much greater degree of personal involvement than we have seen so far. An example is *shoot*:

(17) The gunsmith shot the sheriff.

The sentence in (17) does not fit with any of the scenarios discussed so far. Even if the gunsmith intended for the sheriff to die as a result of his sabotage, it is not true that he shot the sheriff. Why should there be this difference between *kill* and *shoot?* We conjecture that this contrast originates in the fact that *shoot* specifies an instrument
(a gun), whereas *kill does not (see also Potashnik, Chapter 10 below). The presence of an instrument in the lexical semantics of a verb is relevant because instruments are associated with a user and—at least in causal contexts—with a resultant state brought about through the use of the instrument.

An immediate consequence of association with a user is that an instrument requires the presence of a [+m] CCF (compare Siloni’s (2002) Instrument Generalization). This explains why there is a contrast in acceptability between (18a) on the one hand and (18b) and (18c) on the other.

(18) a. The bandit killed the sheriff with a Colt 45.
   b. *The bus killed the pedestrian with its nearside front wheel.
   c. *The sheriff died with a Colt 45.

In (18a), the subject is a [+m] CCF, as required. In (18b), it is a CCF, but no mental state can be ascribed to it, while in (18c) the subject can be specified as [+m] but is not a CCF (not even if the sheriff committed suicide) because it is generated as an internal argument (compare (3)).

But a [+m] CCF is not enough to license the presence of an instrument in a sentence. A further condition must be met. In the prototypical case, an instrument is an object manipulated by the user to bring about a physical change through direct contact. Linguistic instruments can diverge from the prototypical case in certain respects, but nevertheless they are construed as associated with the actions of the user and, in causative contexts, with the immediate effects that these actions have. The two conditions that hold of instruments are summarized in (19).

(19) **Instrument Condition**
   Consider a mental model that contains a causal chain of events \(e_1, e_2, \ldots, e_z\).
   If an instrument is specified for an event \(e_n\), then (i) the user of that instrument must be the [+m] CCF participant of \(e_n\) and (ii) the instrument must be used to bring about \(e_{n+1}\).

The effects of the condition in (19) can be demonstrated by considering once again the scenario in which the gunsmith sabotaged the sheriff’s gun with the aim of bringing about his death. Let us assume that the means of sabotage were a few grains of sand, which the gunsmith deliberately inserted into the gun’s firing mechanism. As before, the gun jams at the critical moment and the sheriff loses his life. We can...

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16 The conditions on instruments discussed here do not apply to instruments realized as a CCF argument, as in *A Colt 45 killed the sheriff.*

17 We are uncertain about the status of the PP modifier in examples like *He read the inscription with a magnifying glass.* If such PPs are instruments, then the argument associated with instruments cannot always be a [+m] CCF and consequently the conditions on instruments licensing must be relaxed accordingly. However, it remains true that where a verb encodes a resultant state, the instrument is licensed only in the presence of a [+m] CCF argument.
describe the relevant causal sequence as in (20a). Crucially, the entire causal sequence is part of the gunsmith’s intentions. Therefore, if instruments only required the presence of a [+m] CCF, we should be able to replace x in the The gunsmith killed the sheriff with x by a wide range of expressions. However, whenever the instrument is interpreted as separated from the gunsmith’s actions because of the state it brings about, the resulting example can no longer be matched to the scenario.

(20)  

a. The gunsmith inserts sand into the gun → the gun jams → the bandit gets an opportunity to fire his Colt 45 → the sheriff dies  
b. The gunsmith killed the sheriff with a few grains of sand.  
c. *The gunsmith killed the sheriff with a Colt 45.

The example in (20b) is acceptable because the gunsmith does indeed manipulate the sand and the insertion of the sand is understood as causing the next event in the causal chain, namely the jamming of the gun. By contrast, (20c) is not a proper description of the scenario we have sketched, even though the sheriff was killed with a Colt 45 and the gunsmith took actions to bring this about. The reason for this is that the resultant state of the use of the Colt 45 is the death of the sheriff, but the gunsmith is not the person wielding that revolver.

What these examples show is that the addition to a causative predicate of an instrument taken to bring about its resultant state gives rise to a very strong form of the Katz effect: the agent must be interpreted as manipulating the instrument used to bring about that state. Thus, the flexibility in the length of the causal chain normally allowed by a verb like kill is reduced in (20c) to something coming very close to direct causation. The example can only be used in contexts in which the gunsmith himself manipulates the gun used to kill the sheriff.

Simplex causatives that specify an instrument in their lexical semantics require that this instrument brings about the resultant state expressed by that verb. In other words, there is a causative verb that means ‘kill with a gun’ (namely shoot), but there could not be a causative verb meaning ‘kill with a few grains of sand’ (on the intended reading). We speculate that the reason for this restriction lies in a condition that the interpretation of lexical predicates be self-reliant (possibly as a consequence of lexical integrity). This condition is meant to forbid reference to elements not mentioned in the semantic representation of the predicate.

An instrument realized as a syntactic adjunct can be associated with a subsequent event in the mental model (as in (20b)). However, given the condition introduced above, this is not allowed for instruments specified in a verb’s lexical semantics: they must find a subsequent event or state in the lexical semantic representation itself. It will be clear that the only component that qualifies as such is the resultant state encoded by the verb. But given that instruments must be manipulated by the [+m] CCF to which they are linked, all simplex causatives that imply the use of an instrument will of necessity trigger a sense of direct involvement of the external
argument. Therefore, *The gunsmith shot the sheriff* has restrictions on its use that come very close to those of *The gunsmith killed the sheriff with a Colt 45*. The sentence cannot be used in any of the elaborate scenarios explored in this section.

One might conjecture that it is not the presence of an instrument as such that is responsible for the stronger Katz effect observed with *shoot*, but rather the fact that, in the typical case, use of an instrument implies intentionality. It is easy to show, however, that intentionality cannot explain the relevant data. First, the observed restrictions carry over to examples like *The gunsmith accidentally shot the sheriff*, even though the presence of the adverb is incompatible with the gunsmith having the intention to shoot the sheriff. Second, verbs like *murder* lexically encode intentionality. Nevertheless, the example in (21) can be used to describe all of the scenarios sketched above, except those in which the gunsmith did not have the intention to cause the sheriff’s death. This indicates that intentionality by itself cannot be what lies behind the restrictions observed in the use of *shoot*.

(21) The gunsmith murdered the sheriff.

The contrast between *kill* and *murder* on the one hand and *shoot* on the other is part of a wider pattern. Other verbs that encode the use of an instrument also trigger the strong version of the Katz effect. Some examples are given in (22) below. We leave it to the reader to check that these can indeed not be used as a description of longer causal chains.

(22) a. John peeled the apple.
    b. The angry farmer gunned down the burglar.
    c. Antonio blindfolded the prisoner.
    d. Suzanne combed her daughter’s hair.

We do not want to suggest that the encoding of instruments is the only factor imposing restrictions on the causal chain that can be described by a predicate. Further research will have to establish what other aspects of lexical semantics enter into the equation. However, the data discussed above do warrant the conclusion that there are at least three types of causal predicate: complex causal predicates, simplex causal predicates like *kill*, and simplex causal predicates like *shoot*. It will be clear that the distinction between direct and indirect causation is not enough to capture the full set of data. In fact, when we look at actual restrictions on the use of causative predicates to describe a variety of scenarios, the notion of direct causation does not seem to play a role at all. If it did, we would expect similar effects in sentences with a $[-m]$ CCF, contrary to fact (see the data in (8)). Rather, the restrictions we have observed seem to be associated with the notion of accountability and the stricter notion of intentionality implied by the use of an instrument. The Katz effects, then, do not provide evidence for the presence of a causing event in the linguistics representation of causative predicates.
2.4 CCFs with non-causative predicates

In the preceding sections we have explored the claim that simplex causatives express direct causation, as this claim could potentially provide evidence for the presence of causing events in the lexical semantics of such causatives. We have seen that lexical causatives are not in general subject to a condition of direct causation, and that the data that have been used to argue for direct causation can in fact be explained, and explained better, in terms of accountability and intentionality.

This brings us to the second part of our argument: that the components that make up the lexical semantic representation of causative predicates are motivated independently. These same components are found—in different constellations—in the lexical semantics of verbs that are not causative. This is perhaps not a very surprising claim for resultant states that express the culmination of an event. Presumably, unaccusative verbs like *die* or *grow up* have a lexical semantic representation as in (23). These verbs encode an event that culminates in a state, but they have no apparent causative interpretation and do not express a CCF.

(23) \( \lambda y \ [ e \ [ \ldots y \ldots ] ] \)

It would be more surprising if the notion of CCF had a wider scope than just causative predicates, especially in view of the fact that CCFs are our replacement of [+c] arguments. Indeed, although CCFs are not associated with a causing event in the linguistic representation, we have so far assumed that they represent an aspect of a causing event in the mental model. In the remainder of this section, we show that this characterization of CCFs is insufficiently general. It is true that causing events can be associated with a CCF, but there is at least one further type of eventuality in the mental model that can motivate the presence of a CCF in lexical semantics.

In section 2.1 we defined causation as in (1), repeated here as (24).

(24) a. Causation is a relation between two events: a causing event and a caused event.

b. Causation has a temporal dimension: the causing event must precede the caused event.

c. Causation is counterfactual: if the causing event had not occurred, the caused event would not have occurred either.

However, there is a second relation that bears a certain similarity to causation, but that lacks its temporal dimension. We will refer to this relation as ‘maintenance’. It can be defined as in (25).

(25) a. Maintenance is a relation between two eventualities: a maintaining state or event and a maintained state.
b. Maintenance lacks a temporal dimension: the maintaining state or event must be contemporaneous with the maintained state.

c. Maintenance is counterfactual: if the maintaining state or event were absent, the maintained state would not exist either.

Maintenance is a relation in which the continuation of a particular state of affairs is dependent on the continuation of an activity or a second state of affairs. To get a sense of what we mean by this, consider the examples in (26).

(26)  
   a. The wall protects the city.
   b. John’s uncle supports him financially.
   c. The beam carries the wall above it.
   d. The sheriff upholds the law.

The typical paraphrase of these sentences uses the verb keep. For example, if the wall protects the city, then the wall keeps the city safe. What this means is that the presence of a wall around the city maintains the safety of the city. In other words, the latter—maintained—state is dependent on the existence of the former—maintaining—state. Notice that the maintaining eventuality need not be construed as a state. For example, if the cavalry protects the city, presumably it does so by riding around on horses. In this case, the maintaining eventuality is an activity.

Maintenance cannot be construed as a sub-case of causation. This is because the definition in (24) requires precedence of the causing event, while maintenance requires coincidence of the maintaining state. It does not make sense to say that the presence of the wall precedes the safety of the city in (26a). Rather, the maintained state is present as long as the maintaining state is present. So nothing happens in relations of maintenance, whereas causation is a relation between something that happens and something else that happens (namely the coming about of the resultant state).

Consequently, maintenance verbs meet a criterion of homogeneity that is not met by verbs of causation.18 It is true of every sub-interval of The wall protects the city that the wall protects the city, but it is not true of every sub-interval of The gunsmith killed the sheriff that the gunsmith killed the sheriff. In other words, verbs of maintenance, but not verbs of causation, can be classified as Davidsonian states in the sense of Maienborn (2003; 2005; 2008). One straightforward test that distinguishes Davidsonian states from events is whether or not a subsequent statement of the type ‘This happened when . . .’ is felicitous. Davidsonian states are incompatible with such anaphoric reference. As expected, the test distinguishes between verbs of causation

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18 Not even by causative verbs like transitive spin that encode a resulting activity. These verbs express the fact that the resultant activity comes about through the influence of their CCF argument. A sentence like John spun the bottle describes the situation in which the bottle goes from not spinning to spinning.
and verbs of maintenance. All verbs of causation allow this continuation; no verb of maintenance does.

(27)  a. The gunsmith killed the sheriff. This happened when Mary was in town.
    b. The wall protected the city. #This happened during the Middle Ages.

Verbs of maintenance are sometimes called ‘stative causers’ (see Kratzer 2000 and Pylkkänen 2000). This is an unfortunate choice of terminology, as on standard assumptions causation and maintenance are different relations. Maintenance can only be considered a type of causation if aspects of the definition of causation normally taken to be crucial are removed. However, the two relationships do share a notion of dependence between eventualities: just like the caused event is dependent on the causing event, the maintained state is dependent on the maintaining state or activity (this is probably what Kratzer has in mind when she calls the relevant class of verbs ‘causative’). In view of this, we suggest that verbs of causation and verbs of maintenance both have a resultant state as part of their lexical semantic characterization. However, where this resultant state is interpreted as a culmination in the case of causative verbs, it is interpreted as coexisting with and dependent on another state or activity in the case of verbs of maintenance. If so, verbs of maintenance provide a second example of an embedded state found in a non-causative predicate (unaccusatives are the first example).

There is, of course, an alternative way of interpreting the similarity. Our argument is based on the assumption that we must distinguish two relations in the mental model: causation and maintenance. They share certain characteristics, which in turn implies that their linguistic expressions are similar in certain respects (one of which is the presence of a resultant state). But it could be that what we consider two similar but distinct relations should in fact be unified. On this alternative view, the mental model would employ only a single relationship—dependence between eventualities—that would allow either an eventive or a stative implementation. Dependence would then be defined along the following lines:

(28)  a. Dependence is a relation between two eventualities: an independently existing eventuality and a dependent eventuality.
    b. Dependence is counterfactual: if the independently existing eventuality were absent, the dependent eventuality would not exist either.

But this cannot work. Generalizing over causation and maintenance implies that the temporal specification of these relationships must be removed (as precedence and overlap are distinct). However, this makes it impossible to guarantee that, where dependence is interpreted as causation, the causing event precedes the caused event. The definition in (28) would also allow situations in which the causing event follows the caused event. This is clearly the wrong result: in our thinking about the world, a cause precedes its effect. It would also make it impossible to guarantee coincidence of
maintaining and maintained eventuality, again against the way we think about the world.\textsuperscript{19}

If we are correct in distinguishing causation and maintenance as different relations in the mental model (see Meltzer-Asscher, Chapter 11 below for related discussion), we can construct an argument for CCFs as independent building blocks of lexical semantic representations. This is because verbs of maintenance seem to project a CCF argument, as we will now argue.

As was the case with causation, we can distinguish a range of factors that enter into the maintenance of a state. For example, for a city to be safe, it may not be enough that it is surrounded by a wall. Defenders need to be present, as do weapons to be used by the defenders. In addition, it may be relevant whether the city has entered into a pact with neighbouring cities or not. Further factors may include the weather or the city’s geographical location. Each of these factors can in principle function as the external argument of protect. (For example, given an appropriate scenario, a persistent easterly wind or the fog could protect the city.) This suggests that verbs of causation and verbs of maintenance share not only some notion of resultant state but also the notion of CCF. We may therefore assign them very similar lexical semantic representations, as in (29) below.

(29) a. \( \lambda y \lambda x \left[ \left[ \varepsilon, x \left[ s, y \ldots \right] \right] \right] \& x = \text{CCF} \)
b. \( \lambda y \lambda x \left[ \left[ \varepsilon, x \left[ s, y \ldots \right] \right] \right] \& x = \text{CCF} \)

Further support for the representation in (29b) comes from the observation that apparently causative verbs can receive a state reading expressing maintenance. Some representative examples are given in (30).

(30) a. These hairs obstruct the sink.
b. The government’s position on immigration annoys Mary.
c. This dial shows us the temperature of the nuclear core in our reactor.
d. The pollution in the Gulf endangers the pelican population.

Each of the verbs in (30) allows a causative reading in which some state initially does not hold, but comes into existence as a culmination of the macro event. However, they also allow an alternative static reading in which the resultant state is maintained as a consequence of some other state of affairs. For example, in (30a) the obstruction of the sink can be interpreted as a state maintained as a consequence of the presence of hairs. This suggests that the verb obstruct can have the lexical semantics in either (29a) or (29b). (Alternatively, the macro-event is underspecified and can in appropriate contexts be interpreted as either an event or a state.) As the

\textsuperscript{19} Tali Siloni (p.c.) points out another difference between verbs of causation and verbs of maintenance. The former allow reduction of their external argument (unless specified as \([+m]\)), but the latter do not. At the moment we do not know why there should be such a difference. See also n. 20.
reader can easily check, the static interpretation of the verbs in (30) is incompatible with anaphoric reference using ‘This happened…’. Such a continuation forces a causative reading.

The existence of verbs that alternate between a causative and a maintenance interpretation supports the view that CCF is a building block of lexical semantics used beyond the domain of causative predicates. Otherwise the ambiguity of the verbs in (30) would require a simultaneous change in event class and in the content of the external theta-role. This is because the theta-role in question would be classified as [+c] on the causative reading of the verb, while it could not be interpreted as such on the maintenance reading. However, although the intuition of native speakers supports an alternation in event class, we doubt that any evidence can be found for an alternation in the content of the external theta-role.20

A further speculative, but potentially very strong, argument for the existence of the semantics we have associated with verbs of maintenance comes from the interpretation of the middle voice construction (see Ackema and Schoorlemmer 2005 for an overview). In particular, we suggest that the predicate in an example like (31a) is associated with the interpretation in (31b):

(31)  a. This book reads easily.
    b. $\lambda x \text{Gen}(y) \left[ [s_3 \text{ this book } [s_2 e_3 y]] \& x = \text{CCF}_{s_2} \& e_3 = [e \ y \ x] \right]$
    c. $\text{Gen}(y) \left[ [s_3 \text{ this book } [s_2 e_3 y]] \& \text{this book} = \text{CCF}_{s_2} \& e_3 = [e \ y \ \text{this book}] \right]$

We take easily to have a hidden experiencer, while the verb has an implicit external argument. If so, we can paraphrase the representation in (31c), which results from applying (31b) to this book, as follows: the book is the crucial contributing factor in maintaining a state $s_2$ in which a generic reader experiences his or her reading event $e_3$ as easy. Or, more informally, the book is such that, if one reads it, the reading is easy. The middle in (31a) expresses a relation of maintenance because the state in which the reading is experienced as easy is maintained by the activity of reading this book. Furthermore, the book must be classified as a CCF because properties of the book are instrumental in bringing about the maintenance relation (for example, the book might be written in simple prose or printed in a pleasant font). The CCF status of the book is presumably also responsible for its external realization (see (3)).

On no analysis of middles familiar to us are they analysed as causatives. Therefore, if our characterization of middles is correct, they provide strong evidence for the claim that CCFs exist outside of causative predicates.

20 Of course, it is possible and perhaps even desirable to link the causative and maintenance interpretations of a verb like obstruct by rule. For example, the maintenance interpretation could be derived from the causative interpretation by deletion of temporal information. This does not affect our argument, as it will still be the case that we find CCF arguments (and resultant states) in verbs that do not have a causative interpretation.
The fact that CCFs can be found with non-causative predicates implies that their presence in causative predicates cannot be construed as an argument for the claim that such predicates encode a causing event. But this means that there is no longer any positive evidence for the existence of causing events in the linguistic representation, an issue we explore more fully below.

2.5 Tests for the presence of causing events

In this section we explore how causing events are represented in theories that assume a complete encoding of the causative relation in the semantics of verbs like *kill*. The most interesting proposals for current purposes assume some type of syntactic decomposition. This style of analysis goes back to generative semantics (see Lakoff 1970; McCawley 1976). McCawley argues that *Stalin killed Trotsky* has an underlying structure as in (32a), which is related to the surface representation in (32b) through successive applications of predicate raising, followed by application of a rule that spells out the resulting complex as *kill* (see (32c)).

\[(32)\]
\begin{align*}
\text{a.} & \\
S & \\
\text{Stalin CAUSE S} & \\
\text{Trotsky BECOME S} & \\
\text{BECOME NOT ALIVE S} & \\
\text{b.} & \\
S & \\
\text{Stalin CAUSE BECOME NOT ALIVE Trotsky} & \\
\text{c.} & \\
\text{CAUSE BECOME NOT ALIVE} & \implies \text{kill}
\end{align*}

The stated aim of generative semantics is to develop a theory of syntax whose underlying structures are transparent representations of sentence meaning. It is therefore striking that the representation in (32a) does not contain any hint of a
causing event. The predicate \textit{cause} relates an individual to an event. It does not relate two events. Thus, although an attempt is made to express causation syntactically, the syntactic structure used for this does not match the definition in (1).

The mismatch identified here has not gone unnoticed, and the general solution in theories assuming decomposition of causative predicates is to attribute a richer meaning than perhaps expected to the \textit{cause} predicate. Dowty (1979), for example, suggests the following definition:

\begin{enumerate}
\item If \( t \) is a singular term and \( \phi \) a formula, \textit{cause}(\( t \), \( \phi \)) is also a formula.
\item 'cause(\( t \), \( \phi \))' is true at instant \( i \) in world \( w \) iff there is a property \( P \) such that \( P(t) \) and \( \phi \) are both true at \( i \) in \( w \) and in all worlds \( w' \) that minimally differ from \( w \) and in which \( \phi \) is untrue, \( P(t) \) is untrue as well.
\end{enumerate}

The definition in (33) does two things. On the one hand, it makes it possible for the \textit{cause} predicate to take an individual as its subject. On the other, it introduces the causing event as part of the meaning of that predicate. Thus, while the singular term \( t \) cannot be a cause, \( P(t) \) can characterize (part of) a causing event. In John broke the window, the example we used in the introduction, \( P \) might be swing an arm while holding a hammer, \( t \) might be John, and \( \phi \) would be the window breaks.\footnote{The mention in (33) of worlds minimally different from \( w \) takes care of the problem of oversimplification: all other factors in the diagram in (2) are kept constant. This is important because \( \phi \) might be false and \( P(t) \) true if any of the other factors varies sufficiently. For example, the window might not break if made of bullet-proof glass.} In this way, the fact that causative verbs typically take a non-eventive subject can be reconciled with the a priori assumption that natural language expresses the concept of causation fully.

Dowty’s proposal may be an adequate characterization of the interpretation of causal predicates, but it also amounts to an admission that causation is not expressed linguistically. That is to say, the fact that causation is a relation between events does not have an expression in the linguistic structure. \( P \) is hidden in the definition of the \textit{cause} predicate, and therefore its presence cannot have empirical effects. Thus, even in these early proposals that aim to represent causation through syntactic decomposition, decomposition does not include a transparent representation of the causing event.

This mismatch between the concept of causation and its supposed syntactic expression is inescapable, because it is a fact of language that the external argument of causative predicates typically is an individual. It is therefore hardly surprising that the structure proposed in recent successors of generative semantics shares the relative opacity of the causing event seen in (32). Consider, for example, the representation of causative predicates proposed by Ramchand (2008) (see also Hale and Keyser 1993):
The representation in (34) has the same overall geometry as (32a). The $initP$ corresponds to the $S$ projected by $\text{CAUSE}$ in (32a), the $procP$ corresponds to the $S$ projected by $\text{BECOME}$, while $resP$ is a small clause whose predicate corresponds to the culminating state constituted by $\text{NOT ALIVE}$ in (32a). Given this shared geometry, (34) also does not provide a transparent representation of the concept of causation and in particular of the causing event. In fact, Ramchand’s approach to the apparent absence of a causing event in (34) is similar to Dowty’s, although technical details vary. Ramchand characterizes $initP$ as a whole as a macro-event expressing causation, and defines its head $init$ as follows:

$$[[\text{init}]] = \lambda P \forall x \forall e \exists e_1, e_2 [P(e_2) \& \text{init}^t(e_4) \& \text{State}(e_1) \& e = e_1 \rightarrow e_2 \& \text{Subject}(x, e_1)]$$

As in (33), the causing event in (35), $e_1$, is part of the semantic representation of the $init$ head but is unlikely to have syntactic effects, because it is existentially bound within this head. What is projected is a single participant of the causing event; this ‘initiator’ occupies the specifier position of $init$. Furthermore, the causal relation between the causing subevent introduced by $init$ and the event denoted by $procP$ is also not syntactically represented. It is introduced as part of the lexical semantics of $init$, very much on a par with the approach in Dowty (1979). In other words, neither the causing event nor the causal relation corresponds to a syntactic constituent, so that their presence cannot be probed by standard syntactic tests.

We could ask whether there is any other evidence that might confirm the presence of a causing event. One possibility would be to capitalize on examples like (36a), in which the subject of causative verb denotes an event. Indeed, Pylkkänen (2008) suggests that this possibility results from identification of the subject with the causing event. However, this analysis runs into severe difficulties, because the temporal specification of eventive subjects may identify them as following the resultant state, as shown by (36b, c). This is easily understood if the subject of a causative verb is a CCF: knowledge of a future event may constitute a crucial contributory factor to
events in the present. However, the grammaticality of (36b, c) is incompatible with the claim that eventive subjects identify causing events.

(36) a. Strike action by London Underground staff caused mayhem on the North Circular Road.
   b. Tomorrow’s strike by London Underground staff caused mayhem on the North Circular Road during this evening’s rush hour.
   c. London Underground staff going on strike tomorrow caused mayhem on the North Circular Road during this evening’s rush hour.

An alternative source of potential evidence for the linguistic encoding of causing events would be interpretive restrictions on the subject. For example, we accept as evidence for the existence of a resultant state in a verb like *break* that the internal argument of this verb is always such that this state comes to hold of it (in the absence of negation). In fact, the point of postulating a resultant state in *break* is this fixed interpretive effect. In principle, the presence of a causing event in a verb like *kill* could be motivated in parallel fashion. Suppose, for example, that the causing event were always a specific activity, and moreover that the external argument were always the person performing that activity. Under these conditions, we could construct an argument for the causing event based on the fixed interpretation of the external argument. But, as far as we are aware, such a fixed interpretation is absent (unless the verb encodes the use of an instrument, of course). Consider, for example, the data below, which illustrate the range of interpretations available for the subject of *kill.*

(37) a. Drinking too much wine eventually killed Leo.
   b. Whisky eventually killed Leo.
   c. A hammer eventually killed Leo.
   d. The flood eventually killed Leo.
   e. Bill eventually killed Leo.
   f. The distance to the nearest oasis eventually killed Leo.
   g. The thinness of his skull eventually killed Leo.
   h. His clumsiness eventually killed Leo.
   i. His desire to climb Mount Everest eventually killed Leo.
   j. The lieutenant’s bad mood eventually killed Leo.

We do not want to suggest that the above authors have not noticed this variability in possible external arguments. Dowty leaves open the nature of P in (33), while Ramchand introduces the external argument using a predicate labelled ‘Subject’ in (35). However, in the absence of any explicit hypotheses about the relation between the external argument and the causing event, it is not possible to use the interpretive properties of the subject as a test for the presence of that event.

A similar potential test for the presence of an embedded eventuality can be based on interpretive relations between arguments. In a ditransitive verb like *show*, the
presence of a resulting eventuality is signalled by the constant semantic relation between the two internal arguments, namely one of inclusion of the direct object in the indirect object’s visual field. Thus, if John shows Mary the picture, then Mary must be able to see the picture. Similar relations can be observed with other ditransitive verbs. However, it is never possible for two participants of the causing event to be realized syntactically. Therefore, no similar evidence can be produced for the syntactic representation of this event. Notice that it is very unlikely that the impossibility of projecting two participants of the causing event has an interpretive basis, given the wide variety of interpretations available for external arguments.

A different kind of test for the linguistic presence of causing events is suggested by Pylkkänen (2008). This author shares some of the basic ideas about argument structure with Dowty, Hale and Keyser, and Ramchand, but assumes that the causing event and the associated external argument are introduced—at least in some languages—by separate functional heads, labelled Cause and Voice. She then goes on to argue that in such languages the causing event can be present in the absence of an external argument. The evidence for this claim comes from the distribution of modifiers that mention a causing event. More specifically, Pylkkänen’s suggestion is that at least some of these modifiers can only be added to a structure that has a Cause projection (and hence an implicit causing event). Therefore, if such a modifier is licit, then this provides evidence for the presence of a causing event. The core paradigm is provided by Japanese examples demonstrating a contrast between so-called adversity causatives and various unaccusative structures. The adversity causative allows a ni.yotte modifier naming a causing event, but unaccusatives are claimed to be incompatible with such modifiers:22

\[(38)\]

a. Taro-ga senso-ni.yotte musuko-o sin-ase-ta
   Taro-NOM war-BY son-ACC die-CAUSE-PAST
   ‘Taro’s son was caused to die on him by the war.’

b. *Yasai-ga kouon-ni.yotte kusa-tta
   vegetable-NOM high.temperature-BY rot-PAST
   ‘The vegetable rotted by the heat.’

Pylkkänen uses this contrast to argue that a causing event is present in (38a) but not (38b).

The problem with this argument is that modifiers naming causing events form a heterogeneous class. Among these, there are certainly some that can be added to unaccusative structures. We have already seen an example of this in (5b), repeated

22 Not many native speakers of Japanese appear to accept the crucial adversity reading of causative constructions. We have been able to obtain judgements from nine speakers. Eight of these reject the adversity reading of causative structures altogether. The ninth accepts it, but does not permit insertion of a ni.yotte phrase. This suggests that more empirical ground work is required to determine how widespread the pattern of judgments reported by Pylkkänen is among native speakers.
here as (39a). In fact, although there are various poorly understood restrictions on the
distribution of causative modifiers, it appears that all unaccusative structures allow
the addition of at least some (see (39b–e) for examples)—a point that has been
recognized in the literature (see Alexiadou, Anagnostopoulou, and Schäfer 2006;
Kallulli 2007; Alexiadou and Anagnostopoulou 2009; Levin 2009; Rákosi, Chapter 7
below).23

(39) a. Little Orson grew into a big man by eating John McCann’s Steel Cut Irish
Oatmeal.
b. John died from pneumonia.
c. John left by taking a taxi.
d. The vegetable rotted because of the high temperature.
e. John evaporated due to his not having paid his existence tax.

It is therefore crucial for the validity of Pylkkänen’s test that the particular modifier it
relies on systematically resists insertion in unaccusative contexts. The fact of the
matter, however, is that many unaccusative contexts do allow insertion of ni.yotte
phrases. Some representative examples are given below.

(40) a. Taroo-wa hahaoya-no hukai aijoo-ni.yotte takumashikushi seichooshi-ta
Taroo-TOP mother-GEN deep love-BY strong grow-PAST
‘Taro grew strong through the deep love of (his) mother.’
b. Sono-mura-wa tekikoku-no sinryaku-ni.yotte chizu-zyoo-kara
that-village-TOP hostile invasion-BY map-on-from
shoometsushi-ta disappear-PAST
‘That village disappeared from the map because of the hostile invasion.’
c. Sono-sensuikan-wa tekikoku.no hageshii koogeki-ni.yotte chinbotsushi-ta
that-submarine-TOP hostile severe attack-BY sink-PAST
‘That submarine sank as a result of the hostile severe attack.’
d. Taro-wa senchoo-no tadaina jinryoku-ni.yotte toutou hokkyoku-ni
Taro-TOP captain-GEN great exertion-BY finally Arctic-at
tootatsuushi-ta arrive-PAST
‘Taro finally arrived at the Arctic through the captain’s great exertion.’

23 Alexiadou et al. (2006), Kallulli (2007), and Alexiadou and Anagnostopoulou (2009) use this
observation to argue that even unaccusatives may contain a causatively interpreted syntactic layer of
decomposition. We disagree with this and assume, following Levin (2009) and Rákosi (Ch. 7 below), that
causative modifiers add a causing event to the structure rather than specify a pre-existing abstract causing
event. See also section 2.1.
Pylkkänen presents Finnish desiderative causatives as a further construction that lacks an external argument but encodes a causing event. An example of a desiderative causative is given in (41). The fact that this example can be paraphrased as ‘Something makes Maija feel like singing’ forms the basis for the claim that a causing event is present. Maija-a is taken to occupy the subject position, so that an account involving a silent causer is ruled out.

(41) Maija-a laula-tta-a.
Maija-PART sing-CAUSE-3SG
‘Maija feels like singing.’

The crucial test used to provide evidence for the presence of a causing event in structures like (41) is based on sluicing structures in which mikä ‘what’ survives as a remnant. The idea is that such structures can be coordinated with a preceding clause as long as that clause contains a causing event. A desiderative causative can appear in the relevant context (see (42a)), passing the proposed test for causing events, but a non-causative desiderative structure like (42b) cannot.

I-PART laugh-CAUSE-3SG but-not.1SG know what.NOM
‘Something makes me feel like laughing but I don’t know what (makes me feel like laughing).’

want-COND-1SG laugh but-not.1SG know what.NOM
‘I want to laugh but I don’t know what (makes me want to laugh).’

In evaluating the validity of the proposed test, it is important to note that the logic that motivates it leads to the prediction that causative structures with an overt subject representing a participant in the causing event should pass it. The reason for this is that the presence of such a subject does not identify the nature of the causing event and therefore it should be possible to state that one does not know what that event is. In English, it is clearly the case that the relevant structure cannot be added to causatives with a subject of the relevant type. The interpretation of (43c) is very similar to that of (43a) and (43b) on an analysis of causatives that assumes a hidden causing event, but (43c) does not pass Pylkkänen’s test.

(43) a. Something that John did made me laugh, but I don’t know what.
b. John did something that made me laugh, but I don’t know what.
c. *John made me laugh, but I don’t know what.

It could of course be the case that the conditions on sluicing in Finnish are different from those in English, but in fact the Finnish equivalent of (43c) is ungrammatical as well:
It would take us too far afield to develop an analysis of the Finnish desiderative causative. However, Finnish is a partial pro-drop language in which underspecified pronouns like weather *it* are omitted (alongside first and second person pronouns). It is therefore a possibility that the causative desiderative should be analysed as involving pro-drop, as below. This would immediately explain the grammaticality of (42a). (Notice that the partitive marking of *Maija* is consistent with an analysis of this constituent as an object, as argued in some detail by Pylkkänen.)

> pro *Maija-a laula-tta-a.
> Maija-PART sing-CAUSE-3SG
> ‘Maija feels like singing.’

In conclusion, although there are many theories that assume a linguistic encoding of causing events, there is a distinct paucity of tests that can be used to confirm analyses along those lines.

### 2.6 Conclusion

We have argued that the linguistic representation of causation does not include a causing event, although we assume that causing events are present in the mental model that people construct to understand the world. Natural language approximates causation by representing culmination of events and a CCF external argument. Both these building blocks of lexical semantics are also found in non-causative verb classes. It should not come as a surprise that the linguistic expression of causation underdetermines the mental model to which it corresponds: that is the normal state of affairs for any linguistic representation.
It is of course impossible to prove a negative, and therefore we cannot provide conclusive evidence for the absence of causing events in linguistic structures. However, we have been able to show that phenomena that might be construed as providing support for a full representation of causation in fact do no such thing. Most prominent among these is the apparent restriction to direct causation in simple causatives. We have shown that this restriction does not in fact hold across the board, and that observations supporting it can be reinterpreted in different terms.
The Content of Semantic Roles: Predicate–Argument Structure in Language and Cognition

MARTIN HAIDEN

[The linguist’s task is to understand what it is about language that enables humans to use it to describe their causal perception. An alternative to the search in the realm of invisible abstract structures, is to look at the block stones that we know already that sentences are composed of. The θ-roles associated with verbal concepts are such block stones. [...] So we may ask what other work they do in relating derivations to the cognitive systems. (Reinhart 2000: 38)]

In the section entitled ‘Theta meets Inference’ (Reinhart forthcoming, a), [‘What does it mean?’ of her 2000 paper], Tanya Reinhart puts thematic roles at the centre of the Theta System. In doing so, she sets her research agenda way outside mainstream lexical semantics, where theta-roles are considered as inadequate, if they are being considered at all. In this chapter, I am going to review the case against theta-roles, concluding there is none. Theta-roles are still the best way to think of lexical argument selection. I will then ask ‘what other work they do’, and propose that theta-roles encode the explanatory constructs of a modular theory of event perception. Finally, I apply the cues established in research on perception, in order to establish falsifiable guidelines for the identification of individual roles of lexical items.

3.1 Theta-roles

In his seminal paper, Davidson (1967) argues that the action named by a verb ought to be represented in logical form as a singular term distinct from the verb’s sense,
which he takes to be a description, much as nouns are descriptions of object-types in Russell’s (1905) analysis of referential NPs. For a proposition like (1a), he proposes the logical form (1b) (his (18)), with existential closure over an event-variable, the argument of the event description.

(1) a. I flew my spaceship to the Morning Star.
   b. (∃x) (flew (I, my spaceship, x) & to (the Morning Star, x))

In Davidson’s theory, the event variable is used to link modifiers to the event. The dissociation of argument-roles from the predicate, rejected by Davidson, is elaborated in Parsons (1990: ch. 5.7). Parsons’ example (p. 94) is reproduced as (2a), with the logical form in (2b). It is easy to see that (2a), represented as (2b), entails each sentence obtained from it ‘by omitting an NP or a prepositional phrase’ (p. 95). In particular, (2a) entails all sentences in (3).

(2) a. Brutus stabbed Caesar with a knife.
   b. (∃e)(Stabbing (e) & Agent (e, Brutus) & Theme (e, Caesar) & with (e, knife))

(3) a. Brutus stabbed Caesar.
   b. Brutus stabbed.
   c. Caesar was stabbed.

The use of thematic role predicates has become known as the neo-Davidsonian theory of argument structure. In addition to satisfying Davidson’s original demands on the logical form of action sentences—in particular the singularity of verb denotations and their entailments—the theory facilitates the interface of syntax, semantics, and the lexicon. The syntax passes lexical information on into semantics in the form of theta-grids, without itself processing semantic information (Chomsky 1981).

The neo-Davidsonian theory, and theories postulating thematic role lists in general, are confronted with two conceptual issues that manifest themselves in various empirical problems summarized in Levin and Rappaport Hovav (2005). First, the formalization of thematic information in terms of role predicates (which are not linked to morphosyntactic cues in any systematic way, as Parsons (1990) observes) requires that there be a small, universally accessible set of such roles. Second, a list of atomic roles does not allow for super-roles that (i) regroup a set of finer-grained roles and (ii) are themselves grammatically significant.

Concerning the first problem, Levin and Rappaport Hovav (2005) observe that it is not easy to identify a unique, universally attested set of roles, and claim that this problem cannot be solved by an analysis of roles into constituent features. In support of this claim they cite Ostler (1979; 1980), who proposes eight role-defining features, yielding a total of 256 possible roles, yet uses no more than 48. Levin and Rappaport Hovav (2005) argue that this discrepancy calls for a theory on possible combinations of features, but consider it doubtful that such a theory could ever be spelled out:
‘Considering the care that Ostler takes in motivating this set of features and the wide range of phenomena he attempts to deal with, it is doubtful that other attempts at defining comprehensive feature systems will meet with much more success’ (Levin and Rappaport Hovav 2005: 46).

The second problem (i.e. generalizations over roles) is discussed in detail by Dowty (1991), who observes: ‘the dilemma is, if we adopt the finer characterization of roles to achieve certain distinctions, do we not thereby miss generalizations by not being able to refer to the grosser [ . . . ] category as well?’ (Dowty 1991: 554). The dilemma Dowty talks about is immediately illustrated by Levin and Rappaport Hovav’s (1995) notion of immediate cause, which figures in their lexicon–syntax mapping rules. Immediate cause is a very broad concept, including agents, causes, and emitters, but it has a consistent meaning, and its syntactic realization is predictable. Immediate causes are always realized as subjects. The notion therefore qualifies as an excellent candidate for a thematic role. However, some constructions require finer-grained distinctions. For example, emitters appear in the locative inversion construction (4a), agents usually do not (4b). A list of atomic roles like Parsons’ cannot express both the subject and the locative inversion-generalization without contradiction or redundancy.

(4)  
   a. *In the factory worked young boys at the age of 7.  
   b. And in their wake rumbled trucks to haul off the remains.  
      (Levin and Rappaport Hovav 1995: 255)

There are two possible ways to tackle these problems. The first one, endorsed in this chapter, consists in rejecting Levin and Rappaport Hovav’s (2005) claim about the insufficiency of a feature analysis of thematic roles. In the Theta System, thematic roles are modelled as optionally underspecified clusters of two binary features. The total of nine possible clusters (i.e., four fully specified, four underspecified clusters, and one default cluster\(^1\) with both features underspecified) is small enough to be universally attested. Underspecification and reference to individual features and feature values provide the tools for the statement of generalizations.

The empirical success of this approach has been demonstrated in Tanya Reinhart’s work, and it is amply illustrated elsewhere (cf. several chapters of this book, and Haiden 2005). In this chapter, I will restrict my attention to the cognitive foundation of thematic roles and their constituent features.

The second option is pursued in the large majority of the literature on lexical semantics. Lexical verb entries are decomposed into tree structures projected by a small set of universal base predicates, where the semantic role of an argument follows from its position in the tree. I reject this approach for a variety of reasons. Section 3.2.3 argues that the syntactic realization of argument roles calls for the assumption of two

\(^1\) Cf. Ackema and Mare\(l\)j (Ch. 9 below) on the empty cluster.
orthogonal scales of prominence (causation/force and intentionality). The trees of lexical structure do not easily lend themselves at the expression of multiple, orthogonal scales of prominence. If lexical event decomposition is nevertheless endorsed, its advantage must be elsewhere. Alas, attempts at motivating lexical event decomposition from adjacent domains of inquiry have equally failed. First, there is no unique conceptual structure that would automatically impose itself on the lexicon (section 3.2.1). Second, the acquisition of verb meanings does not require structural knowledge other than overt syntactic structure (section 3.2.2). I conclude that the decomposition of lexical verb meanings into hierarchical tree structures projected by base predicates does not deliver on its central promise. I therefore reject this approach. Theta-roles are back in the game.

3.2 Against lexical event structures

Following work by Jackendoff and Talmy (Jackendoff 1972; 1983; Talmy 1975; 1976; 1983; 1985), it has been proposed that verb denotations should be thought of as sections of a unique conceptual structure.

The Conceptual Structure Hypothesis (Jackendoff 1983: 17)

‘There is a single level of mental representation, conceptual structure, at which linguistic, sensory, and motor information are compatible.’ (italics in the original)

Jackendoff’s hypothesis is appealing for the fact that it offers an explicit theory about the interface between major components of cognition. This is a sizeable advantage that should outweigh considerations with reduced scope (considerations specific to language in particular)—if it turns out that the hypothesis is empirically tenable.

According to the Conceptual Structure Hypothesis (CSH), the lexical representation of verbs is a syntactic structure that contains labelled slots for the insertion of arguments. For a verb like to butter, Jackendoff proposes the representation in (5c) below. When we affirm that Nicky buttered a slice of toast, we do not refer to a single action, as Davidson would have it, but we express a complementation structure relating several (potentially independent) events: a causing action, a directional movement, and a locational state. In this framework, the thematic role of an argument follows from its position in the tree.

(5) a. Nicky buttered the toast. (Jackendoff 1983: 184–5)
   b. Nicky put butter on the toast.
   c. ’butter’: [Event CAUSE ([Thing x], [Event GO ([Thing BUTTER], [Path TO ([Place ON ([Thing y])])])])]

2 Event decomposition in syntax (i.e. Generative Semantics) has been contested as early as Fodor (1970); cf. Neeleman and van der Koot (Ch. 2 above) and Horvath and Siloni (forthcoming) for a recent rehearsal of arguments. Event decomposition in the lexicon is less contested in the generative framework, but see Fodor and Lepore (1998) and Haiden (2005: ch. 1).
The implications of the CSH are extremely strong. According to Jackendoff himself, ‘[p]erhaps the most fundamental consequence of the approach adopted here is that the standard notions of truth and reference play no significant role in natural language semantics’ (Jackendoff 1983: x). It does not seem, though, that this is its most radical aspect. The CSH is even more surprising, if true: linguistic, sensory and motor information consistently converges in a single level of cognitive representation. This claim is problematic from both a psychological and a linguistic perspective.

First, the CSH predicts that cross-linguistic asymmetries of event representations should reflect parallel cognitive asymmetries in a generalized fashion. However, experimental data indicate that this is only true for language-related tasks. This indicates that cognitive and linguistic representations must be dissociable, at least partially (cf. section 3.2.1).

Second, a unique Conceptual Structure should be accessible in acquisition, predicting early stability of verb meanings and semantic bootstrapping of syntactic knowledge. However, research on acquisition (cf. section 3.2.2) shows the exact opposite: syntactic parameters are correctly set at the earliest observable age (Wexler 1998), while verb meanings gradually stabilize up to teenage years (Fisher et al. 2010).

3.2.1 Experimental data on the dissociation of linguistic and non-linguistic representations

The Conceptual Structure Hypothesis is an empirical hypothesis that makes specific predictions. One of these predictions is that the representation of events as we can observe it in linguistic expressions reflects a unique, underlying cognitive structure. If languages systematically differ with respect to the representation of certain event types, such differences should reveal important facts about the organization of cognitive mechanisms.

A well-documented example is the representation of directional motion (Aske 1989; Jackendoff 1990; Talmy 1975). In some languages, call them manner-languages, the manner of motion is typically encoded in the verb (e.g. walking v. crawling v. running) and directional PPs and particles are used to refer to the end-point of the movement. Manner languages include English, German, Russian, and Mandarin Chinese. Other languages, call them path languages, typically use verbs to describe directed motion (e.g., Spanish entrar ‘enter’, salir ‘leave’), and they add modifiers in order to describe the manner of motion (e.g., Spanish entrar corriendo ‘enter by means of running’). Path languages include Japanese, Modern Greek, Spanish, and Turkish. The following examples illustrate this typological distinction: English (6) naturally expresses both the manner of motion and its end-point. Greek prefers the expression of just one of these components. In (7), the PP sti folia tu ‘to its nest’ can only have a locational, not a directional interpretation. The absence of a
directional reading in contexts like (7) is the hallmark of path languages. These languages require a verb to express directional and culminated motion. The sentences in (8) express both the manner of movement and the path endpoint. They are grammatical, but dispreferred. The speakers of Greek prefer using (8a) with a directional verb and PP, but without the manner modifier (petontas ‘flying’), i.e., to express the path endpoint only.

(6) The bird flew to its nest.

(7) To puli petakse sti folia tu.
    the bird flew to its nest

(8) a. To puli bike sti folia tu (petontas).
    the bird entered into its nest (flying)

b. To puli petakse ke bike sti folia tu.
    the bird flew and entered into its nest

(Papafragou, Hulbert, and Trueswell 2008: exx. 1–3)

The very existence of the typological distinction into path and manner languages challenges the CSH. A unique conceptual structure should impose itself on language. There are two options to accommodate the CSH to the facts. Either we allow for cross-linguistic differences in cognition, or we grant a minimum of independence to cognitive v. linguistic representations. Let us call these options the relativist and the modularist option, respectively. On both options, a part of the conceptual structure of directional motion must be learned. Jackendoff (1990; 1996) proposes a learnability argument to single out its underlying, universal core: path languages must reflect the underlying representation, because the presence of an element (directional PPs with manner verbs) can be learned on the basis of positive evidence. The dispreference of manner modifiers with path verbs in path languages would have to be learned from negative evidence.

On the relativist option (and maintaining Jackendoff’s learnability argument), we predict that speakers of path languages should be less sensitive to manner specifications in general. On the modularist option, we expect that speakers of manner languages should be less sensitive to manner specifications in non-linguistic tasks, because manner is not part of the universal conceptual structure. I argue that neither of these options is compatible with the data.

Gennari et al. (2002) performed an experiment on the dependence of cognition and language in the domain of directional motion. They showed short video clips depicting directional motion (e.g. a man carries a board into a room) to speakers of English and Spanish, respectively. Three conditions were distinguished: Naming First, Free Encoding, and Shadow. The Naming First condition elicits the formation of specifically linguistic representations. Participants had to describe each event in a
single sentence after having watched it. The Free Encoding condition does not bias either linguistic or non-linguistic encoding. Participants were just asked to watch and remember the events for a further task. The Shadow condition discouraged the formation of linguistic representations. Participants had to repeat random nonsense syllables while watching the video clips, in order to occupy working memory and to reduce linguistic encoding of the events.

The experimental design contained two additional series of video clips, which depicted alternative versions of the original events. In one series, manner information was altered (e.g. striding rather than walking into a room). In the other series, path information was altered (e.g. walking out of rather than into a room).

All three series were presented to subjects in recognition memory and similarity judgement tasks. Gennari and colleagues found a difference between the two language groups in the similarity judgement task: Spanish speakers produced more similarity judgements for the same path (distinct manner) alternants than English speakers. This confirms the known typological distinction between the two languages. However, the difference was only found in the Naming First condition, where speakers had explicitly been asked to encode the events linguistically. In the Free Encoding and Shadow conditions, there was no effect of language. Gennari and colleagues interpret these results as indicating that language affects the salience of certain aspects of mental representation, if language is used in the creation of those representations, but not otherwise. Similar results are reported in Papafragou, Massey, and Gleitman (2002) and Papafragou et al. (2008) for Greek and English.

Everything else being equal, this result remains compatible with (a weakened version of) the CSH. However, Gennari et al. report on another finding which is particularly relevant for the present discussion. In their naming task, English speakers showed no sensitivity to the nature of encoding. They produced a similar amount of manner references after linguistic or non-linguistic encoding. Spanish speakers were sensitive to the type of encoding. They produced fewer manner references after linguistic encoding.

Recall that Jackendoff’s learnability argument claims that manner is absent in universal conceptual structure, to be learned on the basis of positive linguistic evidence by the speakers of manner languages (e.g. English). On the relativist amendment of the CSH, we should thus expect that the speakers of path languages produce fewer manner references than the speakers of manner languages, and that across conditions. In fact, Spanish speakers produce fewer manner modifiers, but only after linguistic encoding.

On the modularist amendment (and still maintaining Jackendoff’s learnability argument), we should expect that English speakers produce more manner references after linguistic encoding. In fact, English speakers produce an equal amount of manner references across linguistic and non-linguistic conditions. The modified
version of the CSH, supplemented with Jackendoff’s (1990; 1996) learnability argument, fails to predict those data.

Linguistic utterances, similarity judgements, and conscious recollection are only the final product of potentially complex processing operations. In order to study the attention allocated to different components of an action in real time, Papafragou et al. (2008) performed an eye-tracking experiment on speakers of Greek (path) and English (manner). They presented short videos of instrumental motion (e.g. roller skating, sailing, skiing) performed by animate agents. There were two types of actions: bounded motion with a visible target object (that was attained at the end of the video clip), and unbounded motion without a target (the agent just froze in its position at the end of the clip). In the linguistic condition, speakers had to verbally describe the action they had just seen; in the non-linguistic condition, they were asked to memorize it for a further task. After they had watched all videos, all participants did a memory task (which was a surprise for the subjects in the linguistic condition). They were shown still images from the middle of the video clips. Half of these images corresponded to scenes they had actually seen, half of them had been altered by reversing telicity (originally bounded events appeared without the target object, originally unbounded ones had had a target object introduced).

The eye movement data show a clear asymmetry between the linguistic and non-linguistic conditions. In the linguistic condition, Greek speakers started looking at the path-endpoint more than English speakers, and then turned to the manner component. English speakers did the opposite. In the non-linguistic condition, the behaviour of subjects was ‘nearly identical for both language groups’, with ‘an overall preference for path endpoints over instrument regions’ (Papafragou et al. 2008: 169). The authors conclude: ‘Greek and English speakers do indeed allocate attention to these regions differently in accordance with their language, but only in the Linguistic task and only when the languages differ in terms of the kind of information encoded in the verb (i.e., in the case of bounded motion events)’ (p. 168).³

These experiments firmly establish the present argument. While there are doubtless reasons to believe that language and cognition interact at different levels, there are areas in which the two components must be separated on empirical grounds. A unique conceptual structure cannot deal with the independence of components. I reject it in favour of a modular theory of cognition. Consequently, the CSH can no longer serve as an argument for the assumption of conceptual structures in the lexicon.

³ Language-specific differences reappeared (in the non-linguistic condition) after the action had stopped and subjects were inspecting the final frame for further recollection. Papafragou et al. (2008: 169) conjecture that ‘the two populations constructed linguistic representations of the scenes before committing perceptions to memory’. 
3.2.2 On the instability of early verb meanings, and syntactic bootstrapping

Let us now turn to a more specific problem for the family of theories assuming lexical conceptual structures: The universal templates provided by Conceptual Structure should guide children in the acquisition of verb meanings, leading to early stability of lexical verb entries, which could in turn be used to bootstrap syntactic structure (Pinker 1984). Correspondingly, we would expect that children establish syntactic generalizations across lexical items gradually, for a prolonged period of their development (Tomasello 1992).

Empirical studies have shown that the exact opposite is true. While basic syntactic parameters like headedness or Verb-second are correctly set at the earliest observable age, i.e. at around 18 months (Wexler 1998; 2002), infantile verb meanings are flexible, and for some verb types they remain so into adolescence and even adulthood. As a matter of fact, young children and infants use syntactic knowledge (the number of noun phrases in a sentence) in order to guess the meaning of predicates they do not (yet) understand, and they can do so on the basis of purely distributional cues, in the absence of any knowledge about the events themselves (Fisher et al. 2010). These data suggest that the ‘event-structure’ that verbs appear in is syntax, not a lexical structure distinct from syntax.

Beginning in the 1980s, work on the acquisition of verb meanings has shown that, under certain conditions, children are readily willing to accept and interpret verbs in ungrammatical sentences (Gleitman 1990; Landau and Gleitman 1985; Naigles 1988; for a recent overview, see Fisher et al. 2010). They would, for example, accept a sentence like *The elephant comes the giraffe from Naigles, Fowler, and Helm (1992) as meaning The elephant makes the giraffe come, in which the subject is an agent, and the direct object a theme. In other words, children have knowledge about the typical meaning of a given syntactic frame (e.g. transitives tend to be causative), and they apply this knowledge, when they are guessing the meaning of a verb in a new context. This behaviour is known as ‘frame compliance’.

Adults do not behave in this way. On encountering a sentence like *The elephant comes the giraffe, they would either repair its syntax (e.g. by repeating the sentence as The elephant comes to the giraffe) or its meaning (e.g. by interpreting the sentence as meaning The elephant comes (alone)). In other words, adults know that the verb come can only be used in an intransitive frame and refuse to accept the use of this verb in a different frame. Adults are ‘verb-compliant’.

Children become verb-compliant on a gradual basis, depending on individual verbs and the frames they appear in. Naigles, Fowler, and Helm (1992) studied five age groups from five to thirteen, and compared them to the preschool and adult populations of Naigles, Gleitman, and Gleitman (1992), all native speakers of English. The subjects had to act out sentences in four different frames (transitive plus PP, transitive, intransitive plus PP, and intransitive), with grammatical and ungrammatical
examples for each frame. They found that verb compliance steadily increased with age for all frames except the most complex one (transitive + PP), where even adults exhibit a very high level of frame compliance (around eighty per cent). In fact, the development observed was different for each frame. In the simple intransitive frame, adult-like verb compliance is attained by the age of five. In the transitive frame, adult-like behaviour was reached at age ten. In the intransitive + PP frame, the development continued until age twelve. This shows that the shift from frame compliance to verb compliance is not a general developmental phenomenon, but that it depends on the particular frames a verb appears in.

Syntactic structure has since been found to be crucial in the acquisition of verb meanings even in languages where this is not immediately evident. In Mandarin Chinese, for example, arguments corresponding to known information can be dropped from finite sentences. Overt transitivity is therefore not as reliable an indicator for argument structure as it is in English. Nevertheless, Lee and Naigles (2008) found that Mandarin-speaking children (age two to three) do use the number of overt NPs in order to infer the meaning of new verbs. Another telling example is reported in Lidz, Gleitman, and Gleitman (2003). In Kannada (a Dravidian language spoken in southwestern India), the number of arguments is as powerful a cue for argument structure as it is in English; in both languages, transitives tend to be causative. Kannada morphology provides a much stronger, absolute cue: if a verb is marked causative by a unique, distributionally stable morpheme, it must be causative. In spite of this, child (mean age 3;6) and adult speakers of Kannada ignore morphological cues when they learn the meanings of new verbs. They rely on transitivity instead.

The influence of syntactic structure on the acquisition of verb meanings is not only stable across genetically and typologically unrelated languages, it is furthermore independent of particular event descriptions. In an experiment with 28-month-old children, Fisher et al. (2010) presented videos of dialogues in which a woman talked of an event using a made-up verb in transitive and intransitive sentences, respectively. The children just saw the dialogue-scenes, but they got no indication whatsoever about the nature of the event referred to in the dialogues. In the test phase, the children watched videos about actions involving one and two participants, respectively, and they heard the verb in isolation (e.g. Find blicking!). The authors found that the children who had heard the verb in a transitive frame looked significantly longer at the two-participant action than the children who had heard it in an intransitive frame. They conclude that children can rely on abstract information about sentence types (notably the number of NPs) to learn novel verbs, when referential cues are not available.

The experimental data reviewed in this subsection show (i) that the meaning of verbs develops over an extended period of time and (ii) that the acquisition of verb meanings is initialized by syntactic structure. These observations do not require the assumption of hierarchical conceptual structures in the lexicon. The acquisition
of lexical verb meanings does depend on structural knowledge, but the locus of this structure is syntax. The decomposition of lexical verb meanings into tree-representable event structures therefore cannot be motivated with reference to acquisition. Such a decomposition would have to be forced by considerations more specific to the lexicon–syntax mapping, to which I turn next.

3.2.3 Pouring, filling, and containing; knowledge, perception, and fear: the paradoxes of lexical structure

Lexical event structures are meant to describe syntactically relevant properties of event representations. We should thus expect that lexical event structure can derive the realization of thematic roles in syntax. As a matter of fact, they are ill-suited to this task. First, the state component of complex lexical structures (an atomic base predicate) systematically yields conflicting syntactic realizations. This observation can be interpreted as calling for a reanalysis of lexical structure in terms of a scale of force (Croft 1991; 1998; Talmy 1976; 1988; 2000). Second, the scale of force fails with respect to psychological predicates (Haiden 2005). If the lexicon is meant to predict argument realization, it should therefore encode two independent scales (force and intentionality/psychological activity), rather than just one. The tree representations assumed in the various frameworks of lexical decomposition are just not up to this task.

Take as a starting point an example adapted from Gropen et al. (1991), Pinker (1989): somebody engages in an action that consists in making water come into a glass. This action could be described by two verbs: to pour and to fill. These two verbs project their arguments in different ways: the object of to pour is a liquid, while the object of to fill is a container.

(9) a. He poured water into the glass.
   b. He filled the glass with water.

Gropen and colleagues argue that the two argument structures follow from two different conceptualizations of the event. To pour describes a causative action affecting a liquid, to fill describes the action as affecting the container. Assuming event decomposition, this difference can be pinned down in the activity part of the lexical representation of these verbs. The part denoting the result state (water is in the glass) is shared by the two verbs. Gropen et al.’s (1991) informal proposal can be faithfully formalized in the following partial representations (ignoring the possibility

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4 More appropriately, the text should read ‘at least two scales’, as aspeutal and other properties of lexical meaning ignored in this chapter might as well be construed as hierarchical notions.
of an aspectual base predicate mediating between the activity and the result state).\(^5\) The base predicate \textit{DO} in (10) means that agent \textit{z} performs an action on an object \((y \text{ or } x)\); \textit{LOC} means that object/substance \textit{x} is in position/location \textit{y}. On Jackendoff’s (1990) assumption that the action-predicate \textit{DO} takes precedence in the projection of syntax, these lexical representations predict that the direct object of filling \((y)\) is a container affected by a change of state; that of pouring \((x)\) is a substance affected by a change of location.

(10) a. ‘to pour’: \textit{CAUSE \textit{DO}(z, x),...LOC(x, y)}
    b. ‘to fill’: \textit{CAUSE \textit{DO}(z, y),...LOC(x, y)}

Gropen et al.’s (1991) argument is interesting, because it invites an obvious extension to the stative variant of \textit{to fill}. Following the reasoning above, stative \textit{fill} should be represented as bare \textit{LOC(x, y)}. Now take the pair of sentences in (11). This pair is comparable to the one in (9). Both sentences describe the same state of affairs: a substance (water) is localized in a container (the glass), but the realization of roles is different.

(11) a. Water fills the glass.
    b. The glass contains water.

The problem with the pair in (11) is that bare \textit{LOC} just does not have an activity component that could be used to distinguish the two argument structures. On the assumption that the first argument of \textit{LOC} (the substance) is mapped on the subject, we successfully derive the reading of (11a), but we likewise predict that (11b) should mean that \textit{the glass is in water}. Clearly, something has gone wrong.

In order to solve the problem, we might want to replace the trees of lexical conceptual structure by a scale of force in the sense of Croft (1991; 1998) and Talmy (1976; 1988; 2000). These authors argue that transitive eventualities are conceptualized as asymmetrical relations between two entities, where one applies force to the other. Croft (1998: 31) explicitly proposes that this type of representation extends to non-causal eventualities. It should thus include the state predicate \textit{LOC}, deriving the behaviour of stative \textit{filling} and \textit{containing} in the following way: when we want to place the container higher on the scale of force than the liquid, then we should be using \textit{to contain}, because this verb realizes the container in a syntactically more prominent position than the liquid. If we want to express the opposite configuration of forces, then we should be using \textit{fill}, because this verb requires the realization of the liquid in the syntactically prominent position, thus associating the liquid with a higher degree of force than the container.

\(^5\) Aspectual base predicates are used to distinguish gradual developments from instantaneous changes, i.e. accomplishments from achievements; see Rapp (1997) for a particular implementation and references.
The force-dynamic approach solves the problem of lexical event decomposition at the cost of substituting a scale of force for the trees projected by base predicates. It might be argued that a sufficiently careful definition of base predicates can derive the effects of the force scale. The strategy would not work, though, if there is more than one scale involved in the lexicon–syntax mapping. Multiple scales of prominence are incompatible with a global tree structure. I claim that there are two such scales: force/ causality and intentionality.

Consider psychological predicates, exemplified by the pair of German verbs in (12), with the respective lexical representations (13, 14). The base predicate PSYCH means that a conscious individual $x$ entertains a psychological attitude towards a representation of $y$ (again, aspetual base predicates are ignored).

(12) a. Er ärgert mich (mit seinem arroganten Benehmen).
   He annoys me (with his arrogant behaviour)
   ‘He annoys me with his arrogant behaviour.’

b. Er erklärt mir die Lösung.
   He explains me the solution
   ‘He explains the solution to me.’

At first glance, this pair can be dealt with in exactly the way suggested by Gropen et al. (1991): erklären ‘to explain’ talks about ideas that are being manipulated by an agent, such that the experiencer (the dative) comes to have them. Rapp’s (1997) representation (13) formalizes this paraphrase. The verb ärgern ‘to annoy’ depicts the experiencer (the accusative) as affected by (an action or a property of) the agent. Applying Gropen et al.’s reasoning, this observation should be represented as in (14).

(13) erklären ‘explain’: CAUSE (DO(z, y), ..., PSYCH(x, y))
(14) ärgern ‘annoy’: CAUSE (DO(z, x), ..., PSYCH(x, y))

As expected, the psychological component common to the two verbs can appear alone, describing cognitive states like kennen ‘to know’ in (15a). This verb realizes the predicted mapping of the experiencer into the subject and the representation into the object. According to Rapp (1997: 58–60), the first argument of bare PSYCH is realized as subject, its second argument as direct object. It will no longer come as a surprise,
though, that the opposite is equally attested. Just simply applying the formalism, (15b) should mean that his arrogance is annoyed by me.

(15) a. *Sie kennt die Lösung.*
   She knows the solution

   b. *Seine Arroganz ärgert mich.*
   His arrogance annoys me

The base predicate PSYCH is thus not adapted to describe the lexical semantics and syntactic realization of stative psychological predicates. So let us see whether the force scale is of any help. Allowing for some metaphorical slack, we might want to paraphrase stative kennenlernen as 'grasping', stative ärgern as 'hurting' (cf. fn. 6), thus deriving a force-dynamic prominence of the experiencer with kennenlernen, and of the stimulus with ärgern. This strategy requires a considerable amount of metaphorical slack to work out, but this is not the problem. The problem is that, even allowing for metaphorical slack, a certain class of verbs will realize the experiencer more prominently than the other argument, no matter how high the latter is located on the scale of force.

Take fear. This emotion is rarely desired or voluntarily generated by the experiencer. Fear imposes itself on an experiencer (otherwise it is an attitude, not a fear). Yet the experiencer remains a subject, and the forceful image must go in object position, as in: *John fears the devil.* This pattern extends to many verbs that link the physical with the mental, in particular in the domain of perceptions. Perception verbs come in various flavours: watching and looking at are activities, but hearing and feeling much less so, and when one is honestly overhearing a secret conversation, it certainly does not happen on purpose. The same holds for feeling pain or suffering a heart attack: such expressions describe events one undergoes. By all standards, one should then expect that the experiencer be located below the other argument on the scale of force. The experiencer should therefore be realized as a direct object. This is obviously not true.

A reviewer points out that the force scale might be saved by an analysis of the problematic verbs as two-place unaccusatives. This suggestion does not work out as desired for two major reasons (see Haiden 2005: ch. 2 for discussion and additional data). First, it certainly does not apply universally. For example, German erleiden 'to suffer' systematically behaves like a normal transitive for standard unaccusativity tests, e.g. adjectival use of the participle in (16): the modified N must identify the internal argument of the participle (16b), which corresponds to the accusative of a finite sentence (16a). Second, the pattern of quantifier binding in (17) shows that the nominative experiencer c-commands the accusative (17a). The inverse is impossible, even if the accusative in topic position precedes the nominative (17b). The experiencer must be structurally higher than the other argument. This fact contradicts the force scale, even if the verbs in question are analysed as two-place unaccusatives.
I conclude that the scale of force fails at describing the pattern of role realization for a certain class of verbs: those that realize the experiencer in a more prominent syntactic position than a perception/experience imposing itself on the experiencer. The existence of such verbs calls for a second scale, independent of the force scale, which orders arguments by their mental involvement in the event (Haiden 2005). The existence of more than one scale of prominence is hardly compatible with the tree format assumed in the framework of lexical event decomposition: trees represent a single, global hierarchy.\(^7\)

To conclude this section, let us recall the problem that motivated the rejection of thematic role predicates, and the subsequent decomposition of lexical verb meanings into hierarchical tree structures projected by base predicates. The problem was that atomic roles are inadequate for the statement of natural classes of roles and their realization in syntax. Clearly, lexical event decomposition does not solve this problem: the existence of more than one scale of prominence (causation/force and intentionality/mental involvement) is incompatible with tree-representable lexical structures. If lexical event decomposition is nevertheless endorsed, its advantage must be elsewhere. Alas, attempts at motivating lexical event decomposition from adjacent domains of inquiry have equally failed. First, there is no unique conceptual structure that would automatically impose itself on the lexicon. Second, the acquisition of verb meanings does not require structural knowledge other than overt syntactic structure. I conclude that the decomposition of lexical verb meanings into hierarchical tree structures projected by base predicates does not deliver on its central promise. I therefore reject this approach. Theta-roles are back in the game.

\(^7\) See Williams (Ch. 4 below) for an argument against what he calls ‘one big undifferentiated syntactical system (OBUSS)’ in the domain of morphology.
3.3 Decomposing roles, not events: the cognitive basis

Let us assume, against Levin and Rappaport Hovav (2005: 46), that a list of thematic roles analyzed into component features can be empirically adequate. Tanya Reinhart proposed two features, C and M, indicating causation and mental involvement, respectively. These are the properties of event descriptions to which syntactic structure is sensitive. Adopting the modularity hypothesis (Fodor 1983) and its application to central processes in Hirschfeld and Gelman (1994), this section explores the two mechanisms of cognition that compute the perception of causation and intentionality: the Theory of Body Mechanism (ToBy) and the Theory of Mind Mechanism (ToMM) (Leslie 1994). The objective of this section is to identify independently motivated perceptual cues for the definition of thematic roles and their component features in section 3.4.

3.3.1 The perception of causality (ToBy)

As early as 1945, Albert Michotte proposed a detailed theory on how a causal impression is perceived on the basis of certain properties of motion-events. Notice first that the notion of causation is a mental construct relating different events. Temporal adjacency and/or statistical covariance are not sufficient for two events to be in a causal relation. As Saxe and Carey (2006) remind us, night and day regularly succeed one another, but we would be hard pressed to claim that they are in a causal relation. Michotte’s book is important, because he was the first to propose what looks like a modular theory of causal perception.

In his study of launching and entraining events, Michotte postulated a perceptual input analyser dedicated to the computation of causal impressions. According to Michotte, the input analyser automatically and obligatorily renders a causal interpretation, if two successive movement events satisfy certain conditions. In particular, ‘he showed that launching is perceived when and only when the two motions have parameters consistent with a single motion transferred from one object to a second, perceptually distinct one’ (Saxe and Carey 2006: 146). The perception of a unique motion event is paramount to the interpretation of causality. Whenever a causing object fails to make contact with the object it is supposed to launch, i.e. whenever subjects have evidence to interpret two independent motion events, they fail to interpret these events as causally related.

Many recent studies of causal interpretations in infants make use of this property. The structure of the respective experiments usually involves a first set, in which subjects are habituated to a partially hidden causal event. In Ball’s (1973) classic design (illustrated in Fig. 3.1), subjects get to watch an object B, which is partially hidden by a screen. An object A enters the scene, it moves towards B, then disappears behind the screen. At the moment A should have made contact with B, B starts
moving in a way that is consistent with a launching event. When the subjects have habituated to the event (i.e. when they lose interest in it), they move on to the test, where they are shown the same events without any hiding screen. The test events come in two conditions. In the contact condition, object A actually makes contact with B, and B starts moving upon impact. In the gap condition, A stops without making contact with B, and B starts moving on its own. Assuming with Michotte that contact is a necessary condition for the perception of causality, and that inert objects are expected to remain stationary in the absence of an external source of propulsion, subjects are considered capable of causal interpretations, if they show surprise (measured by an increase in looking time) in the gap condition. Using variants of this paradigm, it has been shown that infants as young as six months (Spelke, Phillips, and Woodward 1995) perceive (hidden) launching events as causal.

The assumptions made so far are summarized in (i)–(iv).

(i) The domain of causal perception. The primary domain of causal perception is motion in space.

(ii) Inertia. In the absence of a source of propulsion, stationary objects remain stationary; moving objects do not change their trajectory.

(iii) Unique event. A causal interpretation does not occur, unless the motion of the impacting and the launched objects can be perceived as a unique, continuous motion event.

(iv) Contact. Contact is a necessary condition for the perception of causality.

Michotte had studied inanimate objects, and he had found that neither the size nor the perceived weight, solidity, or speed of the objects involved made a qualitative

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**Figure 3.1** Ball’s (1973) design
difference to the emergence of the causal perception. However, more recent studies have shown that the presence of intentionality cues, and certain dispositional properties of inanimate objects, can have such an influence. Leslie and Keeble (1987) showed that the previous classification of an object as causally active or affected has an influence on later predictions about the behaviour of the object in causal interactions. They habituated six-month-old infants to (entirely visible) launching events, where an object A hits object B, which is thus set in motion (direct launching). A second group of infants was habituated to the same kind of events, but with a temporal delay between the impact of A on B, and the onset of B’s motion (delayed launching). In the test, they reversed the temporal order of the event, such that B hits A, and A starts moving. Leslie and Keeble found that infants are surprised by the reversal of direct, but not of delayed, launching events. This confirms the assumption that immediate reaction is a necessary condition for the perception of causality (cf. the unique event condition (iii) above), and indicates that infants can distinguish agentive and receptive dispositional roles in causal interactions. Once they have categorized event participants as agentive and receptive, respectively, they are surprised to find these roles reversed in the same event-type. Kotovsky and Baillargeon (2000) confirm this observation. In an experiment with six-month-old infants, they show that the causal interpretation of hidden launching events crucially depends on prior categorization of the launched object: dispositionally inert objects are expected to move upon contact, and to remain inert without contact. The expectation is cancelled if there is evidence that the launchee is potentially self-moving. Further studies indicate that groups of seven- and ten-month-old infants infer hidden agents when they are confronted with the spontaneous movement of an object they had previously categorized as inert (Saxe, Tzelnik, and Carey 2007). We may thus add a generalization about dispositional roles to our set of observations.

(v) Dispositional role. In the presence of two objects previously classified as active and inert, respectively, the object classified as active is expected to remain active in subsequent events; the object classified as inert is expected to remain inert in subsequent events.

The possession of mental states could be considered a special kind of dispositional role. In his influential study of manual pick-up events (‘entraining’ in Michotte’s terminology), Leslie (1984a) showed that certain indicators of intentionality can influence the production of causal interpretations. His experiment uses video clips showing either a hand or an inanimate object picking up a doll. In the gap condition, the agentive participant approaches the doll but does not touch it, then retreats, and the doll follows at a constant distance. After habituation, the conditions were reversed. The infants who had been habituated to the gap events (reaching and following) watched the contact events (picking up) and vice versa. Leslie’s population (mean age 28 weeks, i.e. approximately 6.5) distinguished human hands from inanimate
objects in their causal interpretation of the events. When the agent was a hand, they were sensitive to the contact/gap reversal, and they were so in both directions. When the agent was an inanimate object, they showed no surprise in either condition: they expected the doll to follow the inanimate object with or without contact.

It is only very recently that the dispositional properties of event participants have been related to the perception of change of state events (Muentener 2009; Muentener and Carey 2010). Change of state is interesting, because Michotte (1945: chs 15 and 16) had found no evidence for a causal perception in this type of event. Muentener (2009) and Muentener and Carey (2010) show that a change of state can trigger a causal perception on the condition that the active event participant exhibits intentional cues. Muentener studied eight-month-old infants in a variation of Ball’s paradigm. During habituation, a box is partially hidden behind a screen. An object enters the scene, approaches the box, and disappears behind the screen. At the expected time of impact, the box undergoes a change of state: it either collapses, or changes colour, or starts emitting music. In the test trials, infants saw the events without the occluding screen. In the gap condition, the change of state occurred without contact, in the contact condition it appeared upon impact. Muentener found that infants did not distinguish the contact and gap conditions, when the impacting object was a toy train. This observation confirms Michotte’s claim that change-of-state events do not trigger the perception of causality. Contradicting Michotte’s claim, Muentener did find a difference between the contact and gap conditions, when the impacting object was a human hand. In that case, the infants were surprised to see the gap events. This suggests that, as for change-of-state events, ‘infants’ representations of the dispositional features of the agent’ do not just guide the formation of causal representations, but determine ‘whether or not the event [is] represented as causal’ at all (Muentener and Carey 2010: 14).

(vi) Change of state. A causal perception of change of state events is contingent on the presence of intentionality cues.

3.3.2 Rational action (ToMM)

At about the time Michotte was working on the perception of causation, Heider and Simmel (1944) studied the production of anthropomorphic, intentionalist explanations for events without figurative animacy cues. In their experiments, they used a stationary square and moving triangles and circles. Under certain conditions, one corner of the square opened, as if it were the door of a house. The circles and triangles moved autonomously, without visible external impulse. Based on the type of movement, Heider and Simmel’s (1944) subjects identified the circles and triangles as intentional agents, and they explained their behaviour in terms of human interaction, e.g. the two triangles are fighting, the large triangle locks up the circle in the house. The authors thus showed that intentional action can be identified by adults on the
basis of purely behavioural cues. The study of these cues, and the prediction of intentional action, remains an important field of research.

In the more recent literature (for an overview see Biro and Leslie 2007), the identification of intentional agents is attributed to both figurative and behavioural cues. Among the figurative cues, the human eye is probably the most forceful cue (Baron-Cohen 1995), but hands are likewise indicative of intentionality (see above). Behavioural cues include self-propelled, autonomous movement (Baron-Cohen 1994; Premack 1990), reaction at a distance (Leslie 1994; Rochat, Morgan, and Carpenter 1997; Schlottman and Surian 1999), persistence towards a goal and satisfaction upon goal attainment (Montgomery and Montgomery 1999), and adaptive, efficient action in the pursuit of a goal (Gergely et al. 1995).

(vii) Intentionality cues
   a. figurative cues: eyes, hands;
   b. behavioural cues: self-propelled, autonomous movement, reaction at a distance, goal-directedness, satisfaction, efficiency.

It has been known since Heider and Simmel (1944) that adult subjects prefer referring to mental states like beliefs and desires in the interpretation and prediction of intentional action: we say that A did B because he believes that B gives him C, which he desires. However, mental state concepts are not fully available to children until rather late in their development: reasoning about beliefs and desires can be found in preschoolers at age four to five. At that age, children succeed in the classic false belief task (Wimmer and Perner 1983), designed as follows. Agent A puts a toy into a box, then A disappears from the stage. Agent B appears, takes the toy out of the box, puts it into a different box, and disappears again. Then A reappears and the subjects are asked where A would look for the toy. Before age four, children fail this test. They point to the box that contains the toy, not to the one where agent A had put it (and should believe it to be).

(viii) Intentional action. Intentional action is explained with reference to mental content (beliefs, desires, etc.) by adults (and children from a certain age).

There are indications that younger children cannot do the classical false belief task, because they fail to inhibit a true-belief default (Ruffman et al. 2001). This suggests that ‘children even younger than 3 years solve false-belief tasks when non-verbal measures are used’ (Leslie, Friedman, and German 2004: 531). However, evidence for mental state attribution remains difficult to find in infants. For that age group, a different experimental paradigm, initiated by Gergely et al. (1995), can be used to study a core trait of intentionality: efficient, rational action.

In Gergely et al.’s (1995) experiment, infants at twelve months of age are habituated to an interaction between two jumping balls on a screen (see Fig. 3.2). Animacy judgements are elicited by the autonomous motion of the balls and by the fact that
they expand and shrink in response to each other (cf. autonomous transformation of an object’s surface as agency-cue in Gibson, Owsley, and Johnston 1978). In the habituation phase, the two balls are separated by a barrier; the small ball ‘jumps over’ the barrier in order to reach the large one, then the two balls are ‘happy together’. In the test phase, the infants watch the event without the barrier. One group watches exactly the same movement they saw during habituation: the small ball ‘jumps’ and thus makes a detour on its way to the large one. This event is familiar, but irrational in the sense that the trajectory towards the goal is longer than necessary. The other group watches the small ball approach the large one in a straight line. This event is new, but rational. Gergely and colleagues observed that the infants were surprised to see the irrational, familiar movement. They conclude that ‘by the end of the first year infants are indeed capable of taking the intentional stance (Dennett 1987) in interpreting the goal-directed behavior of rational agents,’ (Gergely et al. 1995: 184). It is important to emphasize that ‘when interpreting behavior as goal-directed’ at this stage, ‘rationality is attributed as a property of the action, and not of the agent (or the agent’s mind)’ (Gergely and Csibra 1997: 233; see also Csibra 2008). Abstraction from mental state concepts renders the task easy enough for infants to succeed in it.

(ix) *Rational action.* ‘[R]ationality [can be] attributed as a property of the action, and not of the agent (or the agent’s mind).’ (Gergely and Csibra 1997: 233)

Further studies have shown that six- to eight-month-old infants can interpret rational action, and that they are inclined to do so even for anatomically impossible actions, if the actions are efficient in the pursuit of a goal. Southgate, Johnson, and Csibra (2008) use an adaptation of Gergely et al.’s (1995) paradigm, in which a human arm is separated from a ball it wants to reach by three barriers. In the habituation phase, the barriers are arranged so that moving one of them allows the arm to reach the ball. In the test phase, the barriers are arranged differently, such that two barriers need to be removed for the arm to reach the ball in an anatomically plausible way. Southgate et al. call this the ‘inefficient’ condition. In the ‘efficient’ condition, the arm removes no barrier at all, but it bends like a snake and reaches the ball directly. They found
that six- to eight-month-old infants are surprised to see the inefficient, anatomically plausible condition, and expect the efficient, anatomically impossible action. They conclude that the perception of efficient, goal-directed action cannot be based (exclusively) on an infant’s experience. Instead, infants use a cognitive mechanism specifically dedicated to the interpretation of efficient, rational action. This mechanism constitutes the developmental basis of later, mentalist interpretations of goal-directed action (Gergely and Csibra 1997: 232).

3.4 The meaning of thematic features

In the introduction, I had noted two problems for theories using lists of atomic theta-roles. The first problem was finding a set of roles that is both universally attested and large enough to capture all relevant generalizations. The second problem was that a list of atomic roles does not allow for super-roles that (i) regroup a set of finer grained roles and (ii) are themselves grammatically significant. Both problems are addressed in the Theta System, where thematic roles are modelled as optionally underspecified clusters of two binary features \([+/-c, +/-m]\), where \(c\) is short for ‘cause change’ and \(m\) for ‘mental state involved’. The total of nine possible clusters (i.e. four fully specified, four underspecified clusters, and one default cluster with both features underspecified) is small enough to be universally attested; underspecification and reference to individual features and feature values provide the tools for the statement of generalizations. Let us now turn to the content of these features, and to the cues that allow their identification.

At this point the reader might wonder why syntactic bootstrapping is not sufficient for the identification of role features. It is not, because syntactic bootstrapping delivers gross interpretational asymmetries between internal and external roles, initiating the acquisition of verbs. The bootstrapping mechanism is of no help for the identification of finer distinctions, in particular those among sub-classes of internal and external roles. Furthermore, children do not remain verb-compliant throughout their lives. The bootstrapping mechanism must therefore be supplemented with a knowledge system that (gradually) enforces verb compliance. I claim that the perception of events denoted by (transitionally) known verbs can have the desired effects.

Reinhart’s distinction between a feature \(c\) and a feature \(m\) acknowledges the linguistic fact that argument realization is contingent on both causal and intentional prominence, and is compatible with the dissociation of causal/mechanical and of intentional/rational domains of event-perception. Haiden (2005; 2007) thus suggests that the feature \(c\) should be grounded in the cognitive system concerned with the domain of causal/mechanical event perception, the feature \(m\) in the system concerned with intentional/rational event perception. This allows us to refer to independently motivated, domain-specific mechanisms in the definition of thematic
role features. In the lists of cues below (18–21), the roman numbers in parentheses refer to the summary paragraphs of the previous section.

Before we proceed, it is important to note that individual cues should not be taken as necessary conditions for the postulation of a feature and its value. In this sense, the proposed cues are comparable to Dowty’s (1991) lists of proto-entailments. Given an n-place verb, they should suffice to distinguish the arguments from each other. If an argument presents systematically conflicting cues for a given feature, then this is evidence for underspecification with respect to this feature.

Let us start with feature $m$. The feature cluster $[/+m]$ must be assumed, if the respective event participant exhibits features of intentionality relevant for the description of the event by a verb. This includes the better-known figurative intentionality cues (18b), but extends to behavioural cues like autonomy (18a), reaction at a distance (18c), and efficient, goal-directed action (18d, e). An additional factor which has not been noticed so far is the link between intentionality and change of state events: the perception of causality is contingent on intentional intervention for this type of event (18f). Finally, an argument is coded as $[/+m]$ if it is required to hold an event-relevant mental state.

(18) Cues for the presence of $[/+m]$ for argument A of verb V

a. A exhibits event-relevant self-propelled, autonomous movement (vii).
b. A has event-relevant human traits, e.g. uses hands, sensory organs (vii).
c. A produces an event-relevant reaction at a distance (iv, vii).
d. A pursues an event-relevant goal persistently and efficiently (vii–x).
e. A exhibits satisfaction upon attainment of an event-relevant goal (vii).
f. A induces a change of state in another event-relevant participant (vi).
g. A is in an event-relevant state of mind (viii).

The feature $[/−m]$ designates the content of mental representations. Psychological verbs refer to such states directly (19e), but this is only the most evident case. Various cues indicate the presence of an external (or inferred) mind representing the argument in question. An argument is coded as $[/−m]$ if it triggers an event-relevant reaction at a distance (19a), if it is pursued persistently and efficiently (19b), and if it induces satisfaction upon attainment (19c). Finally, an argument is coded as $[/−m]$ if it is the object of a caused change of state (19d).

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8 A reviewer wonders why we should not rather be using morphosyntactic criteria for the definition of thematic roles. The main reason is that such a definition would be circular in a framework like the Theta System, which generates syntactic structure on the basis of thematic information. Furthermore, I doubt the possibility of an empirically adequate morphosyntactic definition of thematic roles. If such a definition were possible, we should be rejecting the Theta System and assuming a constructionist model (cf. Borer, Ch. 5 below) instead.

9 For notational conventions see Reinhart (2002; forthcoming, a), Ch. 1 above, and Haiden (2005; 2007).
(19) Cues for the presence of \([-m]\) for argument A of verb V

- A triggers an event-relevant reaction at a distance, including unattained targets, sources, etc. (iv, vii).
- A is described by V as being pursued persistently and efficiently (vii, ix).
- Attainment of A induces event-relevant satisfaction in an agent (vii, ix).
- A undergoes a caused change of state (vi, ix).
- A is the content of an event-relevant mental representation (viii).

The feature c primarily encodes causal relations in the domain of movement. In Reinhart’s (2000) original definition, c is short for ‘cause change’. This claim is at variance with the observation that change of state is a marginal case in the perception of causality, contingent on event-relevant intentionality. Therefore, c means ‘cause change’ if and only if m is present in some form or another in the lexical entry of the respective verb. If m is encoded in conjunction with physical causation, the result is a fully specified cluster \([+c+m]\), which describes volitional agents. Intentionality can also be described from the perspective of an intentionally affected object, yielding \([-c–m]\), typically called ‘theme’. We might want to extend this reasoning to externally caused changes of mental states (20a). In this case, intentionality is encoded in the experiencer as \([-c+m]\), which in turn allows the inference of \([/+c]\) outside the core domain of physical action.11

In the absence of a relevant mental contribution, the feature c defaults to a Michottean interpretation of causation. i.e. movement in space. Objects described as moving independently, as touching, launching, or pulling others (20a–c), are coded as \([/+c]\). Objects described as being attained/touched (i.e. goals), pushed or pulled by other objects (21a, b) are coded as \([-c]\).

(20) Cues for the presence of \([/+c]\) for argument A of verb V

- A exhibits event-relevant, independent motion (i, ii, v).
- A makes event-relevant contact with another event-participant (iii, iv).
- A induces event-relevant motion in another event participant (ii, iii, v).
- A contributes to an intentionally caused change of state in another event participant, e.g. hands, instruments (vi).
- A causes an event-relevant change of mental state in another event participant (vi–viii).

10 A reviewer insists that \([-m]\) should mean ‘must not contribute relevant mental activity’. As far as I can see, such a condition does not make sense. Take the object of verbs like to eat (a theme, \([-c–m]\)) in a sentence like A shark ate my friend Georgios. In the event thus described, the object, my friend Georgios, will sure as hell be in an event-relevant mental state. If the absence of such a state were asserted as part of the lexical entry of to eat, the proposition A shark ate my friend Georgios would be false, if poor Georgie happened to feel pain in the event. I believe the proposition remains true, and that \([-m]\) should not assert the absence of event-relevant mental activity, as I argue in the main text.

11 See Gleitman et al. (2005) on the problems involved in the acquisition of mental state verbs.
Cues for the presence of \([/-c]\) for argument A of verb V

a. A is being touched or attained in an event-relevant way by another event participant \((i-v)\).

b. A’s motion is described as contingent on another event participant’s activity \((ii, iii, v)\).

c. A undergoes an event-relevant, intentionally caused change of state \((vi)\).

I would like to illustrate the reasoning required for the postulation of specific feature values with the verb *to break* \((22, 23)\) and its respective theta-roles \((24)\) from Reinhart (2002). A more detailed discussion cannot be given for reasons of space. The reader is referred to Haiden (2005) for a large set of German verbs in different constructions; Haiden (2007) discusses emission verbs and underspecified \([-\] \) clusters in English and German respectively; the link between modality and thematic roles is addressed in Haiden (2005; 2006; 2010).

(22) Max broke the window.

(23) The storm broke the window.

(24) break \([+c] [-c-m]\)

The verb *to break* describes a change of state (disintegration). Furthermore, it describes this change of state as being caused. By \((vi)\), the verb should therefore encode intentionality in some form or another. However, the verb plainly allows inanimate causes as subjects \((23)\). In this case, the subject cannot be said to encode intentionality, and the object cannot be viewed as mentally represented by the subject cause. Intuitively, the verb does not attribute intentionality to any of its arguments. So if the findings reported in section 3.3 have any bearing on the linguistic interpretation of changes of state, then we are forced to conclude either that *the storm* in \((23)\) is interpreted as causally irrelevant for the state of the window, or that the verb *to break* encodes intentionality against appearances. As the former option does not capture the meaning of the verb, which describes a caused change of state, the causal force of the subject must be facilitated by a \([/-m]\) specification of the object. Once the feature \(M\) is present in the lexical entry of the verb, the change of state can be encoded as a causal sequence, yielding \([+c]\) for the subject, \([-c-m]\) for the object.

There are two ways to think about the \([/-m]\) specification of the object. Intentionality could be attributed as a property of the event \((cf. ix)\). The other possibility is that expressions like \((23)\) attribute intentionality as a property of the observer \((the\ speaker)\). After all, lexical verb entries are not themselves event perceptions \((as\ Jackendoff\ 1983\ would\ have\ it)\), but linguistic representations thereof. Cases of external intentionality can actually be observed in the context of deontic modality \((Haiden, 2010)\).
3.5 Conclusion

In this chapter I tried to rehabilitate thematic roles as ‘the block stones that we know already that sentences are composed of’, and I explored ‘what other work they do in relating derivations to the cognitive systems’ (Reinhart 2000: 38) After an argument against the lexical structures assumed in mainstream lexical semantics, I proposed a cognitive foundation of Tanya Reinhart’s role features. I argued that those features encode the explanatory constructs of a modular theory of event perception. An important aspect of this discussion, ignored in lexical semantics, is the role of intentionality in the causal interpretation of change of state events. The final section applies the cues established in research on perception, in order to establish falsifiable guidelines for the identification of individual roles of lexical items.
4

Combine

EDWIN WILLIAMS

4.1 The unity of head-targeting operations

In the standard model of generative grammar from nearly the beginning through to the present, there is a syntactic component that generates syntactic structures and interpretative components that do not generate, but rather interpret the syntactic structures by mapping them into other structures or other things. In most models, morphology, particularly morphosyntax, is an interpretative component. This setup forces redundancies which I think can be eliminated only by eliminating the setup itself. I will suggest that there is a single generative function, which I will call ‘Combine’, that mixes phrasal syntactic and morphosyntactic operations in such a way that it is impossible to separate the generative part from the interpretative part. I will further argue that Combine is the unique generative function for two different generative systems, the phrasal system (called ‘syntax’) and the word system (called ‘derivational morphology’), and that in each of these systems, the only structures generated are morphologically interpreted structures. I thus argue against syntactic decomposition approaches which have one undifferentiated syntactic system (e.g. Borer 2005a; 2005b; Chapter 5 below; Harley 1995; Pylkkänen 2008; Ramchand 2006, Travis 2000). Reinhart’s work on argument structure likewise opposes the syntactic decomposition approach on entirely different grounds—see especially Reinhart (2002; forthcoming, a).

I will survey principal findings in the domains of theta structure, derivational morphology, and head movement constructions to substantiate the conclusion.

The most striking redundancy in the standard setup with interpretive morphosyntax is in the role of heads. There is a generative syntactic operation of Head Movement and a morphological interpretative operation of Affix Hopping. In these operations are in different components, and appear to do different things. But there is

1 Sometimes called Affix Lowering or just Lowering.
a striking commonality: both rules target the heads of expressions, both are inhibited by a ‘minimality’ constraint (in syntax, called the Head Movement Constraint (Travis 1984)), and by an absolute constraint (they are both ‘clause-bounded’; see section 4.3 for discussion).

Before we consider the evidence for the commonality, let’s take it as given, and ask what it should prompt us to do, assuming that we cannot ignore it. One possibility is to state some conditions on operations that are general enough that they encompass operations in different components. For the minimality constraint, we would generalize the HMC to apply not just to syntactic operations, but to any operation in any component of a certain type, let’s say ‘head-targeting operations’. We would do the same for the absolute bound: it applies to any operation in any component of the right kind, again, head targeting. I will not pursue this line, because I think that there is a more powerful possibility, but a possibility with radical implications. It is more powerful because it removes our ability to make piecewise decisions about the scope of various laws, like the HMC and clause-boundedness. It is more radical because it suggests dissolving the wall between syntax and morphosyntax so that morphosyntax is no longer interpretative, but is part of the generative engine itself.

Suppose that there were literally a way to make Head Movement and Affix Hopping the same operation. I don’t just mean the same operation occurring in different components, but the same operation, full stop. In the classic English/French distinction, Head Movement operates in French, but Affix Hopping of Tense operates in English:

(1) a. *Jean T+embrasse avoir [t Marie]
   Jean kisses often Mary
   b. *John have often [kiss+T Mary]

   How similar are these operations? As mentioned before, both show minimality and absolute bounding. The following illustrates the minimality condition: in periphrastic tenses Tense can attach only to the higher auxiliary, not the lexical verb:

(2) a. *Jean T+embrasse avoir [t Marie]
   b. *John have often [kiss+T Mary]

   The absolute bounding will be discussed in section 4.5. In addition, they both manufacture a product, the [V+T] unit, and in assembling that product T seeks a V target subject to the bounding conditions just mentioned. In fact, we can write a description of what either operation does in a way that is perfectly ambiguous between the two:

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2 Pollock (1989); Emonds (1978).
3 In some versions of this line Affix Hopping is replaced by ‘Covert Verb Raising’, but the same issue arises; and Affix Hopping is sometimes called Affix Lowering.
Now would it be possible to say that there was a single operation as in (3) which subsumes both Head Raising and Affix Hopping?

The obstacle to such an identification is of course (1): there is the difference between French and English, and numerous similar differences between languages and even between constructions in the same language. But now suppose that we allow for that difference by parameterizing the output of the operation in a way that gives rise to different outcomes along the lines of (1). What we then would have is an operation that gives different outputs given different inputs, but was nevertheless the same operation applied to identical types of material, rather than being different operations operating in different components. I will pursue this possibility, and I will call the operation ‘Combine’.

What are the parameters? To distinguish (1a) and (1b) we need to position the product \[V+T\] differently for the two cases. In French the \[V+T\] product is prefixed to the Verb Phrase. In English, the product is positioned in the head position of the Verb Phrase. So Combine must have a parameter that allows for these two different possibilities. Let us suppose that there is a phrasal ‘size’ parameter ‘P’ which determines whether the product will be prefixed to the phrase (call that value ‘XP’), or positioned on the head (call that value ‘X\(^0\)’). Since the question of where to position the product has nothing to do with the search for the target V, this parameter will not affect how the minimality and absolute bounding works; it will simply determine where the product is pronounced, and so gives the difference between (1a) and (1b).

So Combine is the operation in (3), bounded as discussed, and with a P(hrasal) parameter with values \{XP, X\(^0\)\}. Combine is a function that always takes two arguments, and two parameter values. Where does the parameter come from? The simplest answer is, the first argument to Combine; Tense in English has P=X\(^0\), and Tense in French has P=XP.

The radical conclusion that follows from the identification of Affix Hopping and Verb Raising is that the separation of the grammatical system into two components, a generative phrasal syntactic component and an interpretative morphological component, is now thrown into question. And in fact I think if the logic of this approach is carried out it must be given up altogether. In this chapter I will sketch some of the consequences of doing so.

### 4.2 Extending Combine

We have minimally established that Combine must have a P parameter to distinguish English and French. Before we discuss a further parameter, we must consider what Combine is applying to. The usual assumption about both Verb Movement and Affix
Hopping is that they apply to structures in which the two terms, say T and V, are already in the structure:

\[(4) \quad \begin{align*} 
\text{a. } & [T \ldots V ] \ \Rightarrow \ [T+V \ldots ] \quad \text{(Verb Movement)} \\
\text{b. } & [T \ldots T+V ] \ \Rightarrow \ [T \ldots V ] \quad \text{(Affix Hopping)}
\end{align*} \]

Both outputs are problematic, in that they violate the ‘Extension Condition’, a descendant of the cycle, which says that trees must always grow. In neither operation in (4) does the tree grow; its contents are simply rearranged. So an otherwise needed condition fails to include Affix Hopping or Verb Raising, or for that matter Combine. Chomsky (2001) considered the lapse of generality so grave that he suggested removing Verb Raising to Phonology, since interpretive components obviously cannot be subject to the Extension Condition. But I think that (4) is the wrong idea about what Combine applies to. Instead of applying to a tree, suppose that Combine applies to two items in the workspace, and, well, ‘Combines’ them:\(^4\)

\[(5) \quad \begin{align*} 
\text{a. } & \{ T, [V \ldots ]_{VP} \} \ \Rightarrow \ \{ [T+V][\ldots ]_{VP} \} \quad (P=XP) \\
\text{b. } & \ \Rightarrow \ \{ [[T+V]\ldots ]_{VP} \} \quad (P=X^0)
\end{align*} \]

Now there is an Extension Condition that holds with full generality: ‘something new’ must be added to a member of the workspace; here, T is added to VP in both cases. Whether it ‘makes the tree bigger’ will be determined by the P parameter, but nonetheless, an obvious Extension Condition can apply to both: ‘add something new.’

But Combine is now not just doing the job of Verb Raising and Affix Hopping: it has also taken over at least part of the function of basic ‘Merge’, the operation that simply concatenates two things in the workspace and makes a third thing. We may as well go all the way, and consider Merge to be simply a sub-case of Combine, the sub-case where the Combine parameters dictate simple concatenation. So, for example, at the beginning of derivation a noun is Combined with a verb to create a basic theta structure:

\[(6) \quad \{ N, V \} \ \Rightarrow \ \{ [V N] \}\]

Here Combine\((V, N) = [V N]_{VP}\), where the first two arguments are taken from the workspace, both are removed, and the result is put back in the workspace. I will further discuss Combine in its role at the Thematic level in section 4.6.

There is an important difference between (4) and (5) from the point of view of semantics. In what I have just outlined, there is never a structure \([T VP]\); rather, T and VP are plucked from the workspace and the result of Combining them is put back in. But there is a reason for creating the structure \([T VP]\) in the first place, and

\(^4\) Curly brackets enclose the workspace.
that is semantic interpretation. Compositional semantics knows what to do with [T VP]; but it does not know what to do with [[T+V] . . .]_VP, because in that structure T is in the wrong position to be interpreted compositionally. So one might think it necessary to build the structure [T VP] after all, and live with the Extension problem. But there is another way: instead of semantically interpreting structures, we can interpret derivations of structures, and in a very straightforward way. Every time Combine combines two elements, a (two place) semantic function computes their semantic value; so a derivation consists of paired applications of a morphosyntactic function (Combine) and a semantic function:

\[(7) \quad \text{Workspace: } \{ (X, 'X'), (Y, 'Y') \} \]

Derivational step:
\[
Z = \text{Combine}(X,Y),
\]
\[
'Z' = \text{Semantic-Function('X', 'Y')}
\]
New workspace: \{ (Z, 'Z') \}

Here I use quotation marks as 'meaning brackets'. The assumption now is that every workspace object consists of a morphosyntactic expression (MS) and its interpretation ('MS'). A derivational step consists of taking two objects from the workspace, Combining them morphosyntactically to derive a new MS, and Combining them semantically to derive the meaning of the new MS. So, although [T VP] never exists, its meaning is computed by Semantic-Function (T, VP), and that meaning is assigned to the MS object that results from Combining them.

So we have taken a radical step. Combine subsumes Affix Hopping, Verb Raising, and simple Merge, and as such, it becomes the principle generative function of syntactic derivation. The benefits are the obvious benefits that always arise from identifying several things as one thing, plus there is the solution to the extension condition. The cost, so far, is that we found it necessary to parameterize Combine to account for different outcomes, and we need now to semantically interpret not structures, but derivational steps. The parameterization will be pursued further in the next sections. The new relation to semantics has interesting consequences that cannot be pursued here: principally, that the interpretation of a derivational step will be independent of the parameter values that fix the Combine operation—put in more familiar terms, Verb Movement cannot change meaning.

5 In the remainder of the chapter I will only indicate the MSs in the workspace, since the meanings are not relevant to the ideas I will put forward, but it is to be understood throughout that the workspace objects are structures paired with their meanings.

6 In Williams (2010b) it is suggested that Combine is the only generative function.
4.3 The morphological side of Combine

If we are seriously going to erase the componential divide between syntax and morphosyntax, there is more work to do. Affix Hopping does more than simply attach T to V; in some cases, it seems that it puts T inside V, as in:

(8) \{ past, [understand it]_{VP} \} \Rightarrow \{ [under[stand+past] it]_{VP} \}

That is, it looks as though Combine doesn’t just adjoin Tense to the Verb, it actually positions Tense inside the verb morphologically, at least if Combine has the scope that we have asserted for it. Otherwise, we will need another operation or set of operations, which convert [past + V] into something closer to the pronounced form of the verb, something like on the right side of (8). Since this further process will, it appears, be similar in its essence to Combine itself, it is only fitting that we subsume that operation under Combine as well. At issue here is not the positioning of the product \[T+V\], but rather the character of the product itself—what morphological relation does T have to V? Here, as in the case of the P parameter, we can imagine that there is a range of possibilities—T could attach to the root of V (as in the case at hand), or to a derived stem of V, or to the entire ‘word’ that constitutes the verb. So again, we have a parameter, I will call it the ‘M’ parameter, and it has possible values drawn from \{root, stem, word\}. English T clearly has the value M = root, as shown in (8).

So, Combine is fitted out with two parameters, P and M, with orthogonal ranges of values. This might strike some readers as an artificial arrangement, an artefact of making a false alliance between Affix Hopping and Verb Raising in the first place. But I think in fact that giving Combine these two parameters can be defended on conceptual and empirical grounds.

Conceptually: every morpheme must be positioned in two different dimensions: the head/phrase distinction of syntax, and the root/stem/word distinction of morphology. Combine embodies the idea that these two positionings happen simultaneously, and not in different components. In standard theories, where the two positionings happen in different components, various interactions are allowed that are automatically excluded here. For example, under the present proposal there can be no syntactic operation or relation that intervenes between the two putatively operations of attaching V to T and attaching T inside V.

Empirically: the theory now isolates the difference between French and English, and gives a rationale for movement. French and English differ in how the product is positioned (P=XP for French, P=X⁰ for English), but they are identical as to the character of the product, as both attach Tense to the verbal root, so M = root for both languages. But now we ask: what is the parameter that triggers movement? Why don’t we simply prefix T to VP in French, without movement? The answer is that in French the M = root parameter forces movement; M must attach to the head of VP to form the product, but the P parameter dictates that the product be prefixed
to VP. This is a descendant of the idea that it is morphology that triggers movement.
What happens if there is no M value? Then there is no movement, only prefixation,
as for example with complementizers:

(9)  a. that_{P=XP}  
    b. \{ that, IP \} \Rightarrow \{ [that \ IP]_{CP} \}

So the two parameters conspire to give us a range of possible outcomes:

<table>
<thead>
<tr>
<th>P: X^0</th>
<th>P: XP</th>
</tr>
</thead>
<tbody>
<tr>
<td>M: none ?? that</td>
<td></td>
</tr>
<tr>
<td>M: root English T French T</td>
<td></td>
</tr>
</tbody>
</table>

Table (10) raises the question of whether there is a morphosyntactic process that fills the M = none/P = X^0 slot, a question I will address in section 4.7; but here I turn to the question of what values the M parameter can take. I have asserted that it takes values other than ‘none’ and ‘root’, and French itself provides an example of further variation in this parameter (D. Sportiche, p.c.). In the present and past, French behaves as reported thus far: Tense attaches to the root of the verb; but for the future it does not, and the result is morphological ‘regularization’:

<table>
<thead>
<tr>
<th>Infinitive</th>
<th>3s present</th>
<th>3s past</th>
<th>3s future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple verb</td>
<td>voir ‘to see’</td>
<td>voit</td>
<td>vit</td>
</tr>
<tr>
<td>Derived verb</td>
<td>prévoir ‘to foresee’</td>
<td>prévoit</td>
<td>prévit</td>
</tr>
</tbody>
</table>

We can understand what is special about the future in terms of the M parameter value for the future tense. For the other tenses, Tense attaches to the verb root, giving rise to root allomorphy; but the future tense attaches to the infinitive stem, which includes the prefix. So for the present and past the M value is root, but for the future, the value is stem, resulting in the following structures:

(12)  a. [[pre [voir+past]]] = prévit  
    b. [pre voir]+fut] = prévoir+a

voir+past will give rise to the allomorphic form based on the root verb, but that will not happen for [[pre voir] + fut] as the tense is not attached to the root. This is independent evidence for the set of values we have assigned to the M parameter, and for the M parameter itself.

To summarize, Combine is doubly parameterized, with P values drawn from \{X^0, XP\}, and M parameters from \{none, root, stem, word\}. (The illusion of) verb movement arises when P = XP and there is an M value. (The illusion of) Affix Hopping arises when P = X^0 and there is an M value. The parameters are supplied by
the first argument to Combine; that is, for Combine(X, Y), X supplies the values for
the P and M parameters. Below are some parameter values that have already been
discussed:

(13) that: P = XP
    French Future: P = XP, M = stem
    French Present: P = XP, M = root
    English Present: P = X^0, M = root

4.4 Mirroring

The most important concept in morphosyntax is the Mirror Principle, which is not
really a principle, but an effect: often, the order of morphemes on the verb reflects the
order in which the morphemes occur in the underlying syntactic structure. So, for
example, in most languages with subject and object agreement (S-Agr, O-Agr), the
object agreement marker occurs between the subject agreement marker and the verb,
just as the object itself occurs between the subject and the verb (in the vertical
dimension); Swahili shows this kind of mirroring directly (see below). In a theory
with verb movement and the Head Movement Condition, mirroring will arise
through successive movements that accumulate the morphemes sequentially, and
so the mirror effect is a derived fact:

(14) [ Tense [S-Agr [O-Agr [ V ]]]] ⇒
    [ Tense [S-Agr [V+O-Agr [ t ]]]] ⇒
    [ Tense [V+O-Agr+S-Agr [t [ t ]]]]

But in the theory under consideration here, mirroring will arise only in particular
circumstances, and the action of Combine can give rise to non-mirroring structures.
In fact, we have already seen a non-mirroring structure: understood, analysed here as
[under [stand + past]], has a derivational morpheme superior to a Tense morpheme,
whereas surely the felt semantic relation between the two is the opposite, and in
standard theory the semantic relation is derived compositionally from a syntactic
relation that holds before movement of Tense. In the present theory, the non-
mirroring relation arises because Tense has the M value root, and so Tense is
moved onto the root of the verb, past the already attached derivational prefix under-;
we know that Tense attaches to the root because we find root allomorphy; see the discussion of (11) above.

Given the various parameters of Combine, mirroring by two morphemes A and B
arises precisely under this circumstance: if A is superior to B semantically, and A has
an M parameter value that is larger than or equal to B’s M parameter. Non-mirroring
arises when A has a smaller M parameter than B. ‘Smaller’ M parameter here is
defined by the intuitive ordering root < stem < word.
In particular, if two morphemes with the same M value are Combined with the same verb, they will end up in a mirroring relation to one another in the morphosyntactic structure that arises from Combining them. We might suppose that Swahili works this way, and that that is why the Swahili morphemes are mirrors of the syntactic structure:

(15) \( \text{Juma a-li-ki-soma kitabu} \)

Juma S.Agr-Past-O.Agr-read book

'Juma read the book.' (Barrett-Keach 1986: ex. 37a)

Let us suppose that S-Agr, Past, and O-Agr all have the same M and P values, say stem and \( X^0 \) respectively. Then the following succession of Combines will produce the verb form:

(16) \( \text{Combine(O-Agr, [soma kitabu]) = [ki-soma kitabu]} \)

Combine(Past, [ki-soma kitabu]) = [li-ki-soma kitabu]

Combine(S-Agr, [ki-soma kitabu]) = [a-li-ki-soma kitabu]

The order in which morphemes are Combined is fixed by F-structure. F(unctional)-structure is ordinarily taken to be the ordering of functional elements (Tense, Aux verbs, etc.,) that occur in a fixed order in the structure of the clause; the business of discovering the orderings is called ‘Cartography’. Let’s assume that Cartography has established that S-Agr > Tense > O-Agr > V. In the theory to be developed, F-structure is not directly the structure, or 'spine', of the clause, but is the 'clock' that determines when events happen in the workspace, and is only indirectly related to the structure of the clause.  

We will see in the subsequent sections a number of cases in which non-mirroring relations between morphemes arise exactly when they unequal M values. In every domain—adverbs, quantifiers, thematic structure, derivational morphology—we find only partial mirroring. The promise of the present proposal is that the dimensionality of partial mirroring can be understood in terms of the different target sizes defined by the M and P values; otherwise we have no answer to the question: why is there any mirroring at all?

Mirror failures like understood are common, not unusual. Embick and Noyer (2001) discuss the case of a Lithuanian affixal reflexive morpheme which occurs outside of the Tense morpheme, clearly an inversion of the interpretive order T > reflexive:

(17) a. is-si-laikau

PREVERB-SELF-hold.hand

See Williams (2010b) for a discussion of this conception of F-structure.
The reflexive is really an affix, and not a clitic, as it appears inside other undoubted affixes, the preverbal affixes (a). In Embick and Noyer’s theory, Tense is added first even though it is semantically superordinate to the reflexive prefix (an ordering of course not allowed in the present theory); then the problem is to prevent the reflexive prefix, which according to their analysis is to be lowered, from attaching to the root of the verb itself, and not to the \([\text{root}+\text{T}]\) combination. Their solution they give is a string-vacuous movement of Tense to the verb. Their solution does not actually solve the problem without further stipulations. But really this case is no different from understood: a non-mirroring structure is built because Tense is targeting something smaller than what the reflexive prefix is targeting; for concreteness, we might suppose that for Tense \(M = \text{root}\), and for the reflexive prefix \(M = \text{stem}\).

In theories like Distributed Morphology, non-mirroring structures arise from language-particular morphological rules written in one of several general rule-writing systems. In the theory I am aiming at here, an overriding goal is to eliminate all such general rule-writing systems, and to limit variation to the Combine parameters. It is far from obvious that it is possible to do so, but it is obvious that it is worth trying to.

### 4.5 Bounding Combine

If we think of F-structure as a linear series of elements that make up a clause, then according to the Head Movement Constraint, any F-structure head can block a head from moving over it. Translating into our terms, it means that Combine\(\left(\text{A}_{p=x_0}, F_i P\right)\), where \(F_i\) is some Functional head, should always attach A to the \(F_i\) head. This will give too narrow a bound on Combine; we will see need to enlarge the values of the P parameter of Combine somewhat, and then to allow the product of Combine\(\left(A, F_i P\right)\) to be formed by combining A with the first F in \(F_i P\) that satisfies the M value. So there will be a minimality-style bounding of Combine relativized to the values that the parameters can take. In English, for example, Subject–Aux inversion takes the first Auxiliary Verb and Combines it with a null C, and prefixes the product to the second argument:

---

8 See Williams (2006) for discussion of this problem.

9 See ibid. for discussion of the general rule-writing systems countenanced by Distributed Morphology.
Combine(C_{P=XP}, \ M=AuxV, \ IP) = \[(C+AuxV) \ IP\]

Combine with the given parameters begins a search in IP for an AuxV, and it takes the first one it finds, so we don’t have (19b), for example, but only (19a):

(19)  
   a. Has John \(t\) been swimming  
   b. *Been John has \(t\) swimming

The search for an AuxV will skip over anything in the F-structure of IP that is not an AuxV; there may, for example, be unrealized head positions for \(F_{Modal}\); if these are not overtly expressed AuxVs, then they are skipped over. I will shortly discuss Long Head Movement, and the point I am making here will become more vivid.

But is there an absolute bound on Combine, or only the relativized minimality bound? It seems that there is an absolute bound; in English, for example, suppose that a matrix clause lacked an AuxV altogether, but that there was one in a complement clause:

(20)  
   a. John said Mary has left  
   b. *Has John said Mary \(t\) left

(20b) shows that even if the search through the heads of the top IP for an AuxV is unsuccessful, the embedded CP marks an absolute bound to the search for one. I will call this absolute bounding \(F^n/F^0\) bounding.

Long Head Movement (LHM) seems to violate the strict Head Movement Condition, and at the same time affirms the absolute \(F^n/F^0\) bounding on Combine:

(21)  
   a. Procel, \(sum \ t\), knigata  
       Read have \(I\) \(t\) the book (Bulgarian: Rivero 1992)  
       ‘I have read the book’  
   b. Lennet, \(en \ deus\ Yann \ t\), al levr  
       Read \(3s\)ms has Yann the book (Breton: Roberts 2000)  
       ‘Yann has read the book’

In both examples, a participle has moved above its governing auxiliary. Roberts (2000) documents that the movement really is head movement, and not degenerate (‘remnant’) VP movement; on the grounds that these languages do have VP movement, but the movement illustrated in (21) differs from VP movement in being clause-bound, and in being blocked by certain intervening heads.

Long Head Movement must be squared with the HMC. Roberts’s proposal is that the HMC is ‘relativized’ to target types. In our terms, it means that Combine’s search for a target head in its second argument is governed by the parameters provided by

---

10 \(F^0\) is reserved for the lexical verb, and \(F^n\) for the top of a functional projection, so \(F^n/F^0\) refers to the boundary between a matrix verb (\(F^0\)) and its complement (\(F^n\)).
the first argument. In the face of examples like those in (21), ‘P = \( V^0 \) is inadequate, because it suggests that the highest V should be the only moveable one, and that is clearly wrong; Rivero gives examples where other auxiliaries are skipped over. Rivero (1992) put her finger on the crucial feature of the construction: the auxiliaries that are skipped over are always enclitic, and can never stand as the first element in a sentence; and the verb that is moved is not enclitic. We can accommodate this finding by specifying M=word for the relevant auxiliaries (\textit{sum} in (21a), \textit{en} in (21b)). The search through IP for Combine(\textit{sum} \( P=XP \), \textit{M}=\text{word}, IP), where ‘\text{word}’, meaning ‘non-enclitic free-standing word’, terminates when the first head in IP that is a word is found; then the product [\text{word}+\text{sum}] is formed, and prefixed to the IP, as dictated by the P parameter. Other clitic heads, not qualifying as words, will be skipped over.

A further indication that the trigger for LHM is the enclitic status of the first auxiliary is that it is inhibited in the presence of fronted topics and wh-phrases:

(22) a. *\textit{Koga poljubio je Ivan?}  
whom kissed is Ivan
‘Whom has Ivan kissed?’

b. \textit{Koga je poljubio Ivan} (Serbo-Croatian: Boškovic 2001: 38)

\textit{Je} normally triggers LHM, but not only is it not necessary (b), it is impossible (a); obviously, the fronted phrase itself satisfies the clitic’s need. Furthermore, LHM is a ‘last resort’ process, applying only when a clitic would otherwise go unsupported, as Rivero shows.

The inhibition of LHM in the presence of negation is telling as well:

(23) a. *\textit{Ne prorel sfim knigata}.  
not read I.have book.the

b. *\textit{Prorel ne sfim knigata}.  
read not I.have book.the

c. \textit{Ne sfim prorel knigata}.  
not I.have read book.the

‘I have not read the book.’ (Bulgarian)

The failure of LHM in (b) has led some to conclude that LHM is not a case of head movement, as head movement in general is supposedly inhibited from crossing negation (no such general conclusion is possible with Combine). But strikingly, LHM is not possible \textit{beneath} negation either (a); furthermore, the form with no movement (c) is grammatical. Example (23a) shows that it is not crossing negation which causes the problem, and (23c) shows that whatever drives LHM in parallel cases without negation is neutralized with negation. The answer is simple, and is the
same as for the fronted topics and wh-phrases: *ne* itself satisfies the need of *sfin* to lean left, and since LHM is last resort, it does not happen. All that is required is to give *ne* the status of word.

LHM thus pins down two features of the Combine operation when it has an M value: the first is that Combine initiates a search through the functional heads of the second argument for the first head that satisfies the M parameter; and second, if we accept Roberts’s finding about clause boundedness of LHM, that search is terminated at the $F^n/F^0$ boundary whether it has been successful or not.

We thus can define the Combine operation in the following way:11

\[(24)\text{ for } \text{Combine}(X_{P=a}, M=b \ [Y WP]_{YP}):\]
\[
\begin{align*}
&\text{determine if the head of } YP \text{ can satisfy the M parameter of } X; \\
&\text{if it matches,} \\
&\quad \text{position the product } [X+Y]^{12} \text{ with respect to } YP \text{ as determined by the} \\
&\quad \text{P parameter} \\
&\text{otherwise, if } YP \text{ is the functional complement of } X, \text{ then continue the search} \\
&\quad \text{in } WP.
\end{align*}
\]

The ‘otherwise’ clause gives rise to Long Head Movement and related phenomena, but preserves absolute $F^n/F^0$ bounding. LHM itself appears to be rare, but LHM behaviour is rampant. This particular formulation of Combine will be important for extending its reach, and explaining its behaviour, in domains we have not looked at yet: namely theta structure, derivational morphology, and adverb placement, in all of which we find parallels to LHM and absolute $F^n/F^0$ bounding.

In fact, though, the formulation does not completely live up to what is advertised: it ‘leaks’ at the $F^n/F^0$ boundary; it predicts that for Combine($F^0, F^n$), $F^0$ will be able to attach to the top functional head $F^n$ of the second argument, its complement, and the product will be $[F^0+F^n]$, so long as $F^n$ satisfies the parameters of $F^0$; what is blocked by (24) for such a case is further search into the complement of $F^n$ under the otherwise clause of (24) in case $F^n$ fails. It seems to me that there are some likely examples of such leaks; one is the $[P+D]$ product that one finds in such languages as German, French, and Romanian:

\[(25)\text{ a. zu } [\text{dem } \text{Bahnhof}]_{DP} \Rightarrow \text{zum Bahnhof} \text{ (German)}\]
\[\quad \text{to the train-station}\]

---

11 In this formulation I have deliberately left out a further dimension of variation in how Combine operates, namely the directionality of attachment. Clearly, with the triggering clitics in Bulgarian the attachment must be to the right of the target, but in other cases, e.g. the Greek adverbs to be discussed in the next section, the attachment is to the left. At worst, we will need to enrich the M and P parameters with direction indicators, e.g. $M = \text{word indicating right attachment}$.

12 $[X+Y]$ is shorthand for the structure obtained by attaching $X$ to $Y$ in the manner dictated by the M parameter.
b. *de [le vin] ⇒ du vin (French)
   of the wine

c. Mă indrept către parc / *către parc-ul (Romanian)
   me head towards park towards park-the
   ‘I’m heading towards the park’ (Mardale n.d.)

Another is the ‘wanna’ construction in English, on the assumption that ‘to’ is the top F element in the complement:

(26) Combine(want\(_M^{=to}\), P=XP, toP\(_{13}\))

If this is the correct analysis of wanna, then the famous failure of wanna to contract across a wh-trace has a novel account here: the trace cannot occur in the presence of the contraction because in order for the contraction to take place under the formulation in (24), the complement has to be so small (a bare infintival toP with no case-marked subject position) that there is no appropriate position for the wh-trace to occur in it.

4.6 Theta structure and derivational morphology

The formulation of Combine in the previous section mentions ‘F-structure’, and so one might at first think that Combine only operates in the presence of F-structure, that is to say, in phrasal syntax. But this is not so—any domain in which ‘head’ is defined is a domain in which Combine can operate. However, if a domain does not have F-structure, Combine will operate in a limited way: its ‘otherwise’ clause in case of target failure will be inactive, as that clause does require F-structure. As a consequence, in an F-structure-less domain, the search invoked by an application of Combine will terminate if the first head of the second argument does not match the parameters. I think that this is exactly the right characterization of the syntactic behaviour found in certain domains of linguistic object. In particular, I think it gives the right characterization of derivational morphology, and also of the ‘pure theta’ core of phrasal syntax.

4.6.1 Derivational morphology

I have argued elsewhere (Williams 2006) that derivational morphology in something like the traditional sense is a module separate from phrasal syntax. Inflectional morphology, on the other hand, is part and parcel of phrasal syntax, as the discussion in the previous section suggests. The alternative of course is to integrate all of morphology into phrasal syntax, making one big undifferentiated syntactical system

\(^{13}\) ‘toP’ is a verbal projection with to as its highest functional head.
(OBUSS), as one finds for example in Distributed Morphology. One of the arguments against OBUSS is that it is impossible to define the target attachment conditions of derivational affixes without the modularization of derivational v. phrasal morphology. An example is the English prefix *re-, which only attaches to ‘process-result’ (a subtype of ‘telic’) predicates:

(27) a. The butter remelted.
    b. *John relaughed.

Significantly though, *re- distinguishes between telic words and telic phrases:

(28) a. *John re-made Mary sad.
    b. John re-saddened Mary.

*Make by itself is not a telic predicate; only when combined with a result predicate is a telic predicate achieved. *Sadden, on the other hand, is a telic predicate all on its own. *Now *sadden derives from something like ‘make sad’ in any theory, mine included—in my theory it is derived as Combine(-en, sad) in the derivational morphology component. The problem for OBUSS is that *sadden and *make sad will have essentially the same underlying structure, with incorporation applying to derive *sadden. The problem for the attachment of *re- is: how is it to know that the meaning-neutral application of incorporation has happened (or will happen)? The more general problem for OBUSS is that it has no notion of ‘telic word’, which seems to be the condition governing the attachment of *re-. So in Williams (2006) I conclude that *re- is attached in a derivational system creating words that feeds, but is not part of, the phrasal syntactic system, an arrangement in which ‘telic word’ makes sense. The conclusion is a broad one, since any affix which can appear interior to *re- must also be part of the derivational system, and that includes all of the derivational prefixes of English (*re-mis-align, *re-de-bone, etc.), and also all of the incorporations of the *sadden kind, as well as derivational suffixes. See Williams (2006) for full discussion. See also Neeleman and van de Koot (Chapter 2 above), Haiden (Chapter 3 above), and Horvath and Siloni (forthcoming) for additional arguments against OBUSS approaches.

So there is a derivational system consisting of stems, roots, prefixes, suffixes, etc., but no functional elements. The principal question then is: what is the generative engine in this domain? The answer is Combine, of course, and in what follows I will argue that important aspects of the character of derivational morphology follow directly.

At first blush it would appear that derivational morphology violates categorial boundaries, as in the following derivation:

(29) -er\textsubscript{N} + [truck\textsubscript{N} + drive\textsubscript{V}]\textsubscript{V} ⇒ -er\textsubscript{N} + [truck drive]\textsubscript{V} ⇒ [truck drive-er]\textsubscript{N}
First *drive* and *truck* join in a theta relation to form a verbal complex; then a nominal element, -*er*, moves into that verbal complex. Moving a nominal element into a verbal structure would seem to violate the spirit, if not the letter, of $F^*/F^0$ bounding; but in fact, the formulation of Combine in the previous section allows exactly that. If -*er* has $M = V_{stem_-}$ and the absolute first head of [truck drive], satisfies that value, as it does, then -*er* attaches to it. That can happen; what cannot happen would be for -*er*, in the case where the first head fails, to continue the search in the complement of the first head. So, for example, *trucker drive* is impossible on general grounds, although of course there are also particular grounds in this case. And the continued search is impossible because ‘defaulting’ to the complement via the ‘otherwise’ clause in the definition of Combine only happens in the presence of $F$-structure. The short way to put it is that there can be no LHM-type behaviour in the domains we are considering, because there is no functional structure; but there can nevertheless be limited mis-mirroring.

Several ‘morphological paradoxes’ can be resolved in terms of Combine exactly as we have stated it. For example, it has been observed by Pesetsky (1985) that there is a conflict between the scope and the morphological requirements of -*er* and *un*- in *unhappier*:

(30)  a. -*er* [ unhappy]
     b. un- [happier]

(a) represents the correct structure from the point of view of meaning, but as -*er* normally cannot attach to trisyllabic adjectives, (b) is the correct form for satisfying that restriction. But Combine can get both. The order of derivation is

(31)  a. -*er* > un- > happy $\Rightarrow^{14}$
     b. -*er* > [un[happy]] $\Rightarrow$
     c. un [happier]
     d. -*er*: $M =$ short root

The reason (c) is possible is that *un*- has the $M$ value ‘short root’ (i.e. less than three syllables), and *unhappy* has the short root *happy* in its head position, and so -*er* can target it. In going from (b) to (c), -*er* has passed by *un*- to attach to *happier*, giving a non-mirroring result: the order of the derivation gives the scope order, and Combine gives the spell-out, which in this case does not mirror the derivation. And note that no use of ‘default to the complement’ was made—*un*- is not the head in any sense, and so *happy* is the first, and only, available head.

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14 Here and in what follows, the ‘$>$’ symbol in ‘$X > Y$’ will be used to mean: ‘$Y$ is the complement of $X$’. Semantics interprets the ‘complement of’ relations themselves, not the structures Combine produces as their spell-out.
Another kind of paradox in morphology is ‘level ordering’ paradoxes. These are contested, but it is at least worth mentioning how Combine would treat them. Under the assumption that -ity is a root-attaching affix, and un- is a stem-attaching affix, and that roots are smaller than stems, we get again a representation that does not mirror the meaning:

(32)  
   a. meaning: [un grammatical ] ity
   b. root/stem ordering: un [grammatical ity]

But with the specifications in (a) below, we can get the derivation in (b):

(33)  
   a. Order of complementation: ity > un > grammatical
       -ity: M = root
       un-: M = stem
       grammatical: root, stem
   b. ity > un > grammatical ⇒
       ity > [un [grammatical]] ⇒
       [un [grammaticalinity]]

Again, no use of ‘default to the complement’ can occur here, but nothing blocks the derivation in (b), as in both steps the immediate head satisfies the criterion for the target. Importantly, here and throughout, scope is determined by the merge order, not by the resulting structure. Combine only gives the spell-out; the derivation determines the scope relations. So unhappier is the comparative of unhappy, not the negative of happier, because, as the first line of (31) indicates, un- attaches before -er; and in a completely parallel way -ity nominalizes ungrammatical, rather than un- negating grammaticality in (33).

Morphological ‘bracketing paradoxes’ are simply non-mirroring structures, and given the parameterization of Combine we expect them to arise, but within the narrow limits of how Combine operates in the absence of F-structure. The ‘paradoxical’ non-mirroring will arise exactly when an affix has a smaller M value than that of an affix which is semantically inferior to it.

4.6.2 Theta structure
There are a number of constructions which are probably not part of derivational morphology, but which share with derivational morphology the absence of F-structure. These include the extended family of constructions that Baker (1988) treats as cases of incorporation—they all involve movement of a lexical (i.e. non-functional) head to another lexical head, and thus are candidates for Combine. The question then

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arises whether the details of the constructions are compatible with the bounding of Combine, and in particular whether the narrow scope allowed to Combine in the absence of F-structure is adequate to describe these constructions.

The ‘clause union’ style of causative construction, including the well-studied Romance causative, presents a sharp challenge to the ideas presented here, as the standard analyses are incompatible with Combine as they stand. Generally the construction is taken to involve a movement of a verb embedded in a clause of some size to the governing causative verb, as illustrated here:

\[
(34) \quad \text{Jean a fait manger, [ti la pomme à Pierre]_{vP}} \quad \text{(French)}
\]

\'Jean has made eat the apple to Pierre\'  
Jean has made Pierre eat the apple.

The complement by general assumption is at least as big as vP, and hence contains some functional structure. But \textit{fait} and \textit{manger} are not part of the same functional structure, and so this movement is not possible under the formulation of Combine arrived at in section 4.4. To reconcile such constructions with Combine, it is necessary to assume that the embedded complement contains no functional structure at all, not even \textit{\textquoteleft\textquoteleft}little v\textquoteright\textquoteright; then Combine can target the unique lexical head of the complement and move it as indicated, under the values for \textit{faire} ‘M = word, P = XP.’

This conclusion is incompatible with the assumption that the external argument is assigned not by the V but by a functional element, ‘little v’. But in fact ‘little v’ should be unwelcome in any analysis of causative constructions—since a causative construction has two agents (Jean and Pierre in (34)), it should have two ‘little v’s. But there is in fact strong independent evidence that the embedded complement is a pure V projection, with no ‘little v’—in addition to assigning the external argument role, ‘little v’ has another property, the capacity to assign accusative case. So if one reasons that two agents implies two ‘little v’s, then one must reason further that two ‘little v’s implies two accusative cases, but that is characteristically unavailable in causative constructions. To see why, consider the following:

\[
(35) \quad *\ldots[v_P \text{Jean} [v \text{fait} [v_P \text{Pierre} [v \text{manger la pomme}] ]]]]
\]

If the higher ‘little v’ is available for case assignment, then it remains unexplained why the embedded direct object and the embedded agent cannot both be assigned accusative case. Instead, the embedded agent must get dative case, and in fact the reason this is called ‘clause union’ is because the resulting configuration has exactly the case frame of a single clause: V-Acc-Dat.
If we eliminate ‘little v’, we solve the problem of the extra accusative case, and we also enable Combine to perform the raising of the embedded verb. But we must conclude then that the verb itself is capable of assigning the agent theta role.

The conclusion is that Combine is compatible with the kind of clause union that is found in causatives, but only under radical circumstances: the embedded clause must contain no functional structure. There is certainly prima facie evidence in favour of this: intervening auxiliary verbs, which occupy Functional positions, are completely ungrammatical:

\[(36)\]

| a. | * \[vP Jean \[v fait + avoir \[t [manger la pomme (à Pierre)]]]] |
| b. | * \[vP Jean \[v fait + mangé \[t [avoir [t le pomme (à Pierre)]]]]] |

(a) shows the auxiliary forming a product with faire; (b) shows what happens if we stipulate that avoir is not an appropriate target—Long Head Movement, which is ungrammatical because faire and manger are not in the same F-structure.

If it is correct that clause union occurs in the phrasal syntactic component, then there must be at least one ‘F-free zone’ in phrasal syntax. In Representation Theory (Williams 2003), this is the initial level, theta structure, in the series of levels that constitute the architecture of that theory. In a standard theory, it will correspond to the lowest VP structure of the clause, before any functional elements are introduced.

Obviously the surface of the French causative is non-mirroring—the interpretation is ‘cause [V NP]’ but the surface is ‘cause+V [NP]. A much more surprising non-mirroring causative construction has been pointed out to me in Malagasy by E. Keenan (p.c.) and is reported in Keenan and Polinsky (1998):

\[(37)\]

[Tsy m+amp+atory anao ny kafe]

not pres+cause+sleep you.acc the coffee

‘Coffee makes you not sleep’ not the expected ‘Coffee doesn’t make you sleep’

Here, the interpreted order cause > not > sleep is expressed on the surface as not > cause > sleep. This arises under Combine by giving cause a smaller M parameter than negation (say, ‘word’ for negation and ‘root’ for cause); then the derivation goes,

\[(38)\]

{ cause, not, sleep } \[\Rightarrow\] { [not sleep] , cause } \[\Rightarrow\] [not [cause sleep]]

The interpreted order is, as always, determined by the order in which items are Combined, not by the resulting structure.

Noun Incorporation is another domain in which we seem to be dealing with pure theta relations: a predicate and its bare thematic argument are combined. Some implementations of Noun Incorporation involve Head-to-Head movement, but are nevertheless incompatible with Combine. For example, Baker in early work (1988) analysed Noun Incorporation as in (39a), where a head noun is removed from a DP over the intervening F-structure of the DP and into the domain of the governing
verb; and he gave examples like (b), as analysed in (c), to support this characterization of the process:

(39)  

a. \( N_I V_{\ [D_P \ldots t_I \ldots]} \)  

b. Kanekwarunyu wa’-k-akyatawi’tsher-u:ni  
   it.dotted.DIST PAST-I-dress-make  
   ‘I dress-made a polka-dotted one’  

c. [Kanekwarunyu t_i] wa’-k-akyatawi’tsher_i-u:ni

In (b), only the head *dress* has been removed from the complement DP; the rest is a DP remnant. Combine cannot effect such a relation, as the two positions related are in different F-structures.

But in Baker’s more recent work on the same topic (1996), the analysis of Noun Incorporation is entirely what one would expect if Combine were the operation behind Incorporation. In particular, Baker has proposed that free NPs like the ‘remnant’ NP in (39) are not really arguments of the verb as English direct objects are, but are more like adjuncts, and he presents compelling arguments based on binding, quantification, and other considerations. Under his Polysynthesis Parameter hypothesis, when free NPs are not arguments of the verb, the verb must incorporate a Noun or be overtly case-marked. This means in our terms that the apparent direct object is not the complement of the verb; rather, just the bare Noun *dress* is the complement, and so we have another F-free zone in which Combine can operate:

(40) \( V > N \Rightarrow [N V] \)

As with the Romance causative, in the Representation Theory of Williams (2003), (40) would take place at ‘theta structure’, the only F-free zone in phrasal syntax, lacking even determiners on (future) DPs, a critical feature for noun incorporation. The phrase ‘polka-dotted one’ in (39) is added in later as an adjunct. This explains why incorporation never includes any higher material from the DP, like Demonstrative marking, etc., but only the bare noun itself.

This has been necessarily the briefest tour of derivational morphology and theta structure, and in the space we have allowed ourselves justice cannot begin to be done to what is known in these areas, or even to what is known about the particular constructions we have discussed. The limited point has been to quickly assess the possibility that Combine is the principle generative engine in these domains, with particular focus on what follows if F-structure is not present in these domains. With the right parameter values, Combine can create non-mirroring structures in either of these domains, but only of a highly restricted kind because of the absence of F-structure.
Combining adverbs in syntax and morphology

The generally accepted approach to adverbs has them occupying fixed positions in F-structure with the verb and NPs moving around them. I think, though, that there is a defect in such treatments that can only be remedied by applications of Combine(Adverb, X). In a sense this is a trivial conclusion, given our general conclusion that Combine is the principal engine of syntactic creation; but in fact I believe I can show that the result of Combine(Adverb, X) is not always [Adverb X]x, which is the Combine output that would best match the generally accepted approach. Other non-mirroring outputs are possible as well, and the Combine parameters yield a good approximation to what those other possibilities look like.

The problem with permanently fixing adverbs in F-structure slots is that some adverbs appear in non-mirroring positions that cannot be explained by verb movement; for example,

(41)  John was probably sick.

On the assumption that probably is higher in F-structure (and therefore scope) than Tense, (41) is a non-mirroring structure, as Tense is structurally higher than probably; and obviously the non-mirroring does not arise from moving be to Tense, as the problem concerns the relation of probably to T in the first place, not its relation to V. The solution must involve a derivation that starts like the following:

(42)  Combine(probably, Combine (past, [John be sick])) =
      Combine(probably, [John was sick])

The order of Combines corresponds to the relative scopes of Tense and probably. In the second line the lower Combine has been applied, but the question remains of how to apply the upper one; and that comes down to the question: what are the parameters for Combining probably? ‘P = auxV’ will do it. Using the notation introduced in footnote 11, it says: suffix the adverb to AuxV syntactically. Applying Combine to (41) then gives:

(43)  John [was probably] sick

The structure is non-mirroring, but that doesn’t matter, the scopes are fixed by the order of the Combine operations, not the resulting structure. The same thing arises in French—there are undoubtedly adverbs which out-scope Tense, let’s say probable-ment, but they nevertheless cannot appear just above it:

(44)  a. *Jean probablement a vu Marie
      John probably has seen Marie

       b. Jean a probablement vu Marie
Sentence (b) shows that French has the $P = X^0$ setting that English has; (a) shows that it lacks another setting that English has, $P = _{-}XP$, at least where $X$ is $T_{\text{Finite}}$:

(45) John probably has left

Combine derives non-mirroring positions for adverbs, i.e. adverb positions that do not correspond to their scope positions. In all cases above, the interpretation of the adverb is ‘probably (John has left)’. But there is a limit to the non-mirroring that adverbs can exhibit—because Combine is $F^n/F^0$ bound, an adverb cannot be separated from its actual scope position by more than a clause. So for no language can you have:

(46) John wants to usually leave
    meaning: John usually wants to leave

Further evidence that Combine positions adverbs is the fact that in some languages, wide-scope adverbs show up as verbal prefixes. Greek is such a language, as it has a series of adverbs that can be used either as prefixes or as free adverbs. $Ksana$-(roughly English re- or again\footnote{See Williams (2010a) for a more thorough discussion of the difference between Greek $ksana$- and English re-}) is one such, and its prefixal form out-scopes various mid-level free adverbs:

(47) $O$ Janis $ksana$-moline to potami entelos $ksana > entelos$
    John again-polluted the river completely

Here, unlike English re-, the prefix $ksana$- out-scopes the free adverb $entelos$, and so the structure is non-mirroring. We may assume that $ksana$- enters the derivation at the same point as English again (in F-structure terms, $F_{\text{again}}$) but that it has $M = _{-}\text{word}$, $P = X^0$ parameter values, and so prefixes $ksana$- syntactically and morphologically to the head verb. $Entelos$, which enters earlier, syntactically suffixes to the VP due to its $P = XP_-$ setting, and so a non-mirror relation arises between the two.

Mirroring in general is completely relativized to Combine’s parameter settings. Adverbs with the same settings will line up in a mirroring structure, but adverbs with different settings will occur in non-mirroring structures like (47). In particular, when two Greek adverbs with the same settings as $ksana$- above occur in the same sentence, they show a mirroring effect:

(48) $Dhen$ tha $ksana$-kalo-fai edo $ksana > kalo$
    not Fut again-well-eat-Pres.3SG here (Rivero 1992)

In (48) both $kalo$- and $ksana$- have the same settings ($M = \text{word}$), but $ksana$- enters the derivation after $kalo$-, and so shows up in a mirroring relation to $kalo$-. But non-mirroring does not reduce to whether two morphemes are inside the same word or
not. Even within a word, two morphemes can be in a non-mirroring relation if their M parameters are different. Tense in Greek has $M = \text{root}$, and even though it is added after either of these adverbs, and therefore has higher scope, it winds up in a structurally inferior position to them, as for them M has a bigger value:

(49) $ksana$-$kalo$-$fai$ (Rivero 1992)
    again [well [eat$_{\text{root}}$ + T]$_{\text{word}}$]
    $again \rightarrow \text{well, } T \rightarrow again$

As we have seen before, Mirroring is size-relative, where size is determined by the Combine parameters: for P, $XP \rightarrow X^0$; for M, word $\rightarrow$ stem $\rightarrow$ root. And that is all there is to the Mirror Principle.

4.8 Problems and prospects

The obvious next step is to examine the many analyses that have assumed the syntax/morphosyntax modularization, with syntax generative and morphosyntax interpretive, to see whether they can be recast in terms of Combine, which denies that modularization, and asserts that syntax and morphosyntax are accomplished by a single generative function. Of course that would be impossible here. But there is one particular analysis which has been explicitly put forward as an argument for the modularization in question; that is the analysis of English VP fronting in Embick and Noyer (2001), which if correct would indeed make Combine impossible. They argue specifically that Raising and Affix Hopping must be in different components, a syntactic component and a morphological component respectively, and these components are linearly sequenced with no feedback. They are promoting ‘Distributed Morphology’ in particular, but their argument is relevant to the general question of whether morphosyntax is generative or interpretive. In their model, Head Raising and other phrasal syntactic operations are all completed before any morphological operations such as Affix Hopping (‘Lowering’) as a matter of how the grammatical system is organized. Their argument for such architecture is based on the following kinds of sentences, in which Tense attachment and VP fronting are seen to interact in a particular way:

(50) a. … and [see Mary] [he will t]
    b. … and [see Mary [he did t]]
    c. *… and [saw Mary] [he t]

In their account, the reason that (c) is bad is that its derivation would require the application of Affix Hopping (of T onto V) before VP fronting, and the organization of the grammar they wish to support forbids this, as Affix Hopping belongs to the morphological component, and VP fronting to the phrasal syntactic component.
But their predictions are too wide. Of the English Hopping affixes, it is only Tense that shows this behaviour, as in both of the following the affix is clearly lowered before VP fronting:

(51)  a. and [talk-ing to Bill] [she was t]
    b. and [eat-en her dinner] [she has t]

We know that -ing and -en are Lowered affixes, and not affixes that trigger Verb Raising, because they are exactly like Tense in the familiar V-Adverb-Direct-Object paradigms:

(52)  a. *I was seeing recently Bill
    b. *I have seen recently Bill
    c. *I saw recently Bill

So (c) indeed needs an explanation, but the explanation given by Embick and Noyer cannot be it, as it says that all Lowering affixes will behave similarly, whereas it is only Tense that interacts with VP Fronting in the way that it does. I believe that there is an account of this difference in behaviour in Representation Theory (Williams 2003):

suppose that VP fronting precedes the Merging in of Tense (here of course instantiated as Combine(Tense), but not the other affixes; that would only happen if the trigger for fronting occurred between Tense and the other affixes in F-structure, and so the account reduces to Cartography—i.e. to a fact about the ordering F-structure. But be that as it may, the Embick and Noyer argument cannot be taken as an obstacle to combining Hopping and Raising into a single rule.

There are no doubt many other analyses that need to be rethought if syntax and morphosyntax are to be united in the way that I have suggested, and my remarks about this particular analysis should not be taken as a substitute for the hard work that remains to be done. But to conclude, I will turn to what appears to me to be the most pressing research directive that emerges from the conclusion drawn here.

I have suggested that Combine is the generative engine of syntax/morphosyntax and of derivational morphology. But I have left out entirely the long-distance movements in syntax, covert and overt. At first glance it would seem that Combine was an entirely inappropriate tool for characterizing long-distance movement, because of its strict clause-boundedness, and that another operation not so restricted must be brought in to cover the shortfall. But in Williams (2010b), I suggest that in the right context Combine in fact gives a good characterization of long-distance movements. I won’t tell the whole story here, but I will describe the most important new ingredient. The question is: what really happens when a noun is introduced as a complement to a verb? The usual answer is that they are ‘merged’ (or here, ‘Combined’):
But suppose instead of Combining the noun itself with the verb, we used ‘pointer’ to the noun as the first argument of Combine:

\[(54) \quad \{\ldots \text{see, dog}\ldots\} \Rightarrow \{\ldots [\text{see j}\, \text{v, dog}_j]\ldots\}\]

The basic theta relation between \textit{see} and \textit{dog} has been established via the pointer, but notice two additional things: that \textit{dog} has remained in the workspace available for further operations (i.e. \text{Combine}(\text{which, dog}) = [\text{which dog}]), and that the equivalent of a ‘trace’ has been introduced in the thematic object position of the verb. Could these be the ingredients for a (copy) theory of \textit{wh}-movement?
5

In the Event of a Nominal

HAGIT BORER

5.1 Introduction

At the core of any lexicalist approach stands the notion of a ‘word’, or a listed item. More specifically, lexicalist approaches typically partition the domain of rule application to that which involves the syntax, and which displays canonical syntactic properties, and that which involves lexical information, specifically as associated with listed ‘words’. The motivation for such lexical operations tends to cluster into two rather conceptually distinct types. At one end of the spectrum there are operations which are presumed lexical because they are delimited by properties which are item-specific, or by ‘exceptions’, for instance, English dative shift which affects give but not donate. At the other end of the spectrum we find a formal motivation based on syntactic restrictions. Thus, for instance, it is generally assumed that the syntax is prevented from eliminating argument positions otherwise lexically required. The elimination of arguments, if needed, thus cannot be syntactic, but may be stated as an operation on a lexical entry. Such an operation need not be ‘exceptional’. For example, in Reinhart (2002; forthcoming, a) operations which convert dyadic, causative entries into monadic, inchoative ones are general, but nonetheless must be lexical, for the syntax is prevented from performing them (and see Horvath and Siloni, forthcoming, for a detailed review).

These different motivations notwithstanding, they are linked by one extremely important commonality. All are committed to the existence of listed units, call them “words”, which constitute individual, syntactically atomic packets of morphological, syntactic, and phonological instructions to the grammar.\(^1\) What, however, is a ‘word’,
or more specifically, how can we determine what the basic listed item is, which contains this relevant information, and which can be consulted, or modified? From a syntactic or semantic perspective, we note, the issue is wide open. There is little a priori syntactic or semantic reason to assume that e.g. the doctor is two words, but Mary is one, or that postman is one word, but postal worker is two. A more coherent notion typically comes from phonology (e.g. a domain for specific phonological rule application such as stress); but why should such a phonological domain constitute a privileged unit, from the perspective of the syntax or the semantics?

In turn, and as is well known, syntactic, morphological, and phonological properties do not always go hand in hand. Causative constructions may include two morphophonological heads (English, Romance) or one (Japanese, Turkish), without any syntactic or semantic difference resulting. The English verb whiten, always bi-morphemic, nonetheless corresponds to two distinct syntactic structures of unequal complexity. The verb yellow, always monomorphemic (or so it would appear) corresponds to those very same syntactic structures. In all of these cases, what is a word, how complex it is, or how many of it there are seems orthogonal to syntactic structure, syntactic complexity, or interpretation.

In the last decade, the claim, prevalent in the 1980s and the 1990s, that ‘words’, however defined, are junctures of phonological, morphological, and syntactic properties, came under criticism (see especially Marantz 1997 and subsequent work, as well as e.g. Borer 1994; 2003; 2005a; 2005b). The present chapter is a continuation of this designators’, which is to say their properties, however characterized, hold in all possible worlds. For the potential relevance of this criterion to natural language semantics, see Gajewski (2009). For its specific applicability to the functional/substantive lexicon, see Borer (forthcoming).

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2 The system elaborated by Reinhart (2002; forthcoming, a) makes no explicit claims about the morphophonological realization of ‘words’ and is thus, in principle, compatible with a late morphophonological insertion. We note, however, that once morphophonological realization is divorced from the notion of what is a ‘word’, then it is no longer clear how one defines the basic lexical unit to which arity changing operations can apply. The question is particularly salient because the model explicitly assumes the systematic existence of ‘frozen’ entries, i.e. lexical entries that exist (universally) and may be operated upon, but may never be actually spelled out or be syntactically inserted in a given language, (see Fadlon, Ch. 8 below, for some relevant discussion).

The matter may be made sharper by appealing to the discussion in Horvath and Siloni, forthcoming). Specifically, and in reply to Marantz (1997), Horvath and Siloni argue that evidence for the existence of an ‘active lexicon’, a distinct computational component from the syntax, cannot be based on the architecture of complex word formation or morphophonological properties, but rather must be grounded in direct evidence for arity changing operations that must apply before syntactic structure is available. The statement, however, begs the question: without some sort of a definition of what is ‘pre-syntax’, what units it contains, and whence they come, a certain circularity emerges, insofar as the set of representations to which arity changing operations could apply appears to be defined exactly on the basis of these very operations which apply to them. To illustrate, without a clear notion of what is a possible well-formed ‘lexical’ representation, the existence of e.g. a transitive entry for arrive in English from which unaccusative arrive is derived becomes unfalsifiable.

3 While Baker’s UTAH (1988; 2003) seriously questions the existence of formal lexical operations, it does not question—indeed, it crucially presupposes—the existence of listed items as sets of instructions to the syntax.
research programme, insofar as it presents a serious challenge to the claim that listed items, words, are syntactically atomic and hence, perforce, when complex not syntactically constructed. Specifically, I will show that ‘words’ with an identical morphophonological complexity, in fact homophones, nonetheless exhibit radically different syntactic and semantic properties which cannot be captured without appealing to the presence of articulated syntax *internal* to these words. Even more crucially, I will show that the degree of complexity of such ‘internal word’ syntax not only corresponds directly to syntactic and formal semantic computational properties, but is also an extremely accurate predictor of the availability of (conceptual-encyclopedic) meaning composition at the ‘word’ level. Concretely, there will emerge a syntax-based local domain that delimits the availability of non-compositional meaning for words. In turn, the locality conditions delimiting such non-compositionality will be shown to correlate directly, and non-trivially, with the degree of ‘word-internal’ syntactic complexity otherwise established. In other words, the more complex the ‘internal syntax’, as independently established, the more compositional the meaning. The less complex the ‘internal’ syntax, likewise independently established, the more likely the ‘word’ is to be non-compositional. Finally, I will show that the lexical specification of internal arguments yields, across the board, the wrong results on a myriad of fronts, in failing, systematically, to correlate the relationship between arguments and grammatical events.

The empirical subject matter will concern a detailed comparison of ‘Synthetic Compounds’ (as in (1)) with argument structure (complex-event) nominals (cf. (2), (3)):

(1)  
   a. truck driving; paper writing; wall fixing; cat grooming
   b. truck driver; paper writer; wall fixer; cat groomer

(2)  
   a. The driving of the truck (by Mary); the grooming of the cats (by John)
   b. Mary’s driving of the truck; John’s grooming of the cats

(3)  
   a. The transmission of the documents (by Mary); the maintenance of the facilities (by John)
   b. Mary’s transmission of the documents; John’s maintenance of the facilities

Traditionally, these phenomena are all handled lexically, and involve word formation (the derivation of nominals, compounding) and lexically privileged information such as argument selection (particularly internal argument), which seems to be realized across the board in all these cases (cf. Selkirk 1982; Di Sciullo and Williams 1987; Lieber 2004; 2009; Ackema and Neeleman 2004). The constructions certainly appear extremely similar, especially in the case of *-ing* nominals. Nonetheless, as I will show, their properties strongly diverge along syntactic and semantic lines, with Argument Structure Nominals (AS-Nominals) exhibiting grammatical event properties and a strictly compositional meaning, and with Synthetic Compounds exhibiting no grammatical event properties and allowing non-compositional meaning. Various attempts
to account for these properties while appealing to any degree of lexical specification will be reviewed, and dismissed, along the way.

The organization of this paper is as follows. Section 5.2 contains a brief review of AS-Nominals, focusing primarily on the properties of AS-\(\text{-ing}\) Nominals, as these are the ones minimally contrasting with Synthetic Compounds. In section 5.3 I turn to Synthetic Compounds, reviewing a number of historically important proposals, and showing that any account for Synthetic Compounds which is based on argument incorporation is unworkable. In section 5.4 I discuss (non-)compositional word meaning, the way in which Synthetic Compounds and AS-Nominals differ along these lines, and how that difference emerges from their distinct structural properties established by that point. Section 5.5 outlines the first part of my analysis for Synthetic Compounds, focusing specifically on the properties of the affixes -\(\text{ing}\) and -\(\text{er}\). In section 5.6 I turn to empirical evidence for the properties attributed to -\(\text{ing}\) and -\(\text{er}\). Section 5.7 returns to the analysis of Synthetic Compounds, and makes a concrete proposal concerning their structure, based to a large degree on the availability of non-compositionality. Section 5.8 offers a brief summary.

5.2 AS-Nominals

5.2.1 Preliminaries

I will accept, as a foregone conclusion, the central results of Grimshaw (1990), partitioning (deverbal) derived nominals into standard referential nominals, on the one hand, and nominals which denote a grammatical event, on the other. Table (4) summarizes some of the relevant diagnostics. ‘AS-Nominals’ correspond to Grimshaw’s Complex Event Nominals. ‘R-Nominals’ stands for referential or individual nominals:4

(4) \(\begin{array}{ll}
\text{R-Nominals} & \text{AS-Nominals} \\
\text{a. no role assignment; no obligatory complements} & \text{role assignment; obligatory arguments} \\
\text{b. event reading not necessary} & \text{event reading necessary} \\
\text{c. no agent-oriented modifiers} & \text{agent-oriented modifiers} \\
\text{d. subjects are possessives} & \text{subjects are arguments} \\
\text{e. by phrases are non-arguments; in Spanish, select } de; \text{ in Hebrew, } šel & \text{by phrases are arguments; in Spanish, select } por; \text{ in Hebrew, ’al yedey} \\
\text{f. no implicit argument control} & \text{implicit argument control} \\
\text{g. no aspectual modifiers} & \text{aspectual modifiers} \\
\end{array} \)

Particularly compelling evidence for the Grimshaw classification comes from the fact that any attempt to mix the properties of the two nominal types immediately

4 The change in terminology represents some theoretical divergence as well as some empirical qualms. See Borer (1999; forthcoming) for a more complete discussion.
leads to ungrammaticality, thereby presenting a serious challenge to earlier accounts, originating with Chomsky (1970), which postulate massive argument optionality in derived nominals:

(5) a. *Mary’s deliberate collection  
    b. *The collection to document the disappearance of mushrooms  
    c. *The examination/exam by the teacher  
    d. *The destruction in a day

5.2.2 R-ing Nominals

In Grimshaw’s (1990) account, as well as in a number of subsequent accounts following in her footsteps, an important distinction is drawn between nominals derived with -ing and nominals derived with other (overt) English affixes, e.g. -ation, -ment, -ance/ence, -al (henceforth ‘-ation+kin’) (cf. (6)–(8)). Of particular significance in this respect is the ungrammaticality of (6c):

(6) a. the transmitting of the documents (by Kim)/the deferring of the payment (by the bank)  
    b. Kim’s transmitting of the documents/the bank’s deferring of the payment  
    c. *the documents’ transmitting (by Kim)/*the payment’s deferring (by the bank)

(7) a. the transmission/transmittal/transmittance of the documents (by Kim)  
    b. Kim’s transmission/transmittal/transmittance of the documents  
    c. the documents’ transmission/transmittal/transmittance (by Kim)

(8) a. the deferment of the loan (by the bank)  
    b. the bank’s deferment of the loan  
    c. the loan’s deferment (by the bank)

The ungrammaticality of (6c), for Grimshaw, derives from the crucial claim that -ing nominals (a few listed exceptions notwithstanding) must be (our) AS-Nominals, and cannot be R-Nominals. This claim is combined with the assumption that pre-nominal genitives are always free interpretation possessors and never arguments. In (6b), the pre-nominal genitive is interpreted as agentive, as indeed possessors may be (cf. Puccini’s La Bohème). In (6c), however, and because the possessor cannot be an argument, an internal argument is missing for an -ing nominal, perforce an AS-Nominal, leading to ungrammaticality.

Importantly, by this logic, (7c) and (8c) must be R-Nominals, a consequence Grimshaw (1990) endorses. However, as has been frequently observed, the nominals in (7c) and (8c) largely display the characteristics of AS-Nominals (cf. (9)). The claim that they are not AS-Nominals thus runs the risk of undermining the diagnostics in
across the board, and thereby casting doubt on the usefulness of this putative -ing/-ation+kin distinction, at least in this context:

a. the documents’ (constant) (intentional) transmission (in seven hours) (by Kim)
b. the loan payments’ (frequent) deferment (by the bank)

Many subsequent accounts—some, but by no means all, consisting of a syntacticization of Grimshaw’s system—nonetheless adopt some version of her proposed distinction between -ing and -ation+kin nominals, assuming the former to always contain a grammatical event, but not the latter.\(^5\) As it turns out, however, this core claim is simply wrong.\(^6\) A few examples (including some corpus cases) are in (10a, b) (note that the italicized cases in (10b) cannot be verbal gerunds). Even more clearly, consider the cases in (11). The complement of this kind of is clearly a nominal, and clearly can be a deverbal derived nominal. In turn, it can also be followed by bare, complement-less -ing forms, some derived from very ‘strong transitive’ verbs. In fact, complements to nominals, derived or otherwise, are at best marginal here even when generically construed (cf. (12)). As expected of R-Nominals, by-phrases, implicit argument control, or aspectual modifiers are all illicit:\(^7\)

\[
\begin{align*}
(10) & \quad \text{a. good living, strong craving, violent beating, a reading, (leftist) leaning,} \\
& \quad \qquad \text{(good) standing, (one) sitting, etc} \\
& \quad \text{b. ‘Women are reared not to feel competent or gratified by the questing, the competing, the outbidding that collecting . . . demands.’ (S. Sontag, Volcano Lover, p. 138)}
\end{align*}
\]

\(^5\) For example, van Hout and Roeper (1998) assume that -ing merges with VoiceP and TP and thereby contain full aspectual structure while -ation+kin merge with VP or V, thus allowing the exclusion of grammatical event nodes. Marantz (2000b), as well as Alexiadou (2001), propose to derive -ation+kin AS-Nominals by embedding them under event structure. The -ing nominals, on the other hand, involve the merger of -ing above a v or VoiceP node and are hence necessarily AS-Nominals. In later publications, more in line with Borer (1999) and subsequent work, Alexiadou and Grimshaw (2008) as well as Alexiadou (2009) assume that both (AS)-ing and (AS)-ation+kin merge above grammatical event structure. However, in an effort to give a unified account to -ing in verbal gerunds and in -ing nominals, they also claim that in both, the merger of -ing entails the merger of VoiceP, effectively forcing -ing nominals to be AS-Nominals. Guided by a similar desire to unify the treatment of -ing across gerunds and derived nominals, Sichel (2010) assumes that -ation+kin only license a single event but -ing, in both gerunds and nominals, licenses a ‘complex’ event, i.e. an event with a subordinate sub-event. Within this execution as well, -ing nominals must be AS-Nominals.

\(^6\) As is, in my view, any attempt to unify the nominal suffix -ing and the gerundive suffix -ing along aspectual lines. See section 5.3.2.2 for a few additional brief comments, and section 5.6 on some crucial contrasts.

\(^7\) Contra Alexiadou (2005) the same is true for adjectival -ing constructions, otherwise not discussed here (see fn. 8):

(i) a terrorizing event; a growing experience; a parenting experience; a bullying incident
(11)  a. this kind of friendship/table/behaviour/love/music/clarity/event/journey/happiness
    b. this kind of destruction/transmission/deferral/deferment/adherence/attainment
    c. (this kind of) fighting; fraternizing; parenting; terrorizing; bidding; bullying; craving; viewing; knowing; seeing; sinking (ambiguous); breaking (ambiguous); growing (ambiguous)

(12)  a. ??this kind of destruction of cities; ??this kind of transmission of information
    b. *this kind of outbidding of friends; *this kind of bullying of the innocent
    c. *this kind of bullying in order to make up for low self-esteem
    d. *this kind of parenting for prolonged years
    e. *this kind of terrorizing by immature males
    f. ??this kind of picture(s) of boys/table for guests/story by a young writer

Note that (10) and (11c) cannot be accounted for by appealing to the presence of a generic or habitual operator of some sort, e.g. on a par with what might be licensing the omission of the internal argument in (13). Whatever the conditions on the omitted complements in (13), they clearly differ from those that apply to (10) and (11c). Thus note the contrasts in (14) and (15):

(13)  Mary outbids/terrorizes/bullies. That’s just what she does.

(14)  a. ??Underage teens cannot parent very well (cf. this kind of parenting)
    b. *Kim typically craves/views/sees *(things) cf. this kind of craving; viewing; seeing)
    c. *Philosophers know *(things). That’s their métier (cf. this kind of knowing)

(15)  a. Guy bullies in order to make up for low self-esteem (cf. the ungrammatical (12c))
    b. Kim competes to gratify her desire to win

But if R-ing Nominals exist, are there any restrictions on the occurrence of -ing nominals, or do they fully share the distribution of -ation+kin nominals? The matter, we note, certainly bears on the ultimate explanation for the ungrammaticality of (6c), and from the perspective of a comparison between derived nominals and Synthetic Compounds, is particularly salient, as the core cases of Synthetic Compounds involve -ing nominals, as in (1a).

As it turns out, differences between -ing nominals and -ation+kin nominals do exist, and their investigation will turn out to shed important light on the properties of Synthetic Compounds, as well as on properties of syntactic word formation in general. I must, however, beg for the reader’s patience at this point, as I turn to a more detailed introduction of Synthetic Compounds and the ways in which they differ from AS-Nominals. I return to the distinct properties of -ing and -ation+kin in sections 5.5 and 5.6.
5.3 Synthetic compounds

5.3.1 Preliminaries and the First Sister Principle

By way of providing a description of the range of constructions which come under the title Synthetic Compounds, consider the following (Spencer 2005: 88–9, emphasis mine):

A number of researchers have followed Marchand (1969) and others in distinguishing two types of noun-noun compound in English: *root compounds* such as *coffee table*, and *verbal nexus compounds*, or *synthetic compounds*, in which the lexical head is derived from a verb . . . The point about these constructions is that the non-head of the compound seems to bear a syntactic dependency to the head, realizing its direct object or some other grammatical function. There is thus a prima facie case for the involvement of syntax at some level of representation, and indeed, synthetic compounds bear some resemblance to noun incorporation structures which some take to be a classic case of syntactic word formation (e.g. Baker 1988).8

A particularly influential syntactic treatment of Synthetic Compounds is that of Roeper and Siegel (1978), who suggest a syntactic operation of Synthetic Compounding which involves the incorporation of a constituent into a the verb, providing it is its first sister:

\[(16) \text{ First Sister Principle (FSP) (Roeper and Siegel 1978)}\]

All verbal compounds are formed by the incorporation of a word in first-sister position of the verb.

The FSP seeks to capture the fact that the non-head in Synthetic Compounds, as described above, is typically understood to refer to an internal argument or alternatively to an adjunct, but not to an external argument:9

\[(17) \begin{align*}
\text{a.} \quad & \text{truck driving; letter writing; bread eating} \\
\text{b.} \quad & \text{truck driver; letter writer; bread eater}
\end{align*}\]

---

8 Spencer (2005) further notes that accounts differ in what they consider Synthetic Compounds, and specifically, in the context relevant here, whether e.g. *tomato growth* or *bridge construction* are Synthetic Compounds. As I will show, however, -ing and -er compounds systematically behave differently from compounds constructed with *ation*+kin Nominals.

9 The FSP derives the (passive) compounds in (ia, b) below by incorporating the passivized subject into the verb, under a demotion analysis of passive. The ungrammaticality of (ic) thus follows from the assumption that the object is promoted and hence is no longer a sister of the verb:

\[(i) \begin{align*}
\text{a.} \quad & \text{man driven; secretary written; moth eaten} \\
\text{b.} \quad & \text{quick-fried; slow-roasted} \\
\text{c.} \quad & \text{*cake baked; *letter written; *church gone}
\end{align*}\]
A few comments are in order about the technical aspects of the FSP before we proceed. First, we note, FSP presupposes, in accordance with its period, a rather different model of both the syntax and the lexicon. The lexicon assumed is in essence that of Chomsky (1965; 1970), in which argumental roles, thematic roles, are not specified in verbal entries. Rather, verbal entries come with a subcategorization frame. Syntactically, phrase structure need not be binary branching; more specifically, all constituents that follow the verb within the VP, including, e.g., *quickly in fry quickly, are sisters of V. As a consequence, in a phrase such as fry the pasta quickly, both pasta and quickly may be sisters of V. Finally, the FSP does not assume the Unaccusativity Hypothesis, and in all likelihood pre-dates its earliest formulations (cf. Perlmutter 1978). As a consequence, subjects of unaccusatives are not assumed to be sisters of the verb, but rather bona fide subjects. The ungrammaticality of (20a) follows, then, from the assumption that e.g. tree is never a sister of V, and as such patterns with the ungrammaticality of (20b):

(20) a. *tree falling; *train arriving; *volcano erupting
    b. *boy laughing; *elf dancing; *slave labouring

Any attempt to formulate the FSP in present-day theoretical terms faces serious foundational (rather than mere executional) problems, as we shall see. For instance, an attempt to subsume the FSP under an incorporation account along the lines of Baker (1988) and subsequent work would not, in fact, yield the correct results, given the fact that many of the non-heads are not direct complements of the verb (e.g. church going), and some are altogether adjuncts and not complements (pan frying).

Most crucially, however, the FSP is squarely incompatible with the Unaccusativity Hypothesis. According to the latter, the sole argument of unaccusatives is, structurally, a direct object. The FSP thus erroneously predicts the existence of Synthetic Compounds composed of the unaccusative verb and its argument (e.g. (20a)).

Suppose we turn, then, to a closer investigation of whether the core generalization expressed by the FSP is on the right track altogether, and whether a formal system can be constructed so as to capture it. Specifically, let us pose the question in (21a) relative to the claim in (21b):

(21) a. fast acting; slow growing; quick drying
    b. pan frying; step dancing; church going (fry (in) pan; dance (in) steps; go (to) church)

(19) *chef maker/making (of cakes); *man driver/driving (of trucks)
Could it be maintained that:

b. there exist N+N compounds, call them Synthetic Compounds, in which the head contains a verbal nexus, and the non-head exhibits (syntactic or lexical) argumental dependency on it?

The argumental dependency under consideration here is very vaguely stated in (21b), precisely because, at least in principle, it could be captured syntactically or lexically; as a relationship that holds between the non-head and a root, between the non-head and a verb, or the non-head and a derived nominal. What I hope to show is not that one or another realization of (21b) is untenable, but rather, that in principle there could not be any explanatory adequate realizations of (21b). In short, that the answer to the question in (21) is a resounding NO!

More specifically, I will now embark upon considering some actual and hypothetical accounts of Synthetic Compounds which adhere to some version of (21b). As I will illustrate, they lead, inevitably, to theoretical contradictions as well as to massive empirical and theoretical inadequacy, which strongly militate against the veracity of the claim in (21b).

5.3.2 On the absence of event structure in Synthetic Compounds

A rather striking difference between Synthetic Compounds and AS-Nominals concerns the fact that the former, in contrast with the latter, do not have grammatical event properties (independently also noted in van Hout and Roeper 1998). Thus consider the contrast between (22) and (23):

(22) a. The breaking of the door by Mary in two minutes in order to retrieve her locked-up dog
   b. The stabbing of the emperor by Brutus for ten minutes in order to kill him

(23) a. (I watched) the door breaking (*by Mary) (*in two minutes) (*in order to retrieve her locked-up dog)
   b. (I read about) the emperor stabbing (*by Brutus) (*for ten minutes) (*in order to kill him)

Additional evidence for the absence of grammatical event structure in Synthetic Compounds comes from their felicity in the context of this kind of. In allowing such a context they pattern with the R-ing Nominals in (10)-(11), and contrast with the AS-Nominals in (12):

For reasons of space, the text discussion focuses, by and large, on -ing Synthetic Compounds. Note, however, that at least from the perspective of the diagnostics in (4), AS-er nominals do not quite ‘behave’:

i. The breaker of the door (*in seven minutes) (*in order to retrieve the luggage)

For some discussion of the role of events in the interpretation of -er nominals, see van Hout and Roeper (1998) and Alexiadou and Schäfer (2010).
(24) this kind of spouse terrorizing/dog grooming/child parenting/neighbourhood bullying/tomato growing/fast acting/door breaking/compound dissolving/emperor stabbing

The contrast between (22) and (23), as I shall show, presents an intractable problem for any lexical or syntactic account that subscribes to some version of (21b).

5.3.3 Syntactic problems, syntactic solutions

5.3.3.1 Syntactic problems  Consider first syntactic approaches to event structure. Although eschewing a lexical execution, it is nonetheless the case that a host of current approaches to event structure are crucially invested in the link between the presence of arguments and event structure. For these approaches, too, the conjunction of (21b) with the absence of event structure for Synthetic Compounds presents a difficult puzzle. To illustrate, according to at least some of these approaches, ‘internal’ arguments are not properties of listed items (be they verbs or roots), but rather emerge from (or are checked by) the presence of some syntactic structure which is also associated with grammatical event structure. But if truck, in truck driving or truck driver, is indeed an internal argument in the intended sense, it follows, in such systems, that Synthetic Compounds must come complete with at least some event structure, i.e. with whatever functional structure would be licensing the ‘internal’ argument. However, given the absence of grammatical event properties in Synthetic Compounds, the origin of the internal argument, if indeed linked to an event node of some sort, becomes unclear.

The absence of grammatical event properties in Synthetic Compounds, combined with the continued presumed validity of (21b), is equally if not more problematic for views which link the presence of -ing nominals to grammatical event properties, either directly or through the licensing of an external causer (and causing event) (see footnote 5). As Synthetic Compounds with -ing do not have grammatical event properties, then regardless of the source of the internal argument, one must either give up on the assumption that -ing, in and of itself, always entail the projection of grammatical event structure/external causer of some sort (and the corollary assumption that -ing nominals are always AS-Nominals), or alternatively postulate two homophonous -ing morphemes—one, -ing1, that is associated with grammatical events (and which presumably could be the same in gerundive -ing and AS -ing) and a second, which is not associated with event structure, -ing2, for R-Nominals and Synthetic Compounds. But even this move does not solve the problem. If it is -ing2 and not -ing1 that is implicated in the derivation of -ing Synthetic Compounds, then an argument should not be able to incorporate, contra (21b), for the simple reason that by assumption, -ing2 does not take arguments.

12 AgrO for van Hout (1994) (crucially a telicity-inducing node); AspQ (previously AspE) for Borer (1994; 2005a, b); v, an eventive node, for Alexiadou (2009).
Before turning to the consideration of some current analyses which assume some version of (21b), we note that the problems encountered by syntactic and lexical accounts are extremely similar here (and, as we shall see, will be similar all the way down the line), indicating that, at least when it comes to the statement in (21b), the resolution of the problem does not bear directly on the question of the syntax/lexicon division.

5.3.3.2 syntactic incorporation into a root (non-solution 1)  We concluded that the assumption that internal arguments are associated with event structure, as well as the assumption that -ing nominals always entail a grammatical event, are both incompatible with the fact that Synthetic Compounds do not have properties of grammatical events (under the assumption, recall, that (21b) is valid). A number of obvious fixes do present themselves at this point, which, it appears, would allow us to hold on to (21b). Suppose we abandon the view that -ing entails a grammatical event, or an external causer, or an AS-Nominal (under any execution), a conclusion at any rate warranted by the fact that R -ing Nominals do exist, as already noted. Suppose we now further abandon the claim that internal arguments are licensed structurally only in the context of events.13 Rather, suppose we adopt instead the proposal by Marantz (1997 and subsequent literature) and Harley (2009a; 2009b) according to which roots come with a specified internal argument. Would such partial listing, associated with roots and not with verbs, and including only the internal argument, solve our puzzle? At first blush, this does look promising. If internal arguments are properties of roots, and are not contingent on the presence of event structure, then their presence—in fact their presence alone—would be predicted to occur without the necessary emergence of event structure and AS-Nominal properties.

Alas, the solution is only apparent, as we shall see. An explicit proposal that Synthetic Compounds are formed by incorporating internal arguments into selecting roots is made by Harley (2009b). Concretely, Harley assumes that roots merge directly with their complements (including but not necessarily just direct internal arguments), and crucially, that complements are always realized prior to the categorization of the root. The merger of the root and its complement give rise to a RootP. In regular clauses, the head root further merges with a categorial head, giving rise to a structure such as that in (25):

13 See van Hout and Roeper (1998) for precisely this move, abandoning (at least for derived nominals) the claim in van Hout (1994) and subsequent work that telicity can only emerge when internal arguments, selected by the verb, move to AgrO. The critique below, concerning the inherent incompatibility of any argumental incorporation system with the Unaccusativity Hypothesis, applies to their revision as well.
In Synthetic Compounds, on the other hand, the complement incorporates into the root, and then the result, in its entirety, incorporates into an \( n \) head:

Elaborating on the properties of (26), note, first, that at no point is there a verbal head in the structure. This is a matter of significance for Harley, who seeks in this way to reconcile the presence of an internal argument which is dependent on some head with the fact that English does not have an N+V compounding strategy. Harley in fact highlights this result as evidence for roots and root selection, in preference to selection by categorically specified verbs. We note further that, as there is at no point a verbal projection in the structure, and under the natural assumption that grammatical events entail a verbal structure, however executed, the absence of a grammatical event in (26) comes for free. Structure (26), with its accompanying assumptions, seems to resolve the problem, then. Or does it? As further scrutiny will reveal, (26) in fact fails on a number of fronts, including, but not limited to, actually failing to provide an account for the absence of grammatical event properties in Synthetic Compounds.

The structure in (26) comes at the cost of severing the relationship between internal arguments and grammatical event structure, thereby rejecting, across the board, the typology of derived nominals promulgated in Grimshaw (1990) and outlined in (4) and the related discussion. The problem for this, as well as for any system which rejects this link, is not how to associate the presence of an internal argument with the existence of a grammatical event. That can be easily accomplished through the addition of event structure above the domain of the root. Rather, it is how to capture the systematic absence of grammatical event properties when the internal argument is missing.
A more serious problem for (26) (as well as for root selection in general) is the fact that Synthetic Compounds with the set of properties already reviewed may be formed from derived verbs:

(27) a. (I don’t approve of) this (*deliberate) root verbalizing (*by the linguist) (*in order to do away with counterexamples)
b. This glass encasing (*in plastic) (*in order to protect it from stone throwing)
c. (they noted) the minority patronizing (*for the past several years) (*by the supposedly progressive administration)

(28) a. (I don’t approve of) this (deliberate) verbalizing of roots (by the linguist) (in order to do away with counterexamples)
b. This encasing of the glass in fortified plastic (in order to protect it from stone throwing)
c. (they noted) the patronizing of minorities (for the past several years) (by the supposedly progressive administration)

And yet, in the case of derived verbs, the incorporated argument cannot possibly be selected by the root, and the derivation outlined in (26) cannot possibly proceed as such. The difficulty is not just a matter of execution, but rather, involves a rather radical undermining of the rationale guiding (26) to begin with. To see that this is the case, consider the structure that Harley (2009a) herself assigns to derived verbs, in a different context. Specifically, in (29), the root √NOMIN incorporates into the (little) a head (which spells out as -al), and the result, nominal, incorporates into -ize. The argument verbs, in turn, is not in actuality the internal argument of nominalize or of the root √NOMIN, but rather a specifier, the external argument of a (little) a Small Clause, headed by (√NOMIN)-al (accusative assigning structure omitted for expository reasons):

(29) a. Linguists nominalize verbs

b. \[
\begin{array}{c}
\text{[v} \\
\text{-ize} \\
\text{... [a-sc [nverbs] [a al √NOMIN]]}
\end{array}
\]

c. \[
\begin{array}{c}
\text{[v} \\
\text{√NOMIN-al-ize} \\
\text{[a-sc [nverbs] [a √NOMIN-al √NOMIN]]}
\end{array}
\]

Suppose we were now to derive the Synthetic Compound verb nominalization from (29), mimicking as close as possible the operations in (26) (e.g. as in (30)). Note that \[n\ verb\], by assumption a specifier of the clause headed by -al, cannot incorporate downward either onto the root or onto -al for structural reasons. Thus, presumably, \[n\ verb\] would need to incorporate into nominalize. But in (26) \[n\] incorporates into a root. In (30), rather, it incorporates into a \[v\], a situation which Harley (2009b) seeks to explicitly avoid, as already noted. In the next step, for (26), the constituent
P incorporates into a categorial label, obeying (as already noted) the very same rationale used to incorporate the root into \( v \) in (25). The movement of [verb nominalize] to incorporate into -ing, however, is the movement of the fully labelled and fully articulated verbal syntactic constituent boxed in (30), and cannot in any way be subsumed under the general adjunction of roots to categorial nodes:

(30) \[ \sqrt{n-ing/-er} \cdots [a,verb] \cdots [\sqrt{\text{NOMIN-al-ize}}] [a,verbs] [a,\sqrt{\text{NOMIN-al}} \sqrt{\text{NOMIN}}] \]

What is significant, from our perspective, is that the operations in (29) and (30) cannot be reduced to root selection, and that they involve the incorporation of an \( n \) into a \( v \), and not into a root. Insofar as (26) could capture the fact that English has Synthetic Compounds although it does not have an N+V compounding strategy, this result is lost for derived verbs. Insofar as it was possible to correlate the absence of a grammatical event in (2) with the absence of a verbal projection, that too no longer follows from (30). Rather, for (30), the question one must ask is why the \( v \) constituent cannot be embedded under some sort of event structure, on a par with AS-Nominals, so as to give rise to an event reading for Synthetic Compounds. Even more damagingly, if indeed something along the lines of (30) is required in the grammar alongside (26), the prediction would be that for root incorporation cases, there would be neither N+V compounding nor event structure, but both would be attested for incorporation into derived verbs. No such effects are attested.

Finally, note that all cases of so-called root incorporation could be subsumed under (30), if the root categorizes prior to incorporation, i.e. as in (25). It therefore follows that there is no advantage to the assumption that Synthetic Compounds are derived by incorporating an argument into a selecting root. The direct corollary is that there also appears to be no argument from Synthetic Compounds for the selection of the internal argument by the root, contra Harley (2009b).

5.3.4 The obligatory transitivity of Synthetic Compounds

5.3.4.1 Growing irony The structure in (26) derives (correctly, it would appear) the fact that internal arguments are the prime candidates for Synthetic Compounding. It fails, however, to account for one crucial factor, highlighted as the statement in (31):

(31) When the non-head is construed as an internal argument, Synthetic Compounds must have a transitive construal.

In other words, when the non-head is construed as an internal argument, there must be an implied external argument in addition to the expressed internal one. The issue is particularly clear for causative/inchoative pairs, in which an identical verbal form may alternate between transitive and intransitive instantiations: examples (32) and
(33) (the latter with derived verbs) entail an implicit external argument, while (34) are ungrammatical. The effect is of course also attested in non-alternating transitive cases such as those in (35):

(32) Causative–inchoative pairs, transitive reading only
   a. ship sinking
   b. window shuttering
   c. noise diminishing (and cf. noise diminishment)
   d. tomato growing (and cf. tomato growth)

(33) Causative–inchoative pairs, derived verbs transitive reading only
   a. root verbalizing (and cf. root verbalization)
   b. dust accumulating (and cf. dust accumulation)
   c. fabric reddening

(34) Unaccusatives
   a. *tree falling
   b. *train arriving (and compare with train arrival)
   c. *smoke (dis)appearing (and cf. smoke appearance/disappearance)

(35) Transitives
   city destroying; child abusing; wall painting; pasta frying…

Importantly, (32) and (33) contrast with cases in which the non-head is not construed as an internal argument, but as an adjunct or modifier of some sort, and where no obligatory transitivity is attested. Thus (36) and (37) are ambiguous, and (38) fully grammatical:

(36) a. the fast/ocean-sinking (of the ship)
    b. the slow/night-shuttering (of the window)
    c. the fast/mountain-growing (of the crops)

(37) a. the quick/classroom verbalizing (of roots)
    b. the slow/summer reddening (of the fabric)

(38) the loud falling (of trees); the summer wilting (of flowers); the night-time arriving (of trains); the noontime appearing/disappearing (of smoke)

The obligatory transitivity effects in (32)–(35) also contrast with the construal of ‘bare’ R-ing Nominals (cf. section 5.2.2), where no such effects are in evidence. Thus the expressions in (39) are all ambiguous, and the intransitives in (39) licit:

(39) a. (This kind of) growing; sinking; dropping; verbalizing; reddening…
    b. (this kind of) (dis)appearing; wilting; departing; arriving
Finally, note the possibility of omitting the ‘internal’ argument altogether in (40), although retaining a transitive construal:

(40) daytime destroying; pan frying; backyard terrorizing

Examples (36)–(38) are cases in which the Synthetic Compounds in their entirety can serve as the nominal head of an AS-Nominal (cf. the bracketed of-objects). Clearly, then, it cannot be maintained that the compounding process as such deprives the resulting Synthetic Compound of its ability to take arguments or to be associated with a grammatical event. Rather, the absence of grammatical event properties, in Synthetic Compounds, is a statement applying exclusively to the relationship, however characterized, between the head and the non-head. It is within that domain and within that domain alone that grammatical event properties are excluded. It thus emerges that Synthetic Compounds are just like any other derived nominal. They have an R-Nominal as well as an AS-Nominal instantiation, and the fact that they are, in some internal sense, compounds appears to play no significant role in this respect (see section 5.7 for some important structural ramifications of this conclusion).

Returning now to the statement in (31), we note a certain irony associated with the fact that the Synthetic Compound tomato growing is exclusively transitive, when compared with the obligatorily intransitive tomato growth. For approaches which subscribe to root selection of internal arguments, and in particular Marantz (1997 and subsequent work), crucial evidence for that hypothesis is summoned from the properties of grow in its derived instantiations, as illustrated by the contrasts between (41a–c) and (42a–c):

(41) a. the growth of the tomatoes
    b. *the farmer’s growth of the tomatoes
    c. *the growth of the tomatoes by the farmer

(42) a. the growing of the tomatoes (for seven weeks/in seven weeks) ambiguous
    b. The farmer’s growing of the tomatoes
    c. The growing of the tomatoes (by the farmer) (in order to prepare for the autumn season)

Marantz (1997 following speculations in Chomsky 1970) suggests that the absence of transitive reading for growth derives from the fact that it is the root, grow, that assigns the internal argument. The external argument in such cases (and specifically when understood as an external causer in the sense of Levin and Rappaport Hovav 1995) is assigned by an additional layer of functional structure which is verbal in nature (e.g. v or VoiceP). As a result, the intransitive instantiation of grow need not be verbal, but the transitive one must be. The claim about the properties of grow is then augmented by the assumption the affix -th is the spellout of a (little) n node which attaches directly to the root (potentially with its selected argument), but without any
intermediate verbalization. *Growth*, then, and by extension all derived nominals with the exception of those derived with -ing, are the spell-outs of nominalizations of the root (with or without an internal argument), and at any rate well below the merger of any verbalizing structure. The transitive grammatical reading in (42a, c), in turn, emerges directly from the assumption that -ing is the spell-out of a nominalizer which merges with verbal structure, and is thus the only nominalizing form that can occur with transitive *grow* and its verbal layers.

Consider now this set of assumptions in conjunction with the structure in (26). By assumption, Synthetic Compounds here are derived without any verbal layers. First, clearly, and in reference to the structure in (26), the claim that -ing always signals the existence of a verbal layer cannot be maintained (as Harley 2009b in fact concedes). More seriously, however, as the derivation here crucially excludes any verbal layers, it also, by assumption, must exclude an external causer reading, and be restricted to whatever interpretation may emerge from the combination of the root with its selected argument. In other words, Synthetic Compounds with *grow* should pattern with *growth* in excluding a transitive reading. Instead, they enforce it.

If one nonetheless wishes to preserve (21b) as a statement concerning the arguments of roots (or verbs, as we shall see) while still accounting for the obligatory transitivity of Synthetic Compounds, two possible repair strategies come to mind. One could claim that external as well as internal arguments are listed with the root, and that Synthetic Compounding is akin to a lexical passive of sorts, an operation of suppressing the external and promoting the internal. Clearly, however, such an execution is fundamentally incompatible with any approach which seeks to minimize, if not eliminate altogether, lexical information and lexical computation. In turn, for a system that wishes to avoid stating external argumental selection on the root, or the verb for that matter, the only way to reconcile (21b) with (31) would be to consider the domain of Synthetic Compounding to be considerably larger than that specified in Harley (2009b), and to include in it whatever verbal structural nodes are responsible for the emergence of external arguments in general, and external causers in particular.

On the bright side, that just might give a boost to the faltering claim that -ing may only merge with a higher, verbal domain. On the not-so-bright side, however, note first that *tomato growing* or *ship sinking* must be transitive, while the *growing of tomatoes*, with its full verbal projection, is ambiguous. More damagingly, we seem to have now come full circle. The assumption that Synthetic Compounds are derived by incorporating the internal argument into a selecting root, which appeared initially to account for the presence of an internal argument without grammatical event properties, now seems to work only if one assumes that the

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14 This requires assuming that the subject of e.g. *destroy* is fundamentally different from the subject of *grow*, as *the destruction of the city by the enemy* is clearly grammatical, when contrasted with (41c). See Borer (2003; forthcoming) for some discussion of this issue.
domain of Synthetic Compounding includes a fully specified event structure, complete with whatever event-functional structure is implicated in licensing an external argument, including (by assumption) an external causer which implies an event. For that approach too, then, one must now ask why it is that Synthetic Compounds have none of the properties of AS-Nominals associated with e.g. (42a–c): no aspectual modification, no by-phrases, no implicit argument control, and so on.

Finally, the problem carries over to any account which subscribes to (21b), while at the same time assuming that the licensing of the external argument (be it an external causer or otherwise) is associated with event structure of any sort. Consider the possibility that the internal argument is selected by a verbal head of some sort, and that the domain of the verb and its internal argument do not carry an event entailment.\(^{15}\) It remains the case that within such a system, (31) can only be accounted for if reference is made to the existence, or lack thereof, of an external argument, by assumption licensed in a bigger, event-denoting structure, thereby raising anew the original puzzle: why is event structure missing in Synthetic Compounds?

### 5.3.4.2 Whence the Unaccusative Hypothesis?

Viewed from an even broader perspective, the obligatory transitivity of Synthetic Compounds as stated in (31) (together with (21b)) is fundamentally incompatible with the Unaccusativity Hypothesis, insofar as the operation under consideration seems to make a distinction, incompatible with the Unaccusativity Hypothesis, between the licit incorporation of internal arguments of transitives and the illicit incorporation of internal arguments of intransitive predicates:

#### 5.3.5 Incorporation into a nominal (non-solution 2)

For completeness sake, we must consider another possible syntactic realization of the idea in (21b)—one in which the internal argument is selected by the derived noun itself (possibly through inheritance), and where syntactic incorporation would adjoin that argument to the deverbal nominal, essentially as in (43):

\[(43) \quad [\text{N}[\text{N truck [N driving]]}] \text{truck}\]

I am not actually aware of current proposals specifically along such lines, but interestingly enough, and from a very distinct perspective, the proposal in (43) is directly criticized by Ackema and Neeleman (2004) as part of their general critique of syntax-based word formation operations. Assuming (correctly, I believe) that (43) amounts to deriving truck driving from its derived nominal correlate in (44), clearly an instance of AS-Nominal, they point out to the obligatoriness of of in (44), v. its

\(^{15}\) See, within syntactic approaches to word formation, Embick (2004) and van Hout and Roeper (1998).
impossibility with Synthetic Compounds, as in (45) (and see sections 5.4 and 5.7 for more comments on their perspective):

(44) The driving of the truck

(45) a. *of truck driving of trucks
    b. *truck driving of trucks

Crucially, they reject the claim, originally made by Baker (1988), that incorporation would satisfy the case requirements on truck, thereby eliminating the need for of insertion. We note, however, that even if the complementarity of incorporation and of insertion is assumed, the problem re-emerges in contexts such as those in (46):

(46) a. the frying (of pasta) in the pan
    b. *in pan frying (of pasta) in pan
    c. *pan frying (of pasta) in pan

This objection is strengthened, first, by observing that if (43) were to be derived from (44), we would expect it to share its event argument properties, contrary to fact. Second, it is entirely unclear why the very same operation that would derive (43) from (some version of) (44) could not derive (47b) from (47a):

(47) a. the growing of the tomato (intrans.); the falling of the tree
    b. *tomato growing (intrans.); *tree falling

And finally, we note that some Synthetic Compounds have no well-formed correlating AS-Nominals:

(48) a. *the acting fast; *the smelling strong (and cf. Mary’s acting fast)
    b. ??the frying in the pan (and cf. the pan frying of the pasta)
    c. *the going to church

In short, the analysis in (43) fares no better in attempting to resolve the major problems we have already noted: the absence of grammatical event properties in Synthetic Compounds, and the obligatory transitivity constraint, as stated in (31).

5.3.6 A lexicalist treatment? (Non-solution 3)

Under any plausible lexical execution, the event properties of AS-Nominals may have several sources. They may stem from some specification on the noun itself that it is an event/argument taker (e.g. Grimshaw 1990; Siloni 1997). Alternatively, they may emerge through the inheritance of argument structure from the verb (e.g. Selkirk 1982; Di Sciullo and Williams 1987; Lieber 2009). Finally, they may represent a direct relationship between V and N which is embedded under a nominalizer (Ackema and Neeleman 2004). Crucially, and to capture the relevant properties of AS-Nominals when contrasted with R-Nominals, all these executions would need to link the
presence of a grammatical event to the presence of an argument, and the absence of grammatical event properties to the absence of arguments. But from this perspective, the contrast between (22) and (23) is entirely unexpected. If the veracity of (21b) is assumed, then the non-head in e.g. emperor stabbing is an argument of stab(ing). Likewise, emperor certainly is the argument of stab(ing) in the stabbing of the emperor. That the latter is a grammatical event but not the former simply cannot be derived, under such circumstances, without some added mechanisms. However, the hypothetical mechanisms that might be needed appear less than attractive. One could assume, for instance, that grammatical event properties are severed from argument realization, and that some additional specification, syntactic or lexical, renders AS-Nominals grammatical events. This assumption, alas, would pull the rug from under the Grimshaw typology. Alternatively, one could claim that some absorption is associated with Synthetic Compounds, depriving them of their event reading. That, however, would amount again to severing the event argument from other arguments, thereby equally undermining the original, valuable typology under consideration.16

We did note briefly that to capture the generalization in (31) a lexicalist mechanism could be devised so as to suppress or otherwise bind the external argument, but force the realization of the internal one. Crucially, the operation would have to be restricted to dyadic predicates, thereby excluding the formation of Synthetic Compounds for unaccusatives or, for that matter, for unergatives. But even such a stipulation would not quite suffice, as any restriction of Synthetic Compounds to transitive, dyadic entries would fail to capture the grammaticality of the both transitive and intransitive variants of (36) and (37) or the grammaticality of (38), where the incorporated non-head is altogether not an argument.

To conclude this section, it appears that any attempt to hold onto the insight originally expressed through the First Sister Principle is quite simply unworkable. The inevitable conclusion, then, is that the successful account for Synthetic Compounds must avail itself of other means of explaining their properties, and that (21b), under any presently imaginable realization, should be dispensed with.

16 In their lexical account of Synthetic Compounds, Ackema and Neeleman (2004) attribute the properties of AS-Nominals to the merger of N with a phrase (e.g. NP), while Synthetic Compounds involve the merger of terminals (specifically [[N+V]+aff], with the non-head of the Synthetic Compound absorbing the theta-role assignment of its verbal sister. While I agree with the structure proposed for Synthetic Compounds (although I do not think it is morphological: see section 5.7), it is not clear how the putative distinction could derive the event properties of AS-Nominals or exclude them for Synthetic Compounds, or, for that matter, how thematic absorption can account for the obligatory transitivity effects or for the failure of intransitive unaccusative arguments to give rise to well-formed Synthetic Compounds.
5.4 Compositionality

5.4.1 On the obligatory compositionality of AS-Nominals

Before I turn to an actual account of the derivation of Synthetic Compounds, another crucial distinction between AS-Nominals and Synthetic Compounds must be discussed. Thus far, our discussion of AS-Nominals and Synthetic Compounds has highlighted two important distinctions between them, as summarized in (49):

<table>
<thead>
<tr>
<th></th>
<th>AS-Nominals</th>
<th>Synthetic Compounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grammatical events</td>
<td>+</td>
<td>−</td>
</tr>
<tr>
<td>Obligatory transitivity</td>
<td>−</td>
<td>+</td>
</tr>
</tbody>
</table>

In this section, I will pursue yet another difference between AS-Nominals and Synthetic Compounds—one related to the presence, or lack thereof, of compositional reading. This difference will serve to augment the already massive arguments against (21b). It will also serve to provide us with a crucial insight into the structural difference between AS-Nominals and Synthetic Compounds that will inform the subsequent discussion in an important way. Beyond that, it will point to an extremely strong and compelling correlation between syntactic complexity and compositionality, and lend strong support to the syntactic representation of words.

AS-Nominals are always fully compositional, which is to say that their meaning can be reliably computed from the meaning of the verb (or the adjective for de-adjectival AS-Nominals), the arguments, and the event structure (see also Marantz 2000b). This holds for AS-ing as well as for AS-ation+kin. The matter can be illustrated by considering some derived nominals which are non-compositional, and comparing their behaviour with that of their compositional correlates:

(50)  a. *the transformation of the structure by the linguist
      b. *the patient’s transference of his feelings

(51)  a. the transformation of our department by the administration
      b. the transference of funds

The contrast is, from any possible perspective, very surprising. Both forms are derived from the same verb with an identical suffix, and thus there is little about their morphophonology that could account for this contrast. Presumably, in anybody’s account, the jargon senses of transformation and transference must be listed somewhere. It is not clear, however, why such listing should correspond to the inability to take arguments, or why the ability to take arguments should correspond to the impossibility of listing. All the more so since the arguments, were they present for the listed forms, could be identical to those that are otherwise assigned by the AS-Nominal or by its source verb (e.g. agent and patient in the case of
transformation). The sets of meaning under consideration are perfectly expressible with e.g. light verbs, as in (52a, b), with pretty much the same roles or event properties, and yet the AS-Nominals corresponding to them are ill-formed:

(52) a. the linguist did/performed a transformation on the structure
    b. the patient finally went through transference

Suppose we consider, from this perspective, the lexicalist view developed in Chomsky (1970) whereby there could exist argument-taking entries which are underspecified relative to being a noun or a verb. To capture the absence of argument structure for the listed entry of transformation, however, one would have to exile it to a different entry, and augment the lexicon with the statement that when an entry does not have a verbal instantiation with an identical meaning, it may not have arguments. But if so, such a system boils down to the claim that only verbs may have arguments, and that, to all intents and purposes, argument-taking nominals inherit their arguments from verbs. But even then, matters are not entirely straightforward. Morphophonologically, jargon-transformation is derived from transform, and its morphophonological properties are entirely predictable from this derivational process. The account required would thus have to actually block transformation from inheriting the arguments of transform, but only when it doesn’t mean ‘the act of transforming’. Alternatively, it would have to be stipulated that, for some reason, R-nominals may drift but not AS-Nominals.

It appears, however, that all these hypothetical attempts are putting the cart before the horse. Intuitively, it seems clear that what keeps the derived nominal compositionally ‘honest’, so to speak, is not its relationship with the verb but its relationship with the full verbal/argumental complex. When it is the full verbal/argumental complex that is nominalized, the derived nominal must be compositional. When it is the verb alone that nominalizes, non-compositionality may emerge. The simplest, most direct way to capture this generalization would thus be syntactic: in AS-Nominals, the nominal head scopes over the verbal/argumental complex. In R-nominals, it scopes over the verb, and specifically excludes any structure that may be implicated in the projection of arguments.

17 To be workable, any inheritance account would need to subscribe to some notion of phonological faithfulness. Without such phonological faithfulness, it is not obvious how to exclude, in a principled fashion, the derivation of jargon-transformation or similar terms from a ‘frozen’ verbal entry transform with the relevant jargon sense which may not be directly inserted into the syntax, and with transformation, as a consequence, behaving like an AS-Nominal. Such derivations do not exist, thereby casting doubt on their availability in principle and, by extension, on the idea that ‘frozen’ forms can serve as a source for derivational processes in general, contra e.g. Reinhart (2002; forthcoming, a).

18 The generalization is even trickier to state for lexicalist accounts which do not assume inheritance, e.g. Grimshaw (1990). In Grimshaw’s account, the argument structure of derived nominals emerges from the assignment of Ev as an external argument in the context of some nominalizing affixes. It is hard to see, however, why in such an account transformation can assigns Ev and select arguments, but only if it means the act of transforming, and not the act of performing a (grammatical) transformation.
Consider what a syntactic execution would be like. Crucially, we cannot assume that verbs—or roots, for that matter—come lexically specified with their arguments, internal or otherwise. If that were the case, then it is hard to see how nominalizing the verb in and of itself would allow the omission of the arguments, and the emergence of non-compositionality. If, however, verbs (and hence perforce roots) are deprived of arguments, and arguments, including the internal one, emerge from the presence of functional structure, then the problem disappears. Specifically, we may assume that the structure for R-Nominals, derived or underived, compositional or non-compositional, is the simplest possible one, as in (53a), involving either a non-branching structure altogether, or alternatively the merger of either a (verbalized) root or a derived verb with a nominalizer, to give rise to one of the structures in (53b, c). The absence of argument structure for R-Nominals now follows directly from the fact that verbs, or roots, do not have arguments, and that the nominalization of either a root or a derived verb includes no syntactic structure otherwise associated with the licensing of arguments:

(53) R-Nominals, structure

a. \[ \text{class} \]

b. \[ N[C=V\sqrt{\_}] \]

(trans)form ation ing

c. \[ N[A[C=N\sqrt{\_} A V N]] \]

verb al ize ation ing

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19 The structures in (53b, c) are essentially reworked from Borer’s (1991/1993) Parallel Morphology, where they were crucially assumed to be morphological, because they do not adhere to X’-theory (for an argument for a morphological component distinct from syntax based on a similar rationale, see Ackema and Neeleman 2004). If, however, X’-theory is replaced with the relativized system of Bare Phrase Structure (cf. Chomsky 1995b), the configurations in (53b, c) become syntactically licit, rendering their relegation to a separate hierarchical component unmotivated.

For reasons of parsimony I am setting aside here issues having to do with linear order and projection in complex word structure such as those in (53b, c), but see Borer (forthcoming) for discussion. Issues having to do with the categorization of roots are also set aside. By way of broad clarification, I assume, as in Borer (2005; forthcoming), that roots as such are not syntactic objects, as in (just about) any syntactic context they are equivalent to a categorial complement-set defined by some rigid designator. Specifically, in a complex adjective such as verbal, \( \sqrt{\_} \text{VERB} \) is rendered N-equivalent (C=N) by being in the complement-set of -al.
The structure of AS-Nominals, however, is considerably more complex. Here, the structure includes at the very least one functional node which is event-related, and which may license the merger of arguments. N, to spell out as e.g. -ation or -ence, in turn merges with this functional complex. In such structures, the verb must move through the relevant functional nodes (indicated here as F₁ and F₂), to reach N and incorporate into it, stranding behind its arguments. The schematic structure (setting aside irrelevant projections) is thus as in (54a). The derived structure is as in (54b):

\[
(54) \begin{align*}
\text{a. } & N \quad [F_1 (\text{subj}) (F_1)] \quad [F_2 \text{ obj} (F_2) \quad [V]]] \\
\text{b. } & [N \quad [(F_1 F_2 V)] \quad N] \quad [F_1 (\text{subj}) \quad [F_2 F_2 V]] \quad [F_2 \text{ obj} \quad (of) \text{ the-city}] \\
& \quad \qa
consideration is that of (first) categorization—the point at which the root merges with a category label. A different, larger domain is proposed in Borer (2009; forthcoming): 20

(55)  a. reactionary (ACT, REACT, REACTION, REACTIONARY)
    b. naturalize (NATURE, NATURAL, NATURALIZE)
    c. editorialize (EDIT, EDITOR, EDITORIAL, EDITORIALIZE)
    d. festival (FEST, FESTIVE, FESTIVAL)

In a nutshell, I propose that the domain of non-compositionality extends as far as the first functional bracket. More specifically, I assume the existence of a single encyclopedia which is the reservoir of all (non-rigidly designating) meaning. A single encyclopedic search takes, as its input, a phonologically realized bracketed string, and returns a single meaning for that string. In other words, a simple, non-compositional meaning is that which is associated with a single encyclopedic search (En-search). Trivially, that is the meaning that a single En-search would link with all non-branching structures, i.e. those containing a single root, whether categorized or not. An En-search, however, may return a single meaning for a larger domain, and specifically, it may return a listed, single meaning (and hence non-compositional) for any domain, however otherwise complex, which does not include a functional bracket. An En-search, in short, cannot jump over a functional bracket (where by assumption \([V \ [N \ [A\) do not constitute functional brackets in the intended sense). From this perspective, it is now clear how the difference emerges between R-Nominals and AS-Nominals. In R-Nominals, no functional brackets intervene between the verb, or the verbalized root, and N. In fact, the entire structure of the R-Nominal is functional-bracket free, internally. This, however, is not the case for AS-Nominals. Event structure, with its full functional glory, intervenes between the verb and its target, and the successive head movement of the verb to N yields the boxed string in (54b), where any En-search for a listed reading for transformation would be stopped by a functional boundary. The schematic workings of the system are illustrated in (56) and (57): 21

(56)  R-Nominals: ambiguous
    a. \([N \ [V \ \underline{\text{transform }} \ -ation]\)  En-search returns TRANSFORM meaning for transform. Transformation is composed from

---

20 With thanks to Heidi Harley (p.c.) for NATURALIZE and EDITORIAL. See Borer (forthcoming) for a fuller critique of the Arad system.
21 The encyclopedia, as argued in Borer (2009; forthcoming) operates on syntactically bracketed phonological strings. As a consequence, non-compositional meaning is not associated with e.g. transfer +N, but rather, specifically, with transference, and not with the compositionally identical transferral. The account is highly amenable to a phase-based execution, once it is assumed that the lowest Extended Projection segment constitutes a phase. See Borer (forthcoming) for details.
TRANSFORM plus the grammatically specified NOM function of -ation.
En-search returns TRANSFORMATION for transformation (i.e. a technical term in Generative Grammar).

(57) AAS-Nominals: compositional only:

a. \[[N[F_1[F_2[\text{V transform}]]]]-ation]\] En-search returns TRANSFORM for transform. Transformation composed from TRANSFORM plus the grammatically-specified functions of F_1, F_2, and -ation.

b. \[[N[F_1[F_2[\text{V transform}]]]]-ation]\] At least in principle, there could be a single licit En-search for transform +F_2 (see Borer forthcoming). F_1 and -ation would still compose with it.

c. \[*[N[F_1[F_2[\text{V transform}]]]]-ation]\] Impossible single En-searches. En-search would need to skip over F_2 bracket and possibly F_1 as well. Non-compositional meaning excluded.

5.4.3 Non-compositionality and Synthetic Compounds

With the domain of non-compositionality defined, let us now return to Synthetic Compounds. As it turns out, Synthetic Compounds, or things that look an awful lot like them, need not be compositional, nor is their non-compositionality in these cases traceable in any way to the syntactic incorporation of an argument of a verbal or root head (as noted already by Ackema and Neeleman 2004). Thus the Synthetic Compounds in (58) could not inherit their non-compositional meaning from some verbal or root head plus its complement, for the simple reason that the corresponding VPs do not share their idiomatic meaning. Indeed, at times there isn’t even an independent verb (e.g. monger). Of particular interest is (58b), as to serve time is also idiomatic, but the idiomatic meaning of timeserving is distinct from it and is not available in the clausal domain: 22

(58) a. warmongering *to monger (a) war
b. time-serving opportunism (!)to serve time be imprisoned
c. babysitting *to sit (a) baby
d. line producing film accountancy #to produce (a) line
e. crystal-gazing future telling #to gaze (into) a crystal
f. facelifting #to lift (a) face

22 Care must be taken not to analyse the Synthetic Compounds in (58) as the nominalization of complex verbs such as to babysit, to copy edit, to proof read, all arguably cases of ‘back formation’ whose existence postdates the existence of the corresponding Synthetic Compound. I return to this matter in some detail in section 5.7.
We note that the reading is likewise missing in AS-Nominals, thereby providing yet one more argument that Synthetic Compounds are not derived from AS-Nominals:

\[(59)\]

\[
\begin{array}{ll}
\text{a. } \text{*the mongering of war} & \text{d. } \text{#the lifting of faces} \\
\text{b. } \text{#the serving of time (V idiom only)} & \text{e. } \text{#the producing of (a) line} \\
\text{c. } \text{*the sitting of (a) baby} & \text{f. } \text{*the gazing of (#into) crystal}
\end{array}
\]

If the account of non-compositionality outlined here is on the right track, the inevitable conclusion from the existence of non-compositional Synthetic Compounds is that they do not contain an internal F bracket. Importantly, this conclusion is entirely consistent with the fact that they do not have grammatical event properties, just as the non-availability of non-compositional reading for AS-Nominals correlated directly with the presence of grammatical event properties.

It thus appears that we have here a convergence of evidence from very distinct domains all pointing towards the same conclusion. Complex syntax, complete with functional structure, is necessary in order for arguments, including the event argument, to be licensed, and for grammatical event properties to emerge. That very same functional structure then serves to block the emergence of non-compositional (word) meaning. Conversely, in the absence of complex syntax, grammatical event properties are not attested, arguments are not available, but non-compositionality is possible. Explicit statements of the correlations are given in \[(60)\]:

\[(60)\]

\[
\begin{array}{ll}
\text{a. } \text{complex functional structure } \rightarrow \text{ compositionality} \\
\text{non-compositionality } \rightarrow \text{ no complex functional structure} \\
\text{b. } \text{grammatical event (licensed event argument) } \rightarrow \text{ complex functional struc-} \\
\text{ture compositionality} \\
\text{no functional structure } \rightarrow \text{ no grammatical event (event argument not} \\
\text{licensed)}
\end{array}
\]

The correlations in \[(60)\] cannot be coincidental, nor can they be captured directly by any lexical-entry based account. Rather, they provide extremely strong evidence not only for a syntactic representation of event structure but for the presence of complex, meaningful syntactic structure internal to so-called words, which can be shown to distinguish between different occurrences of e.g. *lifting.*

### 5.5 Synthetic Compounds: all that remains

In the previous sections, I established that Synthetic Compounds cannot be successfully derived by appealing to any generalization according to which the non-head is an argument of the head, without running into a series of irresolvable difficulties. But if so, what remains of the claim that Synthetic Compounds involve a relationship of argumental dependency on a verbal-nexus head? In other words, is the distinction
between Synthetic Compounds and Root Compounds altogether motivated? An alternative, and a simple one, would be to assign to Synthetic Compounds the structure in (61a) or possibly in (61b) and to assume that, as such, they do not differ from any other Root Compound, and that the argument construal is but an implicature:

\[(61)\]

\[\text{a. } \begin{array}{c}
\text{ing/(er)} \\
\text{truck} \\
\end{array} \quad \begin{array}{c}
\text{ing/(er)} \\
\text{drive} \\
\end{array} \quad \text{b. } \begin{array}{c}
\text{ing/(er)} \\
\text{??} \\
\end{array} \quad \begin{array}{c}
\text{ing/(er)} \\
\text{truck} \\
\end{array} \quad \text{drive}\]

An investigation of the effects previously attributed to the First Sister Principle, however, reveals that a significant residue does remain, consisting, specifically, of the descriptive generalizations in (62):\(^{23}\)

\[(62)\]

\[\text{a. } \text{-ing Synthetic Compounds exclude a ‘subject’ construal for the non-head.} \]
\[\text{b. When the non-head of an -ing Synthetic Compound is interpreted as an ‘object’, Synthetic Compounds must refer to a transitive activity (i.e. must be atelic and non-stative).} \]

Attempting to formulate these generalizations, I suggest that the properties of Synthetic Compounds with -er and -ing are attributable directly to the properties of the suffixes used. Specifically, I propose the (informal) statements in (63a, b):\(^{24}\)

\[(63)\]

\[\text{a. } \text{fast growing; pan frying; slow spinning; sick feeling} \]
\[\text{b. } \#\text{light frying; #nice spinning; #school cooking (=cooking at school); #well feeling} \]

\(^{23}\) The generalization in (62) is necessary, but may not be completely sufficient, to account for the contrasts in (ia, b), noted but not explained here:

\[(i)\]

\[\text{a. fast growing; pan frying; slow spinning; sick feeling} \]
\[\text{b. #light frying; #nice spinning; #school cooking (=cooking at school); #well feeling} \]

\(^{24}\) The term ‘Originator’ is used here in accordance with the system developed in Borer (2005). In terms of its actual interpretation, it comes very close to that of ‘Internal Causer’ (assuming external causation, in the relevant sense, always to entail internal causation). It spans not only traditional agents and causers but also, importantly, subjects of activities, including those occurring with so-called variable behaviour verbs in their unergative instantiation (cf. (ib)). The subjects of the unaccusatives in (ia), on the other hand, are ‘Subjects of Quantity’, in Borer (2005), or alternatively ‘Patients’ or ‘Undergoers’. The reader is referred to Levin and Rappaport Hovav (1995) as well as Borer (2005b) for the relevant discussion of variable behaviour verbs:

\[(i)\]

\[\text{a. the ship sank/the flower wilted/the table moved in three minutes} \]
\[\text{b. the ship sank/the flower wilted/the table moved for three minutes (Originators)} \]
(63) -ing, a rigid designator, is a Simple atelic (activity) Event with an Originator.25

Specifically, then, by virtue of having -ing as its head, an expression such as collecting designates a Simple Event that has a ‘perpetrator’, in this case, a presumed collector. By Simple Event I refer, specifically, to the distinction first drawn by Grimshaw (1990) between Complex Events, specifically those which include arguments in general and the event argument in particular, and Simple Events, which are nominals that refer to events but which lack arguments (including, by assumption, the event argument) and which do not conform to the diagnostics in (4). Importantly, the latter may, but need not, be derived from verbs.

(64) a. the class/friendship/journey/event/exam started at 2 pm and went on for three hours
b. the (instantaneous) victory/collision/destruction/disaster/catastrophe/incident occurred at 3pm exactly

(65) a. the class/friendship/journey/event/exam (*for three hours)
b. the accident/victory/collision/disaster/catastrophe (*in two seconds)

(66) a. the class of physics (*by Prof. Smith)
b. the friendship (*of Mary) (*by John) (*in order to copy her homework)
c. The victory (of the chess player) (*in order to collect the substantial prize)

Informally, (63) accounts for (62a) under the assumption that two Originators cannot inhabit the same minimal functional domain. Specifically, if we assume that -ing in (67a) has an Originator meaning built into it, then it follows that chef in (67a) cannot be interpreted as an additional Originator. If, however, chef refers to a manner, and not to an Originator, thereby functioning as a modifier of an event with an understood Originator linked, by assumption, to the presence of -ing—i.e. the cooking has been done by a non-chef in a chef-like manner, so to speak—then the expression becomes licit, as in (67b):

(67) a. *chef stewing (of the dish) (with chef as Originator) → two Originators in one functional domain

25 And for -er:

(i) -er is a rigid designator meaning an Originator

Effectively, this boils down to the claim that the suffix -ing is the ‘sum’ of the meaning of the suffix -er plus a Simple activity Event, or, alternatively, a relation between -er (potentially abstract) and a Simple Event (and see also fns. 26 and 31 below).
b. chef-like stewing (of the dish) (by incompetent graduate students) → licit if in reference to a manner of stewing not necessarily performed by some chef

(63) now accounts for the obligatory transitivity of the Synthetic Compounds as stated in (62b) (and cf. (32)–(35)). Suppose we assume that the non-head in compounds, in general, is only constrained by having to instantiate some relationship of relevance to the head, and thus is free to imply any argument (or non-argument), including an Originator. Specifically, there is clearly no across-the-board restriction against having an Originator implicature associated with the non-head of compounds, including some derived directly from verbs or from verbal derivatives, as the cases in (68) show. A restriction against an Originator implicature for the non-head only occurs, then, in the presence of -ing (or -er), precisely where the presence of such an Originator would lead to a double Originator reading, as detailed above:

(68)  
   a. army invasion; court investigation; bank referral  
   b. court intrusiveness; government destructiveness; teenager inventiveness

In turn, because the non-head in -ing compounds may not be construed as an Originator, it may either be a modifier or, if construed as an argument, an internal one. In the latter case, however, and in the presence of an incorporated grammatical Originator in -ing, the result is a transitive reading.

The effect, we note, is missing in AS-ing nominals where the overt or covert presence of an Originator is certainly licit, in both transitive and intransitive cases:26

(69)  
   a. Kim’s lifting of the package  
   b. the lifting of the package by Kim  
   c. the lifting of the package in order to dry its bottom

(70)  
   a. Salome’s (sensual) dancing  
   b. the dancing of Salome

To account for the contrast between Synthetic Compounds and AS-Nominals, suppose we consider a system of functional composition very much inspired by Lieber (2004), although differing from it in some central points. Within Lieber’s

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26 The effect does hold for AS-er nominals, where an of phrase must be disjoint from the Originator and transitivity is obligatory in AS-Nominals as well:

(i)  
   a. the sinker of the ship; the verbalizer of the noun (transitive only)  
   b. the ship’s sinker; the noun’s verbalizer (transitive only)

(ii)  
   a. the arriver (*of the train); the wilter (*of the flower)  
   b. the jumper (*of the boy); the dancer (*of Salome)

See Borer (forthcoming) for discussion of this effect.
system, the ‘skeleton’ of a morpheme consists of all and only features that are of relevance to the syntax in a given language. The features, or feature bundles, under consideration are in turn functions which may take arguments. Specifically, we may think of *-ing* as a function expressing a relationship between an Originator and a (Simple) atelic Event, as in (71a). Note that the statement that *-ing* denotes a Simple rather than grammatical (complex) event follows directly from the absence of the relevant grammatical event structure and hence need not be stated. Following a similar logic, we can think of what is indicated e.g. in (54) as F1 as a relationship between an Originator and F2, with F2 standing for the rest of the relevant grammatical event structure, as in (71b):

(71) a. *-ing* ([Originator], [Event\textsubscript{atelic}])
    b. F1 ([Originator], [F2])

Semantic skeletons in turn may enter hierarchical relations, and in the case at hand, let us assume that F1, as a semantic function, is embedded under Event\textsubscript{atelic}, giving rise to the following semantic representation:

(72) *-ing* ([Originator], [Event\textsubscript{atelic} ([F1 ([Originator], [F2]) ] ) ]

The composition of meaning in (72) is now subject to Lieber’s (slightly modified) Principle of Co-indexation as in (73):

(73) **Principle of Co-indexation** (slightly modified from Lieber 2004)

When semantic skeletons are composed, co-index the (highest) argument of the head skeleton with the (highest) argument of the immediately subordinate skeleton. Indexing must be consistent with the semantic conditions on the highest argument, if any.

Applying (73) to (72) now gives us the coindexation of the Originator argument of *-ing* with the Originator argument of F1, as required:

(74) *-ing* ([Originator]\textsubscript{i}, [Event\textsubscript{atelic} ([F1 ([Originator]\textsubscript{i}, [F2]) ] ) ]

Note that the representation explicitly licenses two Originator instances, one a semantic argument of the *-ing* event, and the other a semantic argument of F1. The only restriction on the structure amounts to forcing them to be identified. That an Originator may thus occur overtly in AS-*ing* nominals but not in R-*ing* nominals follows directly.

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27 In addition to assuming a different set of features and a slightly distinct architecture, the primary fundamental divergence from Lieber (2004) involves the assumption that skeletons and features, in the relevant sense, are associated exclusively with rigid designators, and never with substantive items, be they roots or lexemes of any other sort.
Consider, however, the applicability of the very same system to Synthetic Compounds. The representation of -*ing* is the very same one as in (71a). In this case, however, there are no embedded additional skeletons nor could there be an additionally licensed Originator, for the simple reason that Synthetic Compounds, as already extensively argued, do not contain the functional structure required for the emergence of grammatical event properties. In the absence of any function that could assign interpretation to the non-head, it can only be interpreted as a secondary predicate, a modifier, of arguments otherwise licensed in the structure. It can thus modify the Originator, as we already saw, or the event itself. The argumental implicature, I suggest, falls under the latter category, thereby rendering the ambiguity of a Synthetic Compounds such as *hand washing* a non-grammatical matter.28

In section 5.7 I return to matters concerning the internal syntactic representation of Synthetic Compounds, and specifically to the choice between the structures in (61). Before doing so, section 5.6 reviews evidence that substantiates the core of the empirical claims in (63). Before proceeding, however, it is important to localize the account I have given here within a broader context. While empirically (63) may appear as a mere relaxation of the FSP, in actuality it constitutes a radical theoretical departure from it. The FSP, or for that matter the statement in (21b), is an attempt to account for Synthetic Compounds by appealing to the privileged relationship between a verb and its arguments, taking Synthetic Compounds to be fundamentally an instantiation of the very same relationship found otherwise between heads and arguments in clauses. In contrast, (63) as well as (71)–(74) are based on the complete rejection of any parallelism between Synthetic Compounds and the syntax of clauses, or for that matter the syntax of grammatical events even when not clausal (e.g. AS-Nominals). More broadly, it constitutes a rejection of as well as a challenge to any account that appeals to a privileged relationship between verbs and arguments, indeed, between roots and arguments, be they syntactic or lexical.

5.6 -*ing*

5.6.1 R-*ing* nominals are simple events

The purpose of this section is to provide evidence for the claim, made above, that -*ing* incorporates an Originator reading and that it denotes a (Simple) activity Event. I argued in section 5.2.2 that, contra Grimshaw (1990), -*ing* need not head an AS-Nominal and can head an R-Nominal. In turn, its occurrence in Synthetic Compounds cannot have an Originator implicature follows, presumably, from the same reason that *Puccini’s La Bohême by Puccini* is infelicitous, or is construed as *Puccini’s* being a modifier, of sorts, of the head, e.g. a *Puccini-style opera by Puccini*, or finally, must involve the assignment of a distinct ‘argumental’ function, namely, that of a possessor, to *Puccini’s*, with the meaning *La Bohème, by himself, which Puccini owns* (e.g. he owns a particular recording of the opera).

28 To draw an analogy (and thus run the usual risks), that the non-head in Synthetic Compounds cannot have an Originator implicature follows, presumably, from the same reason that *Puccini’s La Bohème by Puccini* is infelicitous, or is construed as *Puccini’s* being a modifier, of sorts, of the head, e.g. a *Puccini-style opera by Puccini*, or finally, must involve the assignment of a distinct ‘argumental’ function, namely, that of a possessor, to *Puccini’s*, with the meaning *La Bohème, by himself, which Puccini owns* (e.g. he owns a particular recording of the opera).
Compounds, where no grammatical event is present, is of course entirely consistent with that claim. As it turns out, and rather strikingly, the overwhelming majority of the productive instantiations of R-\textit{ing} Nominals are denotations of Simple Events:

(75) a. This kind of parenting \textit{lasts many years}, and \textit{occurs} when education is deficient.
    b. Yesterday's bullying \textit{started at} dawn, \textit{took place} in my back yard, and only \textit{ended} when I intervened.
    c. My kind of compounding never \textit{takes place} in the lexicon and only \textit{occurs} in the very last step of the derivation.

R-\textit{ing} Nominals are structurally very basic indeed, and it is therefore very hard to see, given that structure, that anything but \textit{-ing} itself could be the source of the systematic Simple Event properties. It is thus a natural conclusion that \textit{-ing}, especially when compared with R-\textit{-ation+kin} Nominals, is the direct contributory to that event reading.

Armed with this preliminary result, I turn to a closer investigation of the event properties of \textit{-ing} Nominals, in both R- and AS-contexts, as well as a comparison between those properties and those of AS-\textit{-ation+kin} Nominals. In what follows, I will make two important heuristic assumptions. First, as should already be clear from the discussion in section 5.5, I assume there is a single nominalizer \textit{-ing} which occurs in R-\textit{ing} Nominals, AS-\textit{ing} Nominals, and Synthetic Compounds. Second, I assume that insofar as \textit{-ing} Nominals, in both their R- and AS- instantiations, display properties that are distinct from those of \textit{-ation+kin} Nominals (in their R-\textit{-ation+kin} and AS-\textit{-ation+kin} instantiations), these properties can serve as evidence bearing on the properties of the nominalizer \textit{-ing} as a whole.

5.6.2 \textit{-ing is atelic}

That AS-\textit{ing} Nominals are atelic when compared to their AS-\textit{-ation+kin} Nominal counterparts has been claimed previously (van Hout and Roeper 1998; Borer 1999; 2005b; Alexiadou 2001). Thus (76) provides evidence that AS-\textit{ing} Nominals bar telic modifiers such as \textit{in few weeks} or \textit{twice}, thereby contrasting minimally with (77) (minimal pairs used wherever possible):

(76) a. Kim's formulating of several procedures \{for the past few weeks/*in few weeks/??twice\}
    b. Pat's forming of many committees \{for three months/*in three months/??twice\}
    c. Robin's dissolving of these chemicals \{for three hours/*in three hours/??twice\}
(77)  a. Kim’s formulation of several procedures {twice/in two weeks}
    b. Pat’s formation of many committees {twice/in two minutes}
    c. Robin’s dissolution of these chemicals {twice/in two hours}

Additional evidence is provided by the strong anomaly, and possibly complete ungrammaticality, of AS-ing Nominals in strong achievement contexts, where activity reading is not available. The very same effects are attested with bare R-ing Nominals (cf. (78)–(80)). Again, no such effects are present for -ation+kin nominals (cf. (81), (82))

(78)  this kind of *reaching/*finishing/*discovering/*exploding/*erupting

(79)  a. */#Kim’s reaching of the summit
    b. */#Robin’s finding of (the) oil
    c. */#Roger’s discovering of his wife’s secret (and compare with discovery)
    d. */#The bulldozer’s hitting of (the) bedrock

(80)  a. */#the erupting of Vesuvius */#Vesuvius’ sudden erupting
    b. */#the exploding of the balloon */#the balloon’s noisy exploding
    c. */#the mysterious appearing of the rabbit

(81)  this kind of discovery/explosion/eruption

(82)  a. the eruption of Vesuvius Vesuvius’ eruption
    b. the explosion of the balloon the balloon’s explosion
    c. the appearance of the rabbit the rabbit’s appearance

Note now that -ing nominals may be intransitive as in the R-ing Nominals in (83), or the AS-ing Nominals (84). In all these cases, however, the reading is that of activity, and no culmination is implied. This holds as well for nominals derived from verbs such as fall, sink, or slip, so-called variable behaviour verbs, where in all intransitive -ing nominals, the subject, present or understood, is interpreted as an Originator (or internal causer: see fn. 24):

(83)  the sinking/the falling/the slipping/the dying/the whitening

(84)  a. the sinking of the ship (under intransitive reading)
    b. the falling of stock prices
    c. the slipping of standards
    d. the laughing of the boys
    e. the dancing of the light spots

Further evidence for the activity, atelic nature of -ing nominals comes from the fact that, few lexicalized exceptions notwithstanding, they may not pluralize or be marked with the indefinite singular article a. Following Mourelatos (1978), I assume that only
telic events may pluralize, a claim otherwise embedded within the assumption that atelic events are mass, while telic events are count (following Bach 1986 and much subsequent work). The failure of -ing nominals to pluralize in both their R- and AS-instantiations thus corroborates both their event status and their atelicity. Note that nominals derived with -ation+kin display no such systematic restriction:

(85) a. *this kind of parentings; *decidings; *formulatings; *terrorizings; *replacings;
   b. Women are reared not to feel competent or gratified by (*a) questing, (*a) competing and (*an) outbidding [of the sort] that collecting . . . demands. (adapted from (10b))

(86) a. the (gradual) promotions/*promotings of these incompetent functionaries (by their superiors)
   b. the (frequent) replacements/*replacings of many humans with few machines
   c. the appointments/*appointings of three musicians to permanent positions (by the management)
   d. the arrivals/*arrivings of the trains

(87) this kind of decisions/formulations/replacements

(88) a. a promotion/*a promoting of an incompetent functionary (by his superior)
   b. a replacement/*a replacing of a worker with a machine
   c. an appointment/*an appointing of a musician to a permanent position (by the management)
   d. an arrival/*an arriving of a train

5.6.3 -ing is not stative (subject is understood as Originator)

Note now that establishing that the understood subject of -ing is an Originator is tantamount to establishing, first, that -ing must have a subject, and second, that the event denoted by -ing it is not just atelic, but also not stative, i.e. that the subject is not a theme or an experiencer of some sort.

By way of addressing the obligatoriness of a subject, implicit or explicit, for -ing nominals, note the ungrammaticality of (89) (adjectives provided to exclude a gerund reading):

(89) a. R-ing Nominals: #this kind of (harsh) snowing; #this kind of (heavy) raining
   b. AS-ing Nominals: #the constant/harsh raining for several days; #the frequent/hard snowing for several hours
As for the exclusion of stative reading, consider first the clauses in (90). Typically, these are understood as ambiguous between activity and state:

(90)  a. Charles felt the coat (stative reading; eventive-agentive reading)
    b. Jenny smelled the stew (stative reading; eventive-agentive reading)
    c. Corrine touched Gil (stative reading; eventive-agentive reading)

The ambiguity, however, vanishes in the context of -ing nominals, where an eventive-Originator reading is the only one available, at times leading to an abnormal construal:

(91)  Eventive-Originator reading only, R-ing Nominals
    a. this kind of touching; this kind of smelling
    b. Women are reared to be gratified by frequent smelling and constant touching

(92)  Eventive-Originator reading only, AS-ing Nominals
    a. Charles’/the feeling of [#the cold/the coat on his shoulders] (by Charles)
    b. Jenny’s/the smelling of the stew (by Jenny)
    c. Corrine’s/The touching of Gil (by Corrine)
    d. The wall’s/The touching of the fence (#by the wall)

No such effects are found in the R-ation+kin Nominals in (93) or the AS-ation+kin Nominals in (94) (and compare with the AS-ing correlates):

(93)  this kind of adherence, knowledge; endurance; resistance; irritation; pleasure

(94)  a. the wall’s (persistent) adherence/*adhering to the fence
    b. Guy’s definitive knowledge/*knowing of all the answers
    c. Dennis’ (patient) endurance/*enduring of the noise
    d. the stain’s (sad) resistance/*resisting to cleaning

29 Note that feeling, in its R-Nominal context, has a reading which is, in actuality, stative. Arguably, however, this reading is listed, rather than compositionally derived. Note, among various other factors, that it can occur as a count noun: a feeling; feelings. AS-Nominals, recall, cannot be listed, and hence, in its AS-Nominal instantiation, feeling, as predicted, cannot be stative.

30 The effects under consideration here are altogether missing in gerunds, which freely allow telicity and stative readings. The behaviour of the progressive, however, is similar (although not identical) to that of -ing nominals, in barring telic readings and in disfavouring stative ones. This suggests that a unified treatment of progressive -ing and nominal -ing may be feasible.

A unified treatment of nominalizer -ing, progressive -ing, and gerundive -ing is proposed by Pustejovsky (1995). An account unifying, specifically, nominal and gerundive -ing is proposed e.g. by Portner (1992), Zucchi (1989; 1993), Alexiadou (2009), and Sichel (2010). The contrasts between -ing nominals and -ing gerunds highlighted here, however, suggest that such unification cannot be correct. For more discussion of these issues, see Borer (forthcoming).
5.6.4 Synthetic Compounds

Just like R-ing Nominals, recall, Synthetic Compounds are Simple Events:

(95) The window breaking/furniture moving/kitten sinking started at 8am, took place in my back yard, and didn’t stop until I intervened.

In fact, whatever effects were attested for R-ing Nominals are directly replicable for Synthetic Compounds. Thus the ungrammaticality of (96a) echoes precisely that of (78) and is contrasted with (96b), arguing specifically for the atelic nature of Synthetic Compounds:

(96) a. *this kind of summit reaching/*task finishing/*oil discovering/*bomb exploding
   b. this kind of gold discovery/bomb explosion/volcano eruption

As concerning the availability, or lack thereof, of stative Synthetic Compounds, (97) shows that here as well they pattern exactly like R-ing Nominals, in barring stative, non-Originator reading when possible and showing non-felicity when a non-stative reading is hard to construe:

(97) a. *Stative, ✓activity
   this kind of fence-touching/fabric feeling/stew smelling/stain resisting (and cf. stain resistance)
   b. Non-felicitous
   #this kind of music admiring/ party hating/ film seeing/bell hearing/ noise enduring/ stain resisting (and cf. music admiration; noise endurance; stain resistance)

Nor are the Synthetic Compounds in (98a) well-formed, without coercion, again in contrast with the -ation+kin compounds in (98b).

(98) a. #fact knowing; #noise enduring; #stain resisting (fabric)
   b. fact knowledge; noise endurance; stain resistance

Summarizing the discussion thus far, I have now established that nominals derived with -ing, whether (bare) R-ing Nominals, AS-ing Nominals, or Synthetic

31 And likewise, note:

   (i) a. fence toucher; stew smeller; coat feeler; stain resister (person/spray)
   b. #fact knower; #sick feeler; #sick looker; #stain resister (fabric)
Compounds, are atelic activities with an (implicit) Originator. I now turn to the final section, discussing the syntax of Synthetic Compounds.32

5.7 Synthetic Compounds: structures, En-searches, and other relevant matters

I concluded in section 5.5 that there is little reason to differentiate Synthetic Compounds from so called root compounds. Specifically, in the absence of grammatical event interpretation or any grammatical selection relationship between the head and the non-head, Synthetic Compounds, just like root compounds, exhibit no evidence for functional syntactic complexity of any sort. Insofar as Synthetic Compounds with -ing are interpreted as Simple events, I argued, this does not follow from the presence of functional structure, but rather from the fact that -ing is a function relating an Originator and an (atelic) Simple Event. Consider again, from this perspective, the structures in (61). These are repeated here as (99) and (100), and illustrated with cases of underived terminals, of derived verbs (and non-heads) and adjunct non-heads:

(99) [N-ing/-er] [C] [N-ing/-er] [C/V] ing/er
   a. [N-ing/-er] [truck] [N-ing/-er] [drive] ing/er
   b. [N-ing/-er] [production] [N-ing/-er] [V-ate orchestrate] ing/or
   c. [N-ing/-er] [fast] [N-ing/-er] [sink] ing/er

(100) [N-ing/-er] [ [C] [C/V] ] ing/er
   a. [N-ing/-er] [ [truck] [drive] ] ing/er
   b. [N-ing/-er] [ [production] [V-ate orchestrate] ] ing/or
   c. [N-ing/-er] [ [fast] [sink] ] ing/or

The structure in (99) is entirely straightforward, and is the structure typically assigned to e.g. heart surgeon, tea merchant, or pastry chef, where the head, presumably, is not derived from a verb (and for this structure, see e.g. Selkirk 1982; Di Sciullo and Williams 1987; Lieber 2009). Prima facie support for (99) comes from the fact that, as already noted in section 5.3.3.1, V-headed compounds do not typically occur in English (verb–particle compounds such as to black out being the exception).

Nonetheless, there is one rather compelling reason to adopt the structure in (100), and that is the fact that multiple factors point to the fact that in non-compositional

32 In contrast with nominal -ing, adjectival Synthetic Compounds with -ing do allow the stative reading, attributable, I assume, to the general stative nature of adjectival constructions in general:

(i) stew smelling room; music loving critic; sick feeling dog
Synthetic Compounds, what is listed as an encyclopedic entry does not have the structure in (99) or any of its sub-constituents, but rather that of the boxed constituent in (100), bracketed, furthermore, as V. The ensuing discussion not only tips the scale in favour of the structure in (100), but also provides independent evidence for the specific claims made here about the relationship between syntactic complexity and compositionality, listedness, and En-searching.

Consider again the paradigm in (58), illustrating the presence of listed readings for Synthetic Compounds which are not shared by V–Obj constituents, clausally or within AS-Nominals. Under consideration, recall, were cases such as those in (101), supplemented, now, with -er Synthetic Compounds:

(101)  

a. whistle blowing whistle blower #to blow whistle  
b. shop lifting shop lifter #to lift shop  
c. type writing type writer #to write (a) type  
d. white washing white washer #to wash white  
e. copy editing copy editor #to edit copy  
f. bottom feeding bottom feeder #to feed at the bottom

One of the striking facts about the list in (101) is that the non-compositional meaning exists, in parallel, in both -ing and -er nominals, but cannot possibly be traced back to any relationship between a verb and its putative argument. Nor is the picture unique to English. Hebrew shows that very same pattern, with non-compositional meaning for Synthetic Compounds frequently patterning together across the equivalents of -er and -ing, but missing in the clausal instantiations:33

(102)  

a. ‘orex din ’arixat din #arax (et ha-) din  
lit: editor law lit: editing law editted [the] law  
‘lawyer’ ‘lawyering’ lit. only  
b. melaxex pinka lixux pinka #lixex (’et ha-)pinka  
lit: chewer bowl lit: chewing bowl chewed [the] bowl  
‘toady’ ‘toadying’ lit. only

Under any account, the non-compositional meaning in (58), (101) and (102) must be listed. The question, however, is how many listings are involved. If the structure is as in (99), (and its Hebrew equivalent), there is simply no constituent which

33 As well as in AS-Nominals, cf. (i):

(i)  

a. ha-ariax šel ha-din  
the-editing of the law (lit. only)  
b. ha-liux šel ha-pinka  
the-chewing of the-bowl (lit. only)
e.g. *shoplifter* and *shoplifting* have in common, and thus the shared meaning is a mere coincidence. Yet such a coincidence is rather hard to reconcile not only with the great frequency of such occurrences, but also with their cross-linguistics occurrence.

Similar logic in support of (100) is pursued by Ackema and Neeleman (2004) (A&N), who observe the great frequency with which verbs that correspond to the affix-less portion of (58), (101), and similar cases comes to exist. List (103) is a partial list of their (partial) list, augmented with some specific cases pertinent to the items in (58), (101):

(103) to babysit to whitewash to play-act
to shoplift to facelift to line produce
to bottom feed to head adjoin to base generate
to carbon date to colour code to Chomsky adjoin

Marchand (1969) attributes the existence of forms such as those in (103) to a morphological process of back formation, which effectively strips a compound such as *babysitting* of its affixal material, thereby turning it into a verb. Among other factors, he dates the actual historical emergence of many of the complex verbs in (103) (e.g. 1947 for first attestation of *babysit*) to show that it postdates the existence of the correlating Synthetic Compound (a claim certainly anecdotally supported by the development of *e.g.* to *Chomsky adjoin* and to *base generate* as verbs in linguistic terminology). Overall, he traces the emergence of complex verbs such as those in (103) to a late trend in Modern English, starting sometime in the nineteenth century. Insofar as some non-compositional Synthetic Compounds existed, for however long, without a corresponding verbal form, and insofar as some of them still do, it is clear that at least for some time interval, Synthetic Compounds can exist such that their non-compositional meaning does not correlate with that of an actually occurring verbal use. Likewise, it strongly supports the diachronic claim that the emergence of the complex verbs in (103) is triggered by the prior existence of Synthetic Compounds with that same non-compositional meaning. The question, then, is how to structurally characterize Synthetic Compounds in general and non-compositional Synthetic Compounds in particular, such that they can plausibly give rise to the complex verbs in (103). If, indeed, ‘stripping’, however characterized, is involved, then, as noted explicitly by A&N, it cannot possibly be stated on the structure in (99), where neither the affix nor the surviving ‘stripped’ remainder are a constituent. Thus even if the initial structure of Synthetic Compounds is as in (99), for ‘stripping’ to apply, the structure would need to first be reanalysed as the structure in (103), therefore perforce allowing that constituent structure into existence in the language.

34 Ackema and Neeleman consider both (99) and (100) to be morphological structures. While I certainly endorse many of their architectural conclusions, I see little reason to exclude either of these structures from the syntax.
But if we now adopt (100), a puzzle emerges. As A&N observe, cases such as those in (103) are virtually nonexistent when compositional. English does not allow to truck drive, to window break, to tree generate, or to paper write. But if the structure of Synthetic Compounds, compositional as well as non-compositional, is as in (100), the contrast is not easy to explain.\(^{35}\) A&N themselves, arguing in favour of the structure in (100) as well as in favour of N+V compounding, in both English and Dutch, account for the effect as follows. First, they state the generalization in (104). Second, to account for the obligatoriness of such further morphological processes in the case of compositional N+V combinations, they appeal to competition and blocking. Effectively, to drive a truck wins over to truck drive. As e.g. *to sit a baby does not exist, to babysit is free, so to speak, to emerge:

\[\text{(104) N–V compounds that do not occur independently are licensed by a further morphological process of compounding [...or] a further morphological process of derivation. (A&N p. 58)}\]

For to truck drive to compete with to drive a truck, as A&N indeed note, crucially presupposes that in Synthetic Compounds, the verbal nexus does assign a role to the non-head. It is precisely because the thematic relationship between drive and truck is presumed to be identical in to drive a truck and to truck drive that the derivations can be compared. Presumably, no such role assignment occurs in the case of e.g. colour code, as to colour code and to code colour are certainly not synonymous.

Insofar as the explanation proposed by A&N crucially hinges on (a lexical realization) of (21b), it is in turn subject to the criticism of all (21b)-based accounts already discussed in some detail in sections 5.3 and 5.4. Nor is it clear how exactly competition should be framed so as to define truck drive and to drive a truck as in competition, but not, say, the sinking of the ship v. the ship’s sinking, or, for that matter, ship sinking.

\(^{35}\) And note in this context that e.g. proof read is not synonymous with to read proofs, nor is copy edit synonymous with to edit a copy. To bartend and to handshake, however, do appear to be genuine counter-examples, as A&N note. The effect is even more striking in Dutch, which visibly allows N+V structures within complex compounds, as in (ia), but which, just like English, only allows the verbal correlates of non-compositional Synthetic Compounds and blocks compositional ones, as in (ib):

(i) a. \[\text{[N [V appel pluk] machine]}\]
   apple pick machine

b. "De boerenknecht [appel plukt] de hele dag the farmhand "apple picks" all day long \(\text{(A&N pp. 57, 58, exx. (12a), (15a))}\)
Suppose, then, we consider an alternative. First, let us adopt a modified version of (104), which makes the morphological embedding of N–V compounds obligatory, thus making them, in the relevant sense, ‘bound’ morphemes:

(105) N–V compounds (English, Dutch, Hebrew) must be licensed by further morphological processes of compounding or derivation.

While for A&N the task was to explain the cases in which N–V may occur without affixation, the task here, as defined by the revised version in (105), is to show that in some important sense, the verbal forms in (106) are no longer truly compounds, and hence do not fall under the jurisdiction of (105). As it turns out, in the system developed here, there is one crucial difference between the Synthetic Compounds truck driving/-er, window breaking/-er, and Synthetic Compounds such as baby sitting, crystal gazing, or bottom feeding. By definition, and because truck driving is fully compositional, its encyclopedic meaning is constructed of two distinct En-searches, whose meaning is then combined. Not so baby sitting, where, under the non-compositional meaning, there is a single en-search which spans BABY and SIT, and which is constant across both -er and -ing instantiations:

(106) a. \[N-ing/-er \quad [\text{truck}] \quad [\text{drive}] \quad \text{ing/er} \]

\[\text{En-search } 1 = \text{TRUCK } \text{En-search } 2 = \text{DRIVE } \Rightarrow [[\text{TRUCK}]+[\text{DRIVE}]] +\text{ing/er}\]

b. \[N-ing/-er \quad [\text{baby}] \quad [\text{sit}] \quad \text{ing/er} \]

\[\text{En-search } 1 = \text{BABYSIT } \Rightarrow [\text{BABYSIT}] +\text{ing/er}\]

Recall now that the encyclopedia, as conceived here, is a reservoir of all listed meanings, regardless of internal complexity. Thus (categorized) roots, non-branching terminals, receive their encyclopedic meaning at the very same stage, involving (trivially) a single En-search as the jargon term TRANSFORMATION. Insofar as [BABYSIT] is the product of a single En-search, encyclopedically, it is neither less nor more complex than [DANCE], but it is different from [[TRUCK] [DRIVE]].

Further encouragement, so to speak, for the entry [BABYSIT] to occur as an independent verb emerges from the categorial status of the boxed constituent in (100). While the category of e.g. drive may not be self-evident, nor, for that matter, is it clear how headedness is determined in the boxed constituent in (100), what is clear is that the constituent in its entirety is verbal, as it is in the complement set of -ing or -er. The emerging picture is, then, that BABYSIT is encyclopedically listed,
complete with a \([v]\) bracket, and to all intents and purposes returned by a single search and, at least encyclopedically speaking, with little to distinguish it from verbalized roots. That it should turn out to actually emerge overtly as a verb without further affixation is thus a natural development. In fact, once Synthetic Compounds such as those in (58) and (101) are in place, the question must be why, at times (as in the case of *to face lift*), the emergence of such verbal existence is so delayed. We note that even without the statement in (105), and although clearly \([\text{TRUCK}\] [\text{DRIVE}]\) is likewise a verbal constituent, its diachronic cycling into a root-like verb does not represent an equally natural extension of the system.

Armed with a structure for Synthetic Compounds, suppose we consider again those Synthetic Compounds which themselves can head AS-Nominals. Some examples were already noted: (36), (37), and (38). Additional cases of interest are in (107):

(107) a. the babysitting/babysitter of my cats  
b. the classroom verbalizing/verbalizer of adjectives  
c. the fast sinker of ships  
d. the summer wilting of flowers; the noontime appearing/disappearing of smoke

I argued here, as well as in Borer (1999; 2003; forthcoming) that AS-Nominals are always derived from attested verbs. It thus must be the case that there are *attested* verbs in (107). Given the impossibility of constructing Synthetic Compounds which contain functional brackets, it also follows that the verbal compound, the correlate of the boxed constituent in (100), must be formed before the verb moves up the functional ladder. It therefore follows that for the compositional as well as non-compositional cases in (107) the non-head merges extremely low in the tree, and that the complex verb in its entirety is then moved through the functional complex. The emerging representation is shown in (108):

36 There does exist a systematic counterexample to A&N’s claim that verbs such as those in (103) are always non-compositional. Those involve cases in which the non-head is construed as an adjunct, to wit, *to machine wash, to pan fry, to hand weave, to jump start, mountain grow.* In turn, in what is a curious contrast, Synthetic Compounds with an adverbial or temporal construal for the non-head, while adjuncts nonetheless do not seem to correlate to very good verbs: #*to quick act; to summer wilt.* Clearly, more fine-grained distinctions are required here—a matter on which the account here as well as that of A&N are silent.
5.8 Conclusion

While the empirical focus of this work has been the comparison of AS-Nominals and Synthetic Compounds, from a broader perspective it bears on the division of labour between the lexicon and the syntax and, more specifically, on domains of rule application. From the broadest perspective, at the core of any lexical approach there is an assumption that some listed unit, however defined, is a syntactically atomic unit, but nonetheless a grammatically coherent domain which consists of an array of grammatical instructions to the syntax (as well as to the morphology and to the phonology). More narrowly, in all lexicalist accounts, however derived or executed, the relevant listed unit (may) include a specification of privileged relationship that must hold between that unit and some other constituent, which may be syntactically rather then lexically realized, i.e. an argument. The claim, as we saw, is not unique to so-called Lexicalist accounts, but is also typical of a host of root-based approaches, who may dispense with listed categorial labels and lexical operations, but not with listed argument selection.

I considered here three distinct instantiations of derived nominals with AS-Nominals, R-nominals, and Synthetic Compounds. I believe the conclusions of this investigation cast serious doubt on a number of claims concerning the properties of listed items, as well as on the assumption that the lexicon is an appropriate domain for rule application which affects the syntax. First and foremost, I showed that identical morphophonological units, arguably phonological words, may nonetheless
have extremely different syntax. The different syntax under consideration was
associated not just with the structure in which such ‘words’ are embedded, or the
structure which they may head, but rather with their actual internal composition.
The morphophonological unit *lifting*, specifically, has considerably more internal
structure when occurring in the context of the *lifting of the package* than it does in the
context of *package lifting*. Specifically, in the former case it has the structure in (109a)
while in the latter case it has the structure in (109b):

\[
\text{(109) a. } [\text{N } [\text{F}_1 [\text{F}_2 [\text{V}]]]\text{-ing}]
\]

\[
\text{b. } [\text{N } [\text{V}]\text{-ing}]
\]

The distinct structures in (109a, b) correlated directly with distinct broader syntax,
with distinct formal semantic properties, and finally, with a very distinct degree of
access to meaning listedness. Insofar as this point has been established, it argues
strongly against correlating any phonological domain for rule application with some
fixed, ‘small’ word-like syntactic domain, and argues extremely strongly for con-
structing complex words syntactically. In contextualizing the present approach
relative to treatments of words in the past decades, it argues extremely strongly
against the Lexical Integrity Hypothesis of Lapointe (1980) as well as its latter-day
incarnation as the Atomicity Thesis in Di Sciullo and Williams (1987).

Beyond illustrating that words, internally, have syntactic constituent structure and
thus must be syntactically constructed, I argued explicitly against the listing of any
syntactic relations, e.g. those which hold between a head and its arguments, be those
heads categorized (e.g. as verbs) or roots. The generalized challenge to any
such listing emerged from the direct correlation between a functional, syntactic
representation of arguments, the emergence of a grammatical event reading, and
the emergence of a strictly compositional reading. Precisely because Synthetic Com-
 pounds do not come with functional structure, it was possible to show that they do
not have a grammatical event representation, that the non-head cannot, in actuality,
be an argument (under any approach), and that non-compositionality may emerge.
It is difficult to see how this result can be explanatorily reconciled with the listing of
internal arguments, or any other arguments, for that matter.

Importantly, what has been provided is *not* an argument against listedness as
such, nor do I believe in the existence of such (valid) arguments. Any grammatical
model which subscribes to the arbitrariness of the sound–meaning pair must have a
list, indeed, two lists, somewhere: one consisting of sound combinations, the other
consisting of (non-rigidly designating) meaning, and alongside these lists, some kind
of pair-forming operation correlating a particular sound with a particular meaning.
The lexicon–syntax debate has never been about listedness as such. It has been, and
remains, a debate about what is the content of the relevant lists—specifically, what
type of units inhabit the sound list, on the one hand, and what type of ‘meanings’ inhabits the meaning list, on the other. The lexical answer has been, by and large, that the listed sound is equivalent to (some) phonological domain of rule application, and that the listed meaning includes sufficient information to inform its appropriate syntactic merger, however derived. In contrast, in the proposal I advance here the ‘meaning’ component is strictly encyclopedic and devoid of any direct grammatical significance.
There are two basic questions that an analysis of the English causative alternation, illustrated in (1), must address. First, is one variant of the alternation basic, and, if so, which one? Second, if one variant is basic, is there a lexical rule which derives the other variant?

(1)  
   a. The butler opened the door. (causative variant)  
   b. The door opened. (anticausative variant)

With respect to the first question, the perceived additional semantic complexity of the transitive or ‘causative’ variant—its explicit association with a notion of cause—may suggest that the transitive variant is derived from the intransitive or ‘anticausative’ variant¹ by the addition of a \textit{cause} operator (e.g. Dowty 1979: 91; Härtl 2003; Lakoff 1966; Parsons 1990). This position is reinforced by the additional morphology associated with at least some verbs in this variant in some languages. In contrast, the intransitive variant is taken as derived by others (e.g. Chierchia 2004; Grimshaw 1982: 103ff; Levin and Rappaport Hovav 1995: 108; Reinhart 2002: 241; forthcoming, a).

¹ The label ‘anticausative’ is attached to the intransitive variant largely because the verb in this variant often comes with some explicit morphology which is taken to obviate the causativeness associated with the transitive variant (Hasselmath 1993; Nedjalkov and Silnitsky 1973). In English, there is no special morphology on the verb in either variant, so we use the term ‘anticausative variant’ here to refer to sentences with intransitive verb uses, as long as the same verb has some ‘causative’, transitive uses. Similarly, we use the term ‘causative variant’ to refer to sentences with transitive verb uses, as long as the same verb has some ‘anticausative’, intransitive uses. See Rákosi (Ch. 7 below: 4) for more on these terms.
most often because its verb is usually morphologically more complex than the verb in the causative variant in many languages, including French, Italian, and Russian (see also Koontz-Garboden 2009).

The second question has also received several answers. Some researchers have suggested that there is a lexical rule which derives one variant from the other (e.g. Grimshaw 1982: 103ff; Levin and Rappaport Hovav 1995: 108; Reinhart 2002: 241; forthcoming, a; Williams 1981: 99). More recently, others have argued for a non-derivational approach to the alternation (e.g. Alexiadou, Anagnostopoulou and Schäfer 2006; Doron 2003; Harley 2008; Piñón 2001a, 2001b). On this approach, the verbs in the two variants of the causative alternation are each derived from a common root in the sense of Pesetsky (1995: 70; see also Alexiadou et al. 2006; Doron 2003; Harley and Noyer 2000), but neither variant is derived from the other by a lexical rule.

In this chapter we revisit the English causative alternation\(^2\) and propose an analysis which gives answers to these two questions that diverge from those embodied in our own previous analysis, as well as the analysis in Reinhart (2002; forthcoming, a). We argue, contrary to this earlier work, that the anticausative form of the verb is basic. Moreover, we suggest that the causative variant is not derived from the anticausative variant via a lexical rule. We point to a basic asymmetry between the single argument of the verb in the anticausative variant and the cause argument in the causative variant: the former argument is lexically specified by the verb, while the latter is not. Rather, extra-lexical factors determine the properties of the causative variant—that is, when a cause can appear and what qualifies as an acceptable cause. More important, it is not possible to provide a unified characterization of the cause argument in terms of its thematic specification, i.e. in terms of semantic roles or their component notions: what qualifies as a cause varies across verb classes and across choices of causative variant direct object. Thus, an account of the causative alternation will have the widest possible coverage if all alternating verbs are lexically associated with only a single argument, and the causative variant is not derived uniformly by a rule which adds an argument with a certain thematic specification.

We argue that our analysis better brings the causative alternation under the purview of Reinhart’s Lexicon Uniformity Principle (2002: 284; forthcoming, a), a principle which articulates an approach to lexical phenomena, certain facets of which we strongly concur with. This principle, which is built on the observation that

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\(^2\) Due to the theme of the volume and space limitations, our analysis of the causative alternation is presented in the context of Reinhart’s Lexicon Uniformity Principle; concomitantly, we focus on just those facets of the analysis that relate to the better understanding of this principle. We leave for another paper explicit comparisons of our analysis with other analyses, as well as the investigation of the implications of our proposed analysis for the relation between anticausatives and unaccusativity. Furthermore, although the causative alternation is instantiated in many languages and has been intensively studied in various languages, we restrict our attention to English. We recognize we must extend our analysis to other languages in the future.
the lexicon is replete with regularities, reflects the assumption that analyses of the relevant phenomena should capture these regularities as much as possible. We argue that an analysis which uniformly derives the anticausative variant of the causative alternation from the causative variant does not capture the regularities in a perspicuous way. In particular, such an analysis leads to the positing of polysemy where this does not seem warranted, and it fails to capture the existence of anticausative variants which systematically lack causative counterparts.

In the next section we introduce the Lexicon Uniformity Principle, making the assumptions behind it explicit, as part of a larger discussion of some considerations and assumptions relevant to any account of argument alternations, many of which we share with Reinhart. Following that, in section 6.2 we review data that are problematic for an analysis that takes the causative variant to be basic, deriving the anticausative variant by a lexical rule. In section 6.3 we introduce our new analysis which instead takes the anticausative variant to be basic, and propose that a causative variant is available when the cause meets what we call the ‘Direct Causation Condition’. We further support this condition by demonstrating its applicability to verbs of sound emission in section 6.4. Section 6.5 asks why in some instances only the causative variant is available for verbs which in general show both variants, attributing this asymmetry to what we call the ‘Proper Containment Condition’. The conclusion, section 6.6, revisits the Lexicon Uniformity Principle in light of our analysis of the causative alternation. We suggest that the notion of lexicalization is useful to understanding what it means to satisfy this principle.

6.1 The Lexicon Uniformity Principle: a hypothesis about the structure of the lexicon

The following quotation encapsulates some basic assumptions which Reinhart makes about the (verb) lexicon.

I believe the lexicon is the information storage of everything needed for speakers to actually use language to describe the world. In some sense, (almost) everything comes from the lexicon. This view entails also that lexical information is largely universal/innate (except, of course, for the sound coding), has minimum idiosyncrasy, and is governed by generalizations that are relevant also for the computational system. (Reinhart forthcoming, a)

As this quotation implies, while the lexicon, as the place for indicating pairings of sound and meaning, is a locus for registering idiosyncrasies, it is not at all ‘an appendix of the grammar, a list of basic irregularities’, as Bloomfield (1933: 274) proposes. Rather, on Reinhart’s view the lexicons of natural languages contain, among other things, lexical forms of verbs which are in some way related, and the
relatedness between these forms is captured by rule. Reinhart makes this intuition explicit in her Lexicon Uniformity Principle:

(2) Each verb-concept corresponds to one thematic structure. That is, the various thematic forms of a given verb are derived by arity (valence changing) operations from one thematic structure. (Reinhart forthcoming, a)

More specifically, if there are morphologically related forms of a verb which differ in their thematic structure, as active and passive forms do, they should be related by a rule, the assumption being that the form of one will be predictable from the other. Indeed, this seems to be why the active and passive forms of a verb are assigned a single lexical entry in the early transformational literature. Chomsky (1957: 42–3) points out that the subcategorization and selection properties of a verb’s passive form are predictable from those of the related active form, suggesting that the former can be derived from the latter by rule.³ As far as we know, this observation is correct. In addition, active and passive sentences with the same verb share the same truth conditions (unless they contain quantified NPs; e.g. Chomsky 1965: 224), and the choice between them is largely due to animacy and information structure considerations (e.g., Bresnan, Dingare, and Manning 2001; Krauthamer 1981; Ransom 1977; Thompson 1987). The conclusion that the active and passive forms of a verb are instances of the same verb-concept, to use Reinhart’s term, emerges from these facts.

Languages do not, however, necessarily have to show this property. Nothing, for example, a priori excludes a language whose verbs have distinct, but morphologically related verb forms, which are conceptually related, but not in a way that can be captured strictly by rule. Thus, Reinhart’s Lexicon Uniformity Principle can be taken to be an empirical claim or, more in line with her own statement, a guideline which helps explore the extent to which there is regularity in the relation between morphologically related forms of verbs and the nature of this regularity. The specific formulation of the Lexicon Uniformity Principle expresses the claim that the appropriate construct for capturing the regularity is an arity operation, an operation on the thematic structure of a verb. We devote much of this chapter to investigating the validity of this claim.

As a case study, Reinhart (forthcoming, a) examines how the Lexicon Uniformity Principle can be applied to the causative alternation. She takes the verbs in the causative and anticausative variants of the causative alternation to be instances of the same verb-concept. Thus, the Lexicon Uniformity Principle dictates that

³ Although in transformational accounts the grammatical relation changes associated with passivization are attributed to syntactic movement, there is still a lexical rule involved: the syntactic movement is triggered by adjustments to the verb’s lexical entry, such as a modification in its accusative case-assigning properties. In lexicalist theories such as LFG and HPSG, active and passive forms of a verb are given distinct lexical entries related by a lexical rule. This approach seems to be in the spirit of Reinhart’s Lexicon Uniformity Principle, to which we assume that lexicalist analyses conform.
each such verb pair should share a lexical entry and have a single thematic structure, which we understand to be a lexical specification of the arguments associated with that verb. Since the verbs in each such pair differ in thematic form, one must be derived from the other by an arity operation. To the extent that arity operations can be shown to capture the relatedness between causative and anticausative forms of the verb, the Lexicon Uniformity Principle, in Reinhart’s specific formulation, can be taken to be verified as an empirical claim.

Here, however, we present another approach to the causative alternation. We argue that although the alternation falls under the purview of the Lexicon Uniformity Principle, it represents a regular relationship between two thematic forms of a verb that is not captured by an arity operation. We support this new analysis following a review of Reinhart’s own most recent analysis, which is based on an arity operation (forthcoming, a). Deriving the properties of one verb form from those of another by an arity operation requires a specification of the components of the representation that the rule operates on. In current generative practice, the rule which derives one thematic form of a verb from another operates on an argument structure representation. Although there are various proposals about what needs to be included in an argument structure representation (e.g. Bresnan 1982b; Grimshaw 1990; Levin and Rappaport 1988; Marantz 1984; Williams 1981), at minimum, such a representation must make explicit what arguments a verb is associated with. Often, it includes more specific, usually semantic information about each argument. In Reinhart’s Theta System, arguments are classified into semantic types on the basis of two binary features, and the rules operating on thematic structure—an argument structure with semantic role specifications—make reference to these features. Reinhart’s general claim is that such a representation is appropriate for the formulation of lexical rules which relate morphologically related forms of the same verb-concept.

This claim is precisely what we argue against as an analysis of the causative alternation. We show that the causative alternation should indeed be brought under the purview of the Lexicon Uniformity Principle, so that the two variants of the causative alternation in English are viewed as involving two forms of the same verb-concept; however, we argue that the regular relation between these forms is not best captured by a lexical rule which operates on a thematic specification of the verb deriving the anticausative form from the causative form.

6.2 The English causative alternation revisited

Reinhart’s analysis of the causative alternation takes the causative variant to be basic, deriving the anticausative variant from it via a lexical arity operation of decausativization (forthcoming, a); called ‘expletivization’ in 2002: 241). This operation applies to verbs whose thematic structure involves two arguments, one of which has the lexical specification [+c(ausing change)]. This lexical specification identifies
arguments that fall under a broad notion of cause, subsuming agents, natural forces, and instruments (forthcoming, a). The decausativization operation eliminates the \([+c]\) argument altogether, leaving a thematic structure with a single argument—the thematic structure of the anticausative variant. This analysis is similar in spirit to our own earlier analysis of the causative alternation, which takes the anticausative variant to be formed from the causative variant of externally caused verbs (Levin and Rappaport Hovav 1995: 108)—verbs describing eventualities which involve some cause with immediate control over the eventuality. In our earlier analysis the externally caused verbs which participate in the alternation are just those which do not impose semantic restrictions on their cause argument. This makes the class of alternating verbs essentially coextensive with Reinhart’s two-argument verbs with a \([+c]\) subject, since the \([+c]\) specification singles out those verbs that simply specify that their subject is a cause.

We contrast our current analysis of the causative alternation with Reinhart’s, even though many of our criticisms of Reinhart’s analysis can also be levelled against our own 1995 analysis. We do this because Reinhart’s analysis provides a backdrop for discussing the Lexicon Uniformity Principle, the starting point for our new analysis of the causative alternation. Furthermore, we take issue with the claim that the conditions which restrict the causative alternation are lexical—specified in the thematic structure of the verb—and Reinhart develops this claim more explicitly than we do.

The following quotation from Reinhart makes explicit the observational basis for her account of the causative alternation: the assumed pervasive regularity between the existence of causative and anticausative variants for verbs which take a range of cause subjects when used transitively.

There are hardly any exceptions to the claim that if an unaccusative entry has a transitive alternate, that transitive can occur with Agent, Cause or Instrument as subject (namely, it selects a \([+c]\) cluster), and vice versa. The correlation is overwhelming. The transitive member of the alternation may be missing idiosyncratically in a given language for a few instances. (Reinhart forthcoming, a)

We devote this section to showing that many English verbs have single argument—i.e. anticausative—uses and related causative uses, which together constitute a causative alternation, but that these uses are often found with limited choices of arguments. In section 6.2.1 we show that change-of-state verbs that may select agents, natural forces, and instruments as subjects may nevertheless not have anticausative uses for some choices of theme. As the relevant verbs participate in the causative alternation, this phenomenon does not contravene the picture in the quotation. It is not, however, explained by the decausativization operation, yet it is pervasive enough that it should be encompassed by an account of the alternation. In section 6.2.2 we show that certain types of verbs have natural causative uses, but these causative uses
cannot be instantiated with the entire range of causes allowed by the [+c] specification in the structural description of the decausativization operation. These verbs, then, do not conform to the generalization suggested in the quote above. In section 6.2.3 we show that the specific nature of the cause argument often depends on the object argument chosen in the causative variant. The data in these sections lead us to conclude that it is more perspicuous to take the verbs in question to be single-argument verbs and to formulate the conditions on the appearance of the cause argument. Since the specific semantic role of the cause is not consistent across verb classes and across choices of direct object, we assume that it is not a lexical rule which adds a cause with a particular semantic characterization. Rather, we argue that the nature of possible causes is determined non-lexically.

6.2.1 Causative variants that lack anticausative counterparts

We begin by considering verbs which meet the criteria for Reinhart’s decausativization operation—they have causative uses with [+c] subjects—but they do not allow every noun phrase that can be the direct object of the causative variant to be the subject of the corresponding anticausative variant. Such verbs are significant because they do not show what is taken to be the characteristic pattern of behaviour for causative alternation verbs. So not only do previous accounts agree that causative alternation verbs allow a range of subject types, but they also assume that these verbs show the alternation across all choices of themes selected by the relevant verb; in fact, this purported generalization is used as a justification for positing a rule that relates the two variants (e.g. Fillmore 1970; Hall 1965). Thus, the change of state verbs break and melt, which are taken to exemplify the canonical causative alternation verbs, allow a range of subject types, as in (3), thus meeting the criterion for Reinhart’s decausativization operation; further, they manifest the alternation across a wide range of themes, as (4) and (5) show.

(3)  a. Antonia/the wind/the ball broke the window.
    b. Pat/the sun/the microwave melted the chocolate.

(4)  a. Antonia broke the vase/the window/the bowl/the radio/the toaster.
    b. The vase/the window/the bowl/the radio/the toaster broke.

    (Levin and Rappaport Hovav 1995: 85, (7))

(5)  a. Kelly melted the butter/chocolate/ice/wax/gold coins.
    b. The butter/chocolate/ice/wax/gold coins melted.

However, although break is taken to be the prototypical causative alternation verb, it does not show the causative alternation for every choice of theme. As Levin and Rappaport Hovav (1995: 85) point out, some causative break sentences lack an anticausative counterpart, as in (6).
(6)  
  a. He broke his promise/the contract/the world record.
  b. *His promise/the contract/the world record broke.

  (Levin and Rappaport Hovav 1995: 85, (9))

  The asymmetry in available variants illustrated in (6) is pervasive. Consider the
de-adjectival change of state verb clear, discussed by Levin and Rappaport Hovav
(1991; 1995: 85–6), which specifies that an entity becomes unobstructed in some way.
As the following examples indicate, this verb satisfies the conditions on Reinhart’s
decausativization operation: its external argument may be an agent, an instrument, a
natural force, or even an event.4

(7)  
  a. In one case, R v Waterfield, the trial judge had cleared the court while the
jury was shown allegedly obscene films. (BNC J78)
  b. What they found was that the wipers cleared the windscreen perfectly well.
(BNC CFS)
  c. On the third morning a gust of wind swept out one final flurry and cleared
the sky. (BNC BNU)
  d. …merchant seamen who fought the great naval battles which cleared the
seas and made possible future trade with the East …(BNC FES)

  However, clear does not have an anticausative counterpart for every choice of
causative variant theme, as shown by (8), where unlike in (6), the verb is not being
used figuratively.

(8)  
  a. The waiter cleared the counter.
  b. *The counter cleared.

  What accounts for the unacceptability of sentences like (8b)? It is possible that this
kind of clearing can only be brought about by an agent actively involved in bringing
about this change of state; this contrasts with clearing a windscreen, which could be
done by an agent, an instrument, or even a natural force such as the rain or wind.
One possibility is to attribute the unacceptability of (8b) to the [+c] specification on
the decausativization operation, which prevents agents, specified as [+c+m], from
undergoing this operation. However, if we attribute the unacceptability of (8b) to its
verb having an argument lexically specified as [+c+m], then two verbs clear must be
posited: an agentive verb, lexically specified as [+c+m], which thus disallows decaus-
tativization, and a second verb which does not impose an agentivity requirement, i.e.
it is lexically specified as [+c], and which thus allows decausativization. The first verb
would lack an anticausative variant, while the second verb would permit such a
variant. This solution, then, takes a verb like clear not to conform to the Lexicon

4 Abbreviations for sources of corpus examples: BNC = British National Corpus, COCA = Corpus of
Uniformity Principle. As Reinhart notes (2002: 284; forthcoming, a), in some instances morphologically identical words may just have to be associated with different concepts; however, this position should be taken only if it can be shown that there is no other generalization that can account for the data.

However, this solution is built on the assumption that the use of clear in (8a) is agentive, an assumption which is invalid. The same sense of clear is found in (9), which has a natural force as the cause.

(9) The wind was enormous. There was a huge dinner table set-up, and the wind cleared the entire table onto the floor and blew over chairs.

Thus, positing that there is a verb clear which selects an agent—a [+c+m] argument—is unjustified. We conclude that the unacceptability of (8b) cannot be attributed to the lexical specification of the verb. Rather, there are constraints on the application of decausativization to a verb’s thematic structure beyond the requirement that the verb lexically select a [+c] argument.

The difficulties with stating the conditions on the decausativization operation are not unique to the verb clear; rather, as we now show, the difficulties found with clear reflect a much more general phenomenon. Comparable patterns are found with the change of state verbs lengthen and empty. These two verbs do not require their subject to be an agent, but rather allow various types of causes as their subject, as (10) and (11) show.

(10) a. A low carb diet may lengthen your life.
(http://lowcarbdiets.about.com/b/2010/11/01/)
b. Intensive care unit infections can lengthen hospital stays.
(http://www.kevinmd.com/blog/2009/12/)

(11) a. It was the failures of those floodwalls that emptied the lake into the rest of the city . . .
(http://www.washingtonpost.com/wpdyn/content/article/2005/09/20/AR2005092_001894.html)
b. Toyota Hilux conquers the volcano just before its eruption emptied the skies . . . (http://www.globalmotors.net/toyota-hilux . . .)

Any account which claims that a verb’s lexical specification constrains the availability of the anticausative variant faces a more serious problem: the apparent influence of context. We also make this point with the verb clear, which is unusual in taking an optionally expressed argument describing the stuff that gets removed from the theme (e.g. I cleared the table of dishes; Levin and Rappaport Hovav 1991). The entity chosen as this argument can influence how the verb realizes its arguments, even if this argument is left unexpressed. Thus, The police cleared the yard has the acceptable anticausative counterpart The yard cleared, if people are understood to be leaving the yard, as when a crowd disperses, but it lacks such a counterpart if the police are clearing some type of equipment from the yard. We intend to deal with this issue in future work.
Thus, on Reinhart’s account these verbs should permit the causative alternation generally, yet they too do not show the alternation for some choices of theme, as in (12) and (13).

(12)  a. I lengthened the skirt and added some ric-rac.
       (http://madquilter.blogspot.com/)
       b. * The skirt lengthened.

(13)  a. I emptied the trash can.
       b. * The trash can emptied.

These examples suggest that there is a general problem here and not one idiosyncratic to the verb clear. It is not possible to provide an analysis of decausativization which is constrained solely by the specification [+c], but still minimizes polysemy by conforming to the Lexicon Uniformity Principle.

Reinhart introduces the [+c] specification to preclude the decausativization of inherently agentive verbs, such as murder, write, or eat. Levin and Rappaport Hovav (1995) suggest that this specification is an instance of a more general constraint. The more general constraint prevents the anticausative variant from being used to describe an eventuality which necessarily involves an agent. This constraint restricts the sentence types which can be used in describing certain kinds of happenings in the world. Although the verb lengthen is not lexically specified as selecting an agent, this constraint disallows the anticausative variant as a description of a skirt being lengthened, since such a happening can only come about via an agent. Levin and Rappaport Hovav suggest that this same constraint prevents verbs like murder and write from ever being found in an anticausative variant, since all instances of murdering and writing are agentive.

However, Levin and Rappaport Hovav’s (1995) solution is not tenable. First, there are certain agentive happenings which can be described using an alternating verb in an anticausative sentence, as illustrated in (14), though a comparable option is never available to verbs like write or murder.

(14)  a. My son wanted to annoy me, so he threw my precious vase against the wall and it broke.
       b. Sally kept tugging on the door until it finally opened.

Second, the anticausative variant may be unavailable even with some changes of state that are brought about without the intervention of an agent. Thus, in (9), the wind can clear the table, although the anticausative *The table cleared cannot be used to describe such a happening.

In section 6.3, we present another solution to the problem of specifying when causative alternation verbs cannot appear in the anticausative form. Verbs like murder, write, and eat never alternate and are necessarily agentive. In addition, as
pointed out by Alexiadou et al. (2006), their counterparts across languages lack an anticausative variant. Based on these properties, we propose that these verbs are lexically specified for two arguments, a theme argument and a cause argument; that is, they are inherently dyadic. Furthermore, they lexically restrict their cause argument to being an agent. We propose that this additional lexical restriction prevents the cause argument from being removed by an arity operation. In contrast, verbs showing the causative alternation do not impose any selectional restrictions on their cause subjects—as Reinhart claims—and we take this property to indicate that these verbs are inherently monadic. This approach requires the formulation of the necessary conditions for the addition of a cause argument, which we set out in section 6.3. In section 6.5 we present a condition which delineates when the cause must appear and, thus, an anticausative variant is impossible. We further show that this condition cannot be subsumed under the condition which precludes anticausative variants of inherently agentive verbs.

In the next two sections we provide further evidence that change-of-state verbs are lexically specified for a single argument. We show that this proposal allows an account of two further sets of verbs which apparently show a causative alternation, but which cannot be given a unified analysis if all causative alternation verbs are taken to basically have two arguments.

6.2.2 *Unexpectedly available causative variants*

There are several classes of verbs which are often said not to participate in the causative alternation because they are found predominantly as intransitives. Yet subsequent research has shown that these verbs do have causative uses, although usually with a restricted set of non-agent causes as the subject. Thus, they deserve a more prominent place in the development of a unified theory of the causative alternation. As we show, the range and nature of the causative uses of these verbs bear on the proper analysis of the causative alternation. Specifically, they also suggest that an account that states the conditions under which a cause subject is allowed may be preferable to one that states the conditions under which a cause subject can be omitted. These data, then, further support our claim that the causative variant is not basic.

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6 Koontz-Garboden suggests that analyses of the causative alternation should meet what he calls the Monotonicity Hypothesis (2009: 80, (8); see also Rappaport Hovav and Levin 1998: 111): ‘Word formation operations do not remove operators from lexical semantic representations.’ Our analysis of the alternation meets this desideratum, though in a different way than Koontz-Garboden’s analysis; however, it may be that our analysis is appropriate for English, while Koontz-Garboden’s is appropriate for, say, Romance languages.

7 Rákosi (Ch. 7 below) also argues that the verb in the anticausative variant is monadic on the basis of the distribution of ablative causes in Hungarian; nevertheless, he takes the anticausative variant to be derived by Reinhart’s decausativization operation.
We begin with so-called ‘internally caused change-of-state verbs’, such as *blossom*, *decay*, *wilt*, and *wither*. These verbs describe changes of state brought about by internal properties of their themes, as reflected in the label ‘entity-specific change of state verbs’ in Levin (1993: 246–7). Levin (1993) and Levin and Rappaport Hovav (1995) claim that these verbs do not show the causative alternation. In Levin and Rappaport Hovav (1995) we suggest that they inherently take one argument, and since for Reinhart the causative alternation arises from a decausativization operation, there is no reason to expect them to have a causative form. The perception that these verbs do not participate in the alternation may arise because these verbs almost never appear with animate subjects—the type of subject most often used to illustrate the causative variant.

(15) a. The fruit trees blossomed.
   b. *The farmer/the new fertilizer blossomed the fruit trees.

Nonetheless, McKoon and Macfarland (2000) and Wright (2001; 2002) show that these verbs do allow causative uses, although with a narrow range of subjects. In naturally occurring examples, such as those in (16) and (17), the subject is a natural force, and perhaps sometimes an event or a circumstance, but it is not an agent or an instrument.

(16) a. Early summer heat blossomed fruit trees across the valley. (LN 1999)
   b. Salt air and other common pollutants can decay prints.
   c. Raindrops selectively erode clay particles. (LN 1982)
   d. The onset of temperatures of 100 degrees or more, on top of the drought, has withered crops. (NYT 1986)

   (Wright 2002: 341, (6))

(17) a. Light will damage anything made of organic material. It rots curtains, it rots upholstery, and it bleaches wood furniture. (LN)
   b. Salt air rusted the chain-link fences. (LN)
   c. Bright sun wilted the roses. (LN)

   (Wright 2001: 112, (24), 113, (27a), 115, (32a))

Internally caused change-of-state verbs pose a different problem from verbs like *clear*, *lengthen*, and *empty*, whose agentive causative uses lack anticausative counterparts. Internally caused change-of-state verbs only allow a restricted range of causative uses, and they typically cannot select an agent subject. An attempt to extend Reinhart’s analysis of the causative alternation to internally caused change-of-state verbs, then, encounters a new problem: assigning their causative subject the [+c] specification misses the generalization that their causative uses only have a restricted set of causes as subject, yet the [+c] specification is assigned to canonical causative alternation verbs precisely to indicate that a wide range of subjects is
compatible with their causative use. In fact, the internally caused change-of-state verbs might instantiate a class of verbs whose existence Reinhart speculates about (2002: 233, n. 3):

In Reinhart (2000), I assumed that the role cause is the cluster [+c–m], i.e. that instrument and cause realize the same feature cluster, and the relevant interpretation is determined contextually. [+c] was assumed to be a special feature cluster which is consistent with the three roles (agent, cause, instrument). However, I did not find subsequently any verb which selects an argument which is obligatorily only a cause (i.e. cannot be realized also by an instrument or an agent). Hence, this assumption is not justified.

We point out, however, that it is not clear that the feature cluster [+c–m] uniquely picks out just the set of semantic roles which are associated with the subjects of these verbs. For example, Potashnik (Chapter 10 below) suggests that emitters also have the feature cluster [+c–m], but clearly, internally caused change-of-state verbs do not appear with emitter subjects. Furthermore, if we give these verbs a dyadic lexical representation with a [+c–m] subject, these verbs will not fall under Reinhart’s decausativization operation. Finally, since these verbs overwhelmingly appear in non-causative sentences, it seems counterintuitive to assign them a causative lexical representation. (Some of these verbs appear in transitive sentences which are not causative, as in *The shrub blooms white flowers in the summer."

An alternative is to argue that the alternation these verbs display is not an instance of the same causative alternation shown by change-of-state verbs such as break. The causative use could be taken to be the result of a causativization operation, instead of a decausativization operation. However, this account runs into the same problems as the decausativization account. First, it does not fit in with the well-established arity operation of causativization which Reinhart (2002: 242–4; see also Horvath and Siloni 2011: 677) describes, as her causativization operation uniformly adds an agent, and, as we have just shown, these verbs do not normally appear with agent subjects. Second, if the feature cluster [+c–m] does not uniquely pick out the kinds of subjects compatible with these verbs, a causativization operation will suffer from the same shortcomings as the decausativization operation.8

Thus, we take these internally caused change-of-state verbs to take a single argument. In section 6.3, we propose that the range of subjects that they allow follows

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8 There are even finer semantic restrictions on the subjects of internally caused change-of-state verbs which are not easily captured using the features available in the Theta System. Although these verbs may take subjects which may be considered events, as in *The onset of temperatures of 100 degrees or more, not all phrases construable as events are possible subjects of these verbs. In particular, phrases such as *the gardener’s digging or planting the trees early, which represent the activities of agents, are not compatible with them: *The gardener’s digging blossomed the trees early this year.
from the interaction of a semantic constraint on the causative variant with the inherent semantics of the verbs themselves.

6.2.3 Subject–object interdependencies: the verb skyrocket

In this section we show that certain verbs only have a causative variant for certain subject–object combinations; in this variant, their choice of subject largely depends on their choice of object. We introduce these interdependencies and illustrate their pervasiveness by examining yet another class of verbs, the verbs of calibratable change of state (Levin 1993: 247). These verbs have not figured in previous discussions of the causative alternation probably because, like internally caused change-of-state verbs, they are most often used intransitively, yet they bear strikingly on our concerns. Their subject–object interdependencies are left unexplained under an analysis where a decausativization operation applies to verbs with a certain thematic structure.

Levin (1993: 247) states that verbs of calibratable change of state do not participate in the causative alternation, having only an intransitive use. However, like internally caused change-of-state verbs, the verbs in this class appear most often intransitively but still show causative uses. Consider the verb skyrocket. Although this verb is overwhelmingly found as an intransitive, it is not difficult to find causative instances, as in (18).

(18) a. Surrounding myself with mentors like this literally skyrocketed my game to
   a higher plateau.
   (www.theattractionforums.com >…> Classic Writings > Daxx)

b. That [receiving compliments] made me feel very good and has skyrocketed
   my confidence level.
   (www.skinbright.com/successstories.html)

c. Solving this issue skyrocketed my personal growth, for it also changed my
   view towards life, work, success.
   (lovesagame.com/about)

d. I’ve decided to reveal my marketing tips and marketing secrets that sky-
   rocketed my businesses to the level of success that I enjoy today!
   (http://www.streetsmartmarketer.com/)

e. Mentions by larger blogs . . . really skyrocketed my readership and profile.
   (zenhabits.net/happy-1st-birthday-zen-habits-celebrating-one-wonderful-year/)

f. I wouldn’t say being on Tara has skyrocketed my career.
   (out.com/detail.asp?id=26671)

g. But it was his feud with the anti-establishment Austin that would skyrocket
   his company past Ted Turners [sic].
   (www.spartyandfriends.com > WWE)
The subjects of the examples in (18) all qualify as events or states, rather than agents, instruments, or natural forces. The verb *skyrocket*, then, resembles the internally caused change-of-state verbs in taking a narrow range of subjects. Yet the attested subjects differ from those found with internally caused change-of-state verbs since they do not include natural forces, at least not in the examples we have found.

These examples, however, do not provide the full picture. The verb *skyrocket* also allows agent subjects, as in (19).

(19) a. When he heard it was for a Catholic church he skyrocketed the price to $6000. (www.sanctacruce.org/…/History_of_Mexican_American_Missions.htm)
   b. Well, I skyrocketed the volume until my ears about blew out. (www.spheredevelopment.org/smforums/index.php?topic=2.1385;wap2)
   c. Gavin not only skyrocketed his company to the top of its industry in record time, but became a student of the business. (www.hardballproductions.com/flash/main.swf?button0)

The examples in (18) and (19) differ in their choice of theme. Although *company* is found in both sets, the examples with agent subjects in (19) have a more restricted range of objects than those with event and state subjects in (18). Specifically, the subjects of many of the examples in (18) are properties inalienably possessed by an animate, such as *confidence*, *growth*, or *success*, while those in (19) are not. It seems, then, that agent subjects are incompatible with themes that represent such inherently possessed properties.

Furthermore, *skyrocket* is representative of the entire class of verbs of calibratable change of state, a class which includes the verbs in (20). List (21) presents causatives involving other members of this class. The verb *fluctuate* is singled out in (22), as it is quite easily found in causative sentences with both agent and non-agent subjects.

(20) appreciate, balloon, climb, decline, decrease, depreciate, differ, diminish, drop, fall, fluctuate, gain, grow, increase, jump, ?mushroom, plummet, plunge, rocket, rise, skyrocket, soar, surge, vary, … (Levin 1993: 247)

(21) a. I woke up this morning to rain and strong winds that have plummeted the temperature… (rummage.typepad.com/rummage/2009/08/index.html)
   b. It [massive job loss and debt] didn’t create jobs, it just ballooned the deficit. (motherjones.com/kevin…/quote-day-spending-cuts-and-elections)
   c. The Broncos 6-0 start is considered the NFL’s biggest early surprise and has soared the value of McDaniel’s high school card to $30. (COCA 2009 NEWS Denver)
   d. The nation had once numbered about 200 but wars and smallpox had dwindled the tribe. (www.niobrarane.com/trail.htm)
The objects found with these verbs also describe properties inalienably possessed by animates, and again the attested examples do not have agent subjects.

The choice of subject for these verbs, then, varies with the choice of object and cannot be independently specified. This interdependency is not explained by the lexical constraint on Reinhart’s decausativization operation. Although it could be argued that the decausativization operation should not account for these facts, in the next section we suggest that these subject–object interdependencies follow from the non-lexical factors which determine when a cause can be found with a basically monadic verb. Therefore, an analysis which takes the anticausative variant of causative alternation verbs to be basic and accounts for possible causative variants through a combination of lexical and non-lexical factors can provide a unified analysis of a wider range of data than accounts which take the causative variant to be basic.

6.3 Direct causation: a constraint on the causative use

We have shown that the specification [+c] for the external argument of the causative variant—a key component of Reinhart’s analysis of the causative alternation—leaves much data unexplained. Suppose, then, that all the verbs we have considered have a root associated with one argument, with none of them lexically selecting for a cause argument. Since all of them specify a particular change that an entity undergoes, the constituent representing this entity is clearly an argument of the verb. If the subject of the causative variant is not lexically determined, we need to formulate a general, non-lexical condition delineating when a subject representing the cause of the change can
appear. (Such an analysis must be supplemented by a condition specifying when a cause subject must appear; we introduce such a condition in section 6.5.) Previous studies of lexical causatives have established that such causatives must describe instances of direct causation, contrasting with periphrastic causatives, which can describe instances of either direct or indirect causation (e.g. Fodor 1970; McCawley 1978; Shibatani 1976; Wolff 2003; but see Neelmea and van de Koot (Chapter 2 above) for another view). Therefore, we propose that the causative variant must meet the condition in (24), where ‘direct causation’ is defined as in (25) from Wolff (2003).

(24) The Direct Causation Condition: A single argument root may be expressed in a sentence with a transitive verb if the subject represents a direct cause of the eventuality expressed by the root and its argument.

(25) Direct causation is present between the causer and the final causee in a causal chain (1) if there are no intermediate entities at the same level of granularity as either the initial causer or final causee, or (2) if any intermediate entities that are present can be construed as an enabling condition rather than an intervening causer. (Wolff 2003: 5)

An important component of Wolff’s definition of direct causation is the inclusion of a ‘no-intervening-cause’ criterion. Other attempts at capturing the essence of direct causation introduce criteria that are similar in spirit. Thus, Piñón includes a constraint that a causal chain should have a single agent (2001a: 353), where agents include ‘organisms that engage in ‘goal-directed’ behaviour, whether or not they do so intentionally or consciously’ (2001a: 351). We prefer Wolff’s formulation in (25), as it is more specific about the nature of direct causation, while allowing for a broader range of causers than Piñón’s does.10

The Direct Causation Condition explains many properties of the causative variant: the wide range of subjects compatible with canonical causative alternation verbs, the varying ranges of subjects observed across different types of verbs, and the subject–object interdependencies shown by some verbs. As mentioned, the last two phenomena are not explained by Reinhart’s thematically constrained decausativization analysis. Perhaps most significantly, the Direct Causation Condition allows a

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9 In this respect our analysis is in the spirit of Harley and Noyer (2000), who argue for non-lexical conditions on the licensing of subjects in nominalizations that involve the nominal analogue of the causative alternation.

10 For detailed discussion of the notions of enablement and causation, see Wolff and Song (2003) and Wolff (2007). We believe that by distinguishing enabling conditions from intervening causers, Wolff’s definition of direct causation also has the advantage of dealing with the thorny issues involving which instruments can be subjects (e.g. Alexiadou and Schäfer 2006; Marantz 1984: 247; Van Valin and Wilkins 1996). Wolff’s definition in (25) makes reference to the granularity of an event; for discussion of this notion, see Bittner (1999: 19–20), Croft (1991: 163–5), and Truswell (2011: 46–51).
uniform analysis of a much wider spectrum of alternating verbs than an account which
derives the alternation by a rule of causativization or decausativization.

First, consider internally caused change-of-state verbs—verbs such as blossom and
wilt that describe changes of state arising from properties internal to their themes. As
discussed in section 6.2.2, these verbs allow a restricted range of causes, contrasting
with the canonical change-of-state verbs, which describe externally caused changes of
state, and allow a variety of causes. Due to their very nature, the most direct causes of
internally caused changes of state are the natural forces and ambient conditions
which trigger or facilitate them. Only such causes, then, meet the Direct Causation
Condition. The sentences in (16) and (17), repeated as (26) and (27), are acceptable
because they have natural forces and ambient conditions as causes.

(26) a. Early summer heat blossomed fruit trees across the valley. (LN 1999)
   b. Salt air and other common pollutants can decay prints.
   c. Raindrops selectively erode clay particles. (LN 1982)
   d. The onset of temperatures of 100 degrees or more, on top of the drought,
      has withered crops. (NYT 1986)

(Wright 2002: 341, (6))

(27) a. Light will damage anything made of organic material. It rots curtains, it rots
    upholstery, and it bleaches wood furniture. (LN)
   b. Salt air rusted the chain-link fences. (LN)
   c. Bright sun wilted the roses. (LN)

(Wright 2001: 112, (24), 113, (27a), 115, (32a))

In contrast, constructed examples with agent causes such as *The farmer blossomed the
fruit trees, repeated from (15b), and *The careless gardener decayed the fence with a
misplaced sprinkler are not acceptable. We argue that such examples cannot meet the
Direct Causation Condition due to the nature of internally caused eventualities. As
ambient conditions and natural forces are the most immediate causes of such eventual-
ities, an agent would have to precede a natural force or ambient condition in the chain
of causation. This is only possible, by part (2) of (25), if the natural force or ambient
condition does not qualify as an intervening causer—that is, it has a status comparable
to an instrument. However, their statuses are not comparable: an instrument is under
the direct control of an agent, but an ambient condition or natural force is not. For this
reason, causative uses with agent subjects are ruled out. Certain kinds of event subjects,
particularly those expressing the action of an agent, are excluded (see fn. 6) for the
same reason: *The gardener’s careful digging blossomed the trees early.

There are exceptions to the generalization that internally caused change-of-state
verbs do not have causative uses with agent subjects. Two such verbs, germinate and
ferment, allow animate causes when used causatively with their literal meaning, as in
The scientist germinated the seeds and The wine-maker fermented the grapes (Wright
Most likely, these verbs are special because they describe processes that may be controlled by agents in the laboratory, factory, or comparable settings. They then comply with part (2) of (25). The verb grow also shows comparable behaviour.

Verbs of calibratable change of state also do not easily appear with agent subjects in causative uses, and at least Levin’s (1993) discussion of these verbs suggests that they are predominantly used intransitively. A hallmark of these verbs is their tendency to select themes that are abstract measurable entities, representing properties of entities with scalar values, such as price, temperature, or volume (of a sound). Other themes include business, career, success, and confidence—notions whose instantiations are often ranked in value with respect to each other. In particular, these verbs typically do not select physical objects as themes, but rather properties of such entities.

As noted, causative uses with event or state subjects have a wider range of objects than those with agent subjects; specifically, when the subject is an agent, properties inalienably possessed by animates, such as confidence, growth, or success, do not seem to be possible as direct objects, as illustrated in (28).

(28) a. Solving this issue skyrocketed my personal growth, for it also changed my view towards life, work, success.
   (lovesagame.com/about)


In fact, however, this restriction is only apparent. Changes in the values of properties inherently possessed by animates are like internally caused changes of state: they are generally only under the control of the possessor, so a third party cannot directly manipulate them. This explains the unacceptability of (28b), where the agent is not the possessor. In contrast, in (28a), cited earlier as (18c), the understood agent of the event subject is the possessor, who has control over a change in the property. This observation suggests that a causative sentence with skyrocket where the possessor of a property is the agent should be acceptable, as indeed is illustrated by (29). This attested use of the verb has career, another inalienably possessed property, as direct object, but here the possessor himself, rather than some third party as in (28b), is the agentive subject.

11 Such examples raise a more general point. It might be possible to envision scenarios where a range of changes of state which typically occur in the natural world, and thus usually do not permit agentive causative uses, are harnessed by scientists, magicians, or the like, either in the real world or in some imagined future or fantasy world. In such instances, the relevant verbs might demonstrate causative uses. Such uses might even be available to externally caused change-of-state verbs when used to describe natural phenomena, such as skies clearing, so that acceptable agentive causative examples describing these might become acceptable too. While recognizing this possibility, throughout this chapter, when we cite causative agentive uses of certain verbs as unacceptable, we are setting such a possibility aside.

12 Unlike many other inalienably possessed properties, a career might be manipulable by someone other than its possessor. Clearly, more systematic analysis of this entire range of data is necessary.
Instead, Henderson skyrocketed his career by sinking a choke in the third. (espn.go.com/extra/mma/blog/_/name/mma/id/5295191)

It is possible that the inclusion of the by phrase also contributes to the acceptability of this example. This phrase makes explicit the more immediate cause of the change of state, and in fact this example could be paraphrased with an event subject, whose understood agent is the possessor, as in Sinking a choke hold in the third skyrocketed Henderson’s career, comparable to (28a). Tal Siloni (p.c.) notes the acceptability of Skyrocket your confidence!, which again has the possessor of the property as the agent. In fact, versions of this example seem to be attested on the Web largely on self-help sites promoting methods people can use to take charge of their own personal development, thus boosting their self-confidence.

Although the subject–object interdependencies exhibited by skyrocket are left unexplained on many accounts, at least some follow from the Direct Causation Condition. This condition, which holds of the transitive, causative uses of this verb, requires that the subject be able to directly cause a change in the values of the property described by the object.

Finally, we turn to canonical causative alternation verbs like break and melt, which generally allow a wide range of subjects in the causative variant. Since the changes of state these verbs describe typically occur through external manipulation of the theme, any type of cause that can appropriately manipulate the theme will qualify as a subject. Such changes, however, need not always arise through external manipulation by an agent. For example, this holds of clearing the sky in contrast to clearing physical objects such as tables or counters, leading to the pair in (30), where only a natural force subject is possible for the causative variant; see fn. 6.

(30) a. The sky cleared.
   b. The strong wind/*Our prayers/*The scientists cleared the sky.
      (cf. Our prayers/The scientists caused the sky to clear.)

It appears that in (30b) the choice of direct object dictates a narrow range of possible subjects, a pattern reminiscent of verbs of calibratable change of state.

The pair in (30) also demonstrates that the verb clear can describe either an internally or an externally caused change of state depending on the choice of theme. Thus, with sky as theme, the verb describes an internally caused eventuality: the change comes about because of properties of the sky, and, concomitantly, the subject of the causative use must be a natural force, as illustrated in (30). More typically, clear describes an externally caused eventuality, as when a table is cleared. In this use various causes are possible, including humans, machines, and even natural forces; see (7) and (9). On either use, the verb is basically monadic, lexically selecting the theme argument only. The choice of theme, however, determines whether the eventuality described is understood as internally or externally caused, and that in
turn determines the range of available cause subjects. Thus, polysemy is minimized since there is no need to posit that *clear* is monadic when it describes internally caused eventualities and dyadic when it describes externally caused eventualities.

### 6.4 Broadening the purview of the causative alternation: verbs of sound emission

Our approach to the causative alternation receives further support from its ability to shed light on transitivity alternations not always taken to exemplify the causative alternation. We illustrate with verbs of sound emission, which describe the emission of a sound primarily by an inanimate entity. These verbs are often cited as not showing the causative alternation—at least, not systematically.

\[(31)\]  
  a. The truck rumbled.  
  b. *The driver/the steep ascent rumbled the truck.

\[(32)\]  
  a. The old car rattled.  
  b. *The bad driver rattled the old car.

\[(33)\]  
  a. The stream babbled.  
  b. *The stones babbled the stream.

\[(34)\]  
  a. The tea kettle whistled.  
  b. *The boiling water whistled the tea kettle.

Levin and Rappaport Hovav (1995) suggest that these verbs do not show the causative alternation because they typically describe internally caused eventualities. With each verb of sound emission, the sound emitted seems to be tied to the nature of the emitter: water gurgles, vehicles with motors rumble, things with spinning parts whir. Yet apparently causative, transitive uses of these verbs are found, which have both agent and natural force subjects, as illustrated in (35) and (36).

\[(35)\]  
  a. Miss Holly, gently whirring the machine, agreed with him.  
  (A. Thirkell, *The Headmistress*, 1943, p. 224)  
  b. They are a gregarious lot—talkative, partial to picnicking on candy and rattling paper in time with the music.  
  c. Outside the nurses were clattering the teacups.  
  (BNC)

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13 Many of these verbs, including *babble*, *groan*, *hiss*, *honk*, *rumble*, and *squeal*, can also be used to describe the emission of a sound with the same acoustic properties by an animate entity via its vocal tract. We ignore these uses, as they have somewhat different properties, most likely because they are predicated of animates. See Levin et al. (1997) for some discussion.
(36)  a. The wind crackled the edges [of a piece of paper].  
   (BNC)
   b. By noon, rain still pinged and rattled her window . . .  
   (J. D. Lamb, *A Question of Preference*, 1994, p. 201)
   c. The cold wind rustled the sagebrush and thistles . . .  

The existence of such uses is acknowledged by Levin and Rappaport Hovav (1995: 115), but classed as ‘spurious’; however, further investigation shows that they arise quite systematically, as noted by Song (1996) and Levin, Song, and Atkins (1997), as well as Potashnik (Chapter 10 below). Actually attested or acceptable constructed causative uses of verbs of sound emission involve the direct manipulation of the sound emitter—the noun phrase expressed as the object in this use.14 In precisely such instances—i.e. where the sound is emitted as a result of direct manipulation, as with *crackle* or *rattle*—there is direct causation as required since the production of the sound is brought under the control of some entity other than the emitter—an agent or some natural force. Thus, these examples fall under the Direct Causation Condition.

This analysis of verbs of sound emission bears on the Lexicon Uniformity Principle for the same reason as we discussed for the verb *clear* in section 6.2.1. Various verbs of sound emission show the causative alternation only for some choices of sound emitter, as illustrated in (37) with the verb *rattle*.

(37)  a. The windows rattled./The wind rattled the windows.
   b. The old car rattled./*The bad driver rattled the old car. (= (32))

A decausativization analysis of this data would require positing two instances of each such verb. However, since the sound emitted is the same whether or not the verb–emitter combination allows a causative use, there is apparently a unified concept behind all uses of such a verb. Thus, we suggest that a single verb root is involved in such examples, with the emitter that the root is predicated of determining in conjunction with the Direct Causation Condition whether or not a causative use is available. For instance, it is only in the (a) pair in (37) that the emitter allows the sound to be brought about by direct manipulation.

14 Our generalization diverges somewhat from that of Levin et al. (1997). They propose that causative uses are available when the verb expresses the external production of a sound. Some sounds are produced internal to the sound emitter (e.g. *babble*, *gurgle*, and *rumble*), while others are produced external to the sound emitter (e.g. *clatter*, *clink*, and *whir*), and still others may be produced in either way (e.g. *rattle* and *rustle*). Externally produced sounds, by their very nature, are always produced by direct manipulation, so both accounts predict that verbs lexicalizing such sounds will have causative uses. The two accounts make different prediction about verbs lexicalizing certain internally produced sounds, such as buzzes, honks, or rings, which nevertheless involve direct manipulation of emitters such as car horns and doorbells—manipulable devices designed to produce a specific sound. The verbs expressing these internally produced sounds have causative uses when predicated of these emitters, consistent with the direct manipulation generalization but not the externally produced sound generalization.
Using data from English and Hebrew, Potashnik (Chapter 10 below) argues that the transitive uses of verbs of sound emission—and verbs of emission more generally—are not true causative variants. While Potashnik’s arguments for this position merit serious consideration, this goes beyond the scope of this chapter. What matters here is that in making this argument, Potashnik suggests that the emitter argument is not a theme—that is, a \([-c-m]\) argument as Reinhart defines this notion—but rather it is a \([+c-m]\) argument, just as an instrument is. The Direct Causation Condition may help explain why the emitter in the transitive variant and an instrument might share this feature analysis: both are directly manipulated by an agent in order to directly cause an eventuality.

6.5 The obligatory expression of the cause

We have proposed that verbs which participate in the causative alternation are basically single-argument verbs. We argued for this position based on the insight that it is more perspicuous to specify the conditions under which the cause argument is added than the conditions under which it is removed, as in our earlier analysis and Reinhart’s analysis. Positing a monadic lexical entry would lead us to assume that these verbs always have an anticausative variant. However, as shown in section 6.2.1 based on examples such as (8b), repeated as (38), and others like it, some verbs which can in principle alternate must be used in their causative variants when describing certain kinds of eventualities.

(38)  
    a. The waiter cleared the counter.
    b. *The counter cleared.

That is, although the Direct Causation Condition must always be met for a cause subject to be possible, in certain instances, as in (38a), there is an additional condition which requires that the cause be obligatorily expressed. We now consider how to formulate this condition.

Some initial insight into the nature of this condition is provided by a minimal pair involving anticausative uses of the verb *open* discussed by McCawley (1978).

(39)  
    a. The door of Henry’s lunchroom opened and two men came in.
    b. The door of Henry’s lunchroom opened and two men went in.

(McCawley 1978: 246, (1))

\[15\] In forthcoming work we show that the assumption that causative alternation verbs are basically dyadic is further undermined by yet another set of alternating verbs which in certain uses are only natural in the anticausative variant. These include change-of-state verbs based on dimensional adjectives in uses where the change is understood as being along a spatial (rather than a temporal) axis (e.g. *The water deepens two feet from the coast, The street widens after the bank*: Gawron 2006), as well as prototypical change-of-state verbs in particular uses (e.g. *My watch broke right after the warranty ran out*).
McCawley points out that in (39b), it is natural to infer that the men have not opened the door themselves, because if the viewer had seen the men open the door, the anticausative variant would have been an inappropriate description of the eventuality. Put differently, if the viewer witnesses the act of opening the door, the viewer must use the causative variant to describe the scene. McCawley formulates a descriptive generalization about the distribution of *open*, which he ultimately attributes to some form of Grice’s conversational maxims: ‘Intransitive *open* cannot be used if the speaker has witnessed an ACT of opening, unless he has otherwise indicated that the event is part of an act’ (1978: 247). The ‘unless’ clause is meant to cover instances such as (40).

(40) Getting ready to dine I grabbed the chair, pulled it out, sat down and then the chair broke into kindling while I fell on my hind end.

(http://whatfatpeopledontlike.wordpress.com/2008/05/02/other-people-furniture)

However, examples such as (38b) are inappropriate independent of the speaker’s perspective. We propose that the more general condition in (41) determines when the causative variant must be used to describe an eventuality.16

(41) The Proper Containment Condition: When a change of state is properly contained within a causing act, the argument representing that act must be expressed in the same clause as the verb describing the change of state.

(41) will rule out (38b) because the change of state—the counter becoming clear—is properly contained in the act carried out by the agent of removing things from the counter. This act is not part of the verb’s meaning, but we can infer what it is from our knowledge of how agents bring about the clearing of dishes from a counter.

Can (41) be reduced to the more general, cognitive principle in (42), which Horvath and Siloni propose as the reason for the constraint against anticausative uses of inherently agentive verbs such as *murder* and *write*?

(42) Conceptualization of eventualities cannot disregard participants (roles) whose mental state is relevant to the eventuality. (Horvath and Siloni 2011: 684, (48))

It cannot. Inherently agentive verbs can never be used in an anticausative variant: the reason is that they are lexically specified for two arguments. In contrast, (41) does not necessarily preclude a causative alternation verb from being used in the anticausative variant to describe a change of state brought about by an agent, a point already made in section 6.2.1 with (14), repeated here.

16 We propose (41) as an initial formulation of the relevant condition, although we believe that this formulation will need to be refined once the conditions under which the anticausative is ruled out are studied further.
a. My son wanted to annoy me, so he threw my precious vase against the wall and it broke.

b. Sally kept tugging on the door until it finally opened.

It only precludes the use of the anticausative variant if the change of state is properly contained within the agent’s action. This explains why sentences like the constructed (43) or the attested (40) are acceptable, although the change of state is explicitly asserted to be brought about agentively. Conversely, agentive verbs cannot show anticausative uses, even if the causing act and the change of state are temporally removed from one another, as in (44).

(44) *The assassin aimed well, the bullet hit the politician in the chest and he murdered right away.

Furthermore, the Proper Containment Condition does not apply just to agents, but rather to acts and changes of state. In (9), repeated as (45a), a change is properly contained in a causing act, but here the actor is a natural force, not an agent, yet the anticausative counterpart in (45b) seems not to be an appropriate description of the eventuality.

(45) a. The wind was enormous. There was a huge dinner table set-up, and the wind cleared the entire table onto the floor and blew over chairs.  

b. *The entire table cleared.

This account allows a monosemous analysis of the verb clear. There is no reason to posit two senses for this verb, one showing the causative alternation and the other not, as already discussed in section 6.2.1. We can posit a single sense for clear by assuming that this verb is lexically associated with a single argument—it’s theme argument—and proposing that the addition of a cause argument is constrained by two conditions, the Direct Causation Condition and the Proper Containment Condition.

### 6.6 Conclusion: lexicalization as a criterion for concept-unity

We have used Reinhart’s Lexicon Uniformity Principle as a context for further exploring the nature of the causative alternation. We argue that the properties of the alternation follow if causative alternation verbs are lexically monadic, selecting the single argument expressed in the anticausative variant, with the causative variant being available when certain extra-lexical conditions are met. Thus, we have proposed, contrary to Reinhart’s and our own earlier analyses, that there is no lexical operation which derives the anticausative variant from the causative variant.
We now consider the implications of our proposed analysis for the Lexicon Uniformity Principle, which is intended to apply to different thematic forms of a single verb-concept. Application of this principle requires a criterion for when two forms of a verb represent the same verb-concept. Reinhart’s formulation of the principle might suggest that the ability to relate two thematic forms of a verb-concept by an arity operation can constitute a criterion for concept-unity—identifying a single concept. While we agree that the two thematic forms of a causative alternation verb belong to the same verb-concept, we have argued that this is not because there is a rule which derives one form from the other. Rather, the forms are unified as instantiations of the same verb-concept because they share the same root, having the same lexicalized meaning. To clarify this criterion for concept-unity, we elaborate on the notion of lexicalization.

It is challenging to delineate the precise range of situations in the world that a verb can be used to describe. How, then, can we determine what belongs in the lexical entry of a verb root? We suggest that the components of meaning that a verb lexicalizes are precisely those elements of meaning which are entailed in all its uses. These components are to be distinguished from additional facets of meaning that can be inferred from a particular use of the verb in context and from the choice of noun phrase serving as argument of the verb. The semantic restrictions that a verb imposes on its arguments constitute a fundamental part of lexicalized meaning. We can use this criterion to reach the conclusion we have already reached in this chapter: causative alternation verbs lexically select a single argument, the argument of the anticausative variant.

As we have shown, causative alternation verbs do not impose selectional restrictions on the subject of the causative variant. In contrast, it is possible to isolate an invariant element of change for the theme argument which remains constant across both causative and anticausative uses of alternating verbs. However, the precise change that a verb specifies is not fully determined by the verb itself, but rather by the verb and the instantiation of the argument it selects. The resulting variation is not part of the verb’s lexicalized meaning. Consider, for example, the change-of-state verb open: opening a jar or a bottle means removing its lid or cap, while opening a door or window means moving the door or window so that the aperture they are blocking is now unblocked (see Levison 1993 on opening containers v. conduits); however, these specifics are not what is lexicalized by open. What the verb lexicalizes is removing an obstruction to allow access to a formerly inaccessible space. The distinction between lexicalized meaning and non-lexicalized meaning is important because it allows different uses of the same verb to be unified under a single lexical entry. In contrast to the theme argument, we showed that there is no constant element of meaning associated with the cause argument of change-of-state verbs participating in the causative alternation, and the properties of the cause are determined fully by context, and in particular by the choice of noun phrase as theme.
The argument realization properties of a verb like *open* also vary with choice of theme: anticausative variants are only available for some choices.\(^{17}\)

(46)  
\begin{align*}
\text{a. The window opened} \\
\text{b. *The jar opened.}
\end{align*}

As we first elaborated in section 6.2.2, insisting that it is strictly the meaning of the verb which determines the availability of the anticausative variant can sometimes lead to positing two senses for alternating verbs, and this reasoning could be applied to *open* based on the pair in (46). In contrast, carefully teasing apart the facets of meaning which are lexicalized from those which are determined in context allows us to provide a more perspicuous analysis of the causative alternation and thus minimize lexical polysemy, in conformity with the Lexicon Uniformity Principle.\(^{18}\)

\(^{17}\) Strictly speaking, (46b) is not unacceptable; it can only be used to describe an eventuality where the jar opens following an attempt by an agent, as in *After trying for five minutes, the jar finally opened*. In contrast, (46a) may be used without such contextual support.

\(^{18}\) In Rappaport Hovav and Levin (2010) we argue that in a few instances there may be no invariant element of meaning across the various uses of a particular verb, so that a form of polysemy must be posited; however, we also show that the conditions which give rise to such polysemy can be delineated.
In Defence of the Non-Causative Analysis of Anticausatives

GYŐRGY RÁKOSI

7.1 Introduction

The transitive/intransitive alternation exemplified in (1) is a central concern for research on argument structure, and has received increased attention from linguists of different theoretical persuasions.

(1) a. John/the draught broke the vase.
    b. The vase broke.

Of the many interesting questions that pose themselves in connection with this alternation, I want to focus on one particular issue in this chapter. Assuming that the transitive (1a) and the intransitive anticausative (1b) structures are related, is

The original impetus to pursue this work came from discussions with Tanya Reinhart in 2005–6 in Utrecht. These included one or two occasional remarks on from-causes and the role they might play in anticausative structures. At that time I was working on dative experiencers for the purposes of my doctoral thesis, and this issue seemed slightly off-topic. And when I started thinking about these constructions more intensively, it was already too late to discuss my ideas with Tanya. If my remarks presented here are on the right track, I can only hope they lend some further support to the view of grammar that she propagated through her Theta System.

Part of this research has been presented at the 2007 International Conference on the Structure of Hungarian in New York (published as Rákosi 2009), at the NORMS Workshop on Argument Structure in Lund in 2008, and in a talk I gave at the University of Stuttgart in January 2010. I thank the respective audiences and the reviewers for comments. I am also greatly indebted to the reviewers of this volume for their extensive comments on the first version of this chapter, and special thanks are due to Florian Schäfer and Torgrim Solstad for many intriguing discussions and for commenting on previous drafts. I am also grateful to the editors for their help and support with the preparation of the manuscript. Needless to say, any errors that remain are solely mine.

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there any reflex of the apparent causal nature of the former in the latter? In other words, is the intransitive construction causal at any grammatically relevant level or representation, and if yes, what exactly is that level?

It is well known that the anticausative construction (1b), unlike passives, lacks a grammatically active external argument (see e.g. Roeper 1987; Levin and Rappaport 1995; Reinhart 2000; 2002; forthcoming, a; Alexiadou, Anagnostopoulou, and Schäfer 2006). Passives license different types of modifiers that require the presence of an external argument. They can take, for example, agentive or causer by-phrases (2a), as well as instruments (2b). Such PP-modification is impossible in anticausatives (3).

(2) a. The vase was broken by John/the draught.
   b. The vase was broken with the hammer.

(3) a. *The vase broke by John/the draught.
   b. *The vase broke with the hammer.

However, the lack of an obvious trait of an external argument in anticausatives does not necessarily imply that causality is also absent. This is especially so since, as has been repeatedly pointed out recently in the pertinent literature, anticausative structures do allow for the insertion of non-agentively interpreted causer PPs.

In English, such PPs are headed by the preposition from (4a). In Hungarian, they are marked by ablative case, which is a source-type marker with the basic locative meaning ‘from the vicinity of’. Notice that only non-agentive readings are grammatical.

(4) a. The vase broke from the draught/*from John.
   b. Az ablak kinyílt a huzat-tól / *János-tól.
      the window.NOM opened the draught-ABL John-ABL
      ‘The window opened from the draught/*from John.’

The construction itself is widely attested cross-linguistically. A recent line of inquiry, including Alexiadou and Anagnostopoulou (2009), Alexiadou et al. (2006), Kallulli (2006; 2007), and Schäfer (2008a), have focused respectively on Modern Greek, Albanian, and German data. Though their analyses differ, these authors share the

1 The ablative case marker has two phonological variants (-tól and -től), whose choice is conditioned by the rules of vowel harmony.

2 Ablative phrases could also function historically in Hungarian as agentive by-phrases in passive structures. This is a marked option in contemporary Hungarian, and only a subset of (mainly older) speakers can use ablative case for this purpose. But even these speakers observe the non-agentivity constraint on ablatives in anticausative structures, which reinforces the point that the constraint is specific to anticausative constructions as such and not to particular P-elements that happen to be used in these contexts.
contention that the anticausative construction contains a causatively interpreted syntactic layer of decomposition, and it is this layer that licenses the causer PPs in various languages.

It thus seems that causer PPs provide massive cross-linguistic evidence for the causal nature of anticausatives. That is, however, not the only interpretation of these data. One could argue that instead of feeding on a causal component already present in the semantic and/or syntactic structure of the verb, the causer PP introduces causation itself. Such an account is elaborated in, for example, Solstad’s (2007) unification-based semantic analysis of the German causal *durch* (the preposition used in anticausative structures in German). Furthermore, Levin (2009) cautions that *from*-phrases might not always be a reliable tool to detect a causal relation inherent in the verb, since they may only introduce an additional notion of causation that need not have direct grammatical relevance. Thus, in principle, even the data in (4) could be disregarded as not obviously helpful in arguments *pro or contra* the causative analysis of anticausatives.

My aim here is to contribute to this ongoing debate via a study of ablative causes in Hungarian. I will argue that the available evidence consistently supports an analysis in which anticausative verbs have no causal semantics or syntax. Ablative causes are reliable tools in the search for causal relations, but what they quite reliably tell us is that anticausative structures are not inherently causative. In fact, this is the more traditional view (see e.g. Dowty 1979; Parsons 1990), which has recently been advocated on grounds independent of the issue of PP-modification by Piñon (2001a; 2001b), Härtl (2003), and Neeleman and van de Koot (Chapter 2 above). As I show, Reinhart’s (1996; 2000; 2002; forthcoming, a) decausativization analysis of anticausatives is also essentially within this line of approach, and consequently this chapter may contribute some further support to it.

The structure of the chapter is as follows. In section 7.2, I provide an overview of the recent literature on anticausatives, focusing on what role causality plays in the analyses. In section 7.3, I discuss the grammar of ablative causes in Hungarian. By showing that ablative causes can also appear outside anticausative constructions but with a contribution that appears to be constant across the board, I argue that these ablatives introduce causation by themselves, and do not feed on a presumed underlying causative layer on the main predicate. In section 7.4, I give a summary of the analysis of the Hungarian facts that I developed in Rákosi (2009). I round up in section 7.5 with a summary of the implications of the current discussion, and with outlining directions for future research.

Two remarks are in order before concluding this introduction. First, as I have pointed out above, I believe the Hungarian data I survey here lend further support to Reinhart’s decausativization analysis of anticausatives. This analysis has been criticized, among others, by Alexiadou et al. (2006), Schäfer (2008a), and Koontz-Garboden (2009). Horvath and Siloni (2011) respond to some of this
criticism, and so do I in Rákosi (2009). Space limitations, however, prevent a more comprehensive discussion here and therefore I focus on the agenda outlined in this introduction.

Second, I use the terms ‘anticausative verb’ or ‘anticausative construction’ in an extended sense, referring to any verb or construction that has been derived from a corresponding transitive alternative, as in (1b). In this, I follow Alexiadou et al. (2006) and Schäfer (2008a), and diverge from Haspelmath (1993) or Koontz-Garboden (2009), who use the term ‘anticausative’ to refer only to inchoative verbs that are morphologically more complex than their transitive alternative. Hungarian verbs exhibit varied and mostly non-predictable morphology in this domain (see Piñon 2001a; 2001b; Rákosi 2006: ch. 2 for overviews) and as far as I can tell, the attested morphological variation does not correlate with any systematic variation in the grammar of derived inchoatives. This justifies a non-differential treatment of the various morphologically distinct inchoative verb classes in Hungarian, and allows me to use ‘anticausative’ as a terminological shorthand to refer to all such verbs.

7.2 An overview of the literature

For our purposes, we can distinguish between three theoretical approaches to causation in anticausative structures. First, it is possible to view anticausatives as causal only in their semantic structure, without an obvious syntactic reflex of this underlying causality (7.2.1). Second, causation can be taken to be present directly in syntax via an interpretable cause feature or a causal projection (7.2.2). This approach naturally entails causative semantics too. Third, one can also assume that causation is not represented directly either in the syntax or the semantics of anticausatives (7.2.3). If a causative interpretation arises, it is due essentially to non-grammatical, post-syntactic interpretive procedures that feed on the underlying conceptual content of the verbal predicate. Let me give a brief overview of representatives of these approaches one by one.

7.2.1 Levin and Rappaport (1995): anticausatives are semantically dyadic

Levin and Rappaport Hovav (1995) interpret the very fact that the anticausative alternation exists as strong evidence that anticausative structures are semantically dyadic (see also Levin 2009).³ I repeat (1) as (5) to illustrate.

³ Rappaport Hovav and Levin (Ch. 6 above) depart from this position and argue that anticausatives and their transitive alternates are instantiations of the same underlying verb-concept, which only includes a single argument that undergoes a particular change. Thus they take causative alternation verbs to be basically monadic, and assume that the presence of the transitive subject is controlled by non-lexical factors. Essentially, this proposal belongs to the family of approaches that I discuss in 7.2.3. I still find it useful, however, to review their earlier proposal (Levin and Rappaport Hovav 1995) as a comparison
(5)  a. John/the draught broke the vase.
    b. The vase broke.

In their analysis, the intransitive lexical entry in (5b) has essentially the same semantic structure as the transitive (5a) inasmuch as an underlying cause predicate is assumed to be present in the lexical semantic representation (LSR) of both. The former differs from the latter in that its external argument position is existentially bound in its LSR. Their proposal can be summed up as (6) (Levin and Rappaport Hovav 1995: 108).

(6) Intransitive break

\[
\text{LSR} \quad [[x \text{ DO-SOMETHING } ] \text{ CAUSE } [y \text{ BECOME BROKEN}]]
\]

\[
\text{Lexical binding} \quad \emptyset
\]

\[
\text{Linking rules} \quad \downarrow
\]

\[
\text{Argument structure} \quad <y>
\]

The lexical binding of the external argument prevents its projection to argument structure. Nevertheless, the intransitive form is still ‘interpreted as asserting that the central subevent [i.e. the second argument of \textit{CAUSE}] came about via some causing subevent, without any specification of its nature’ (Levin and Rappaport Hovav 1995: 108). The syntactic proposals that I discuss directly embrace this semantic intuition and use it to propagate a causative syntax for anticausatives.

7.2.2 \textit{Causation represented directly in syntax}

Non-canonical causes have been studied extensively in (partially) constructionist frames, which decompose argument structure and event structure in syntax. One line of inquiry places causation directly into the syntax of anticausatives. This can happen in two different ways.

Kallulli (2006; 2007) argues that anticausative structures always include a defective vP, which necessarily has a [+cause] feature on its head, giving a particular flavour to it.\(^4\) It is this feature that licenses \textit{from}-causes in the specifier of the vP, which, being defective, cannot host regular (nominative) external arguments. In essence, causer PPs realize—‘identify’ in the words of Kallulli (2006: 204)—the suppressed external argument in its canonical syntactic position. Their causal interpretation is the result of the presence of the interpretable [+cause] feature on \(v^0\).

\(^4\) See Folli and Harley (2005) on the ‘flavours of v’ approach to the syntactic decomposition of verb meaning.
Alternatively, one can separate the introduction of an external argument and the introduction of a causal layer of event decomposition via two distinct syntactic projections: VoiceP and vPCAUS/CauseP, respectively.\(^5\) Alexiadou et al. (2006), as well as Schäfer (2008a; 2008b) use this setup in their analysis of the grammar of causer PPs. I illustrate this analysis now on the basis of the representations in Schäfer (2008b: 16).

A regular anticausative construction lacks an external argument, hence it also lacks VoiceP.\(^6\) It does have, however, a vPCAUS, which ‘introduces a causal relation between a causing event (the implicit argument of [vPCAUS]) and the result state denoted by the verbal root+theme’ (Alexiadou et al. 2006: 202). A from-PP is inserted into this construction via adjunction to vPCAUS, and it will be interpreted as a cause in this specific syntactic configuration. I repeat (4) as (7) to illustrate.

(7) a. The vase broke from the draught.

\[
\text{vPCAUS} \quad \text{PP} \\
\text{vPCAUS} \quad \text{resultP} \\
\text{vCAUS} \quad \text{P} \quad \text{DP} \\
\text{result} \quad \text{theme}
\]

So in this analysis, the from-PP is a modifier of the implicit first argument of the causal relation that is directly coded in syntax.

What is common in these analyses is the following two claims. First, anticausative structures are causal, and this causal relation is directly coded in syntax (either via the [+cause] feature or via a vPCAUS layer of event decomposition). Second, from-causes do not introduce causation themselves, they may only modify the underlying causal relation. As these authors argue, from-PPs in fact detect the presence of the syntactically coded causal relation in anticausative constructions.

### 7.2.3 Causation as an inferential option in anticausatives

Besides the analysis just sketched, both Alexiadou et al. (2006: fn. 13) and Schäfer (2008a; 2008b) make an alternative proposal to suggest that it is possible to replace

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\(^5\) See Pylkkänen (2002; 2008) and Kratzer (2005) for arguments supporting this type of decomposition. Nevertheless, unlike Alexiadou et al. (2006), Pylkkänen claims that CauseP is not universally available in anticausative structures. It is projected in Japanese adversative constructions or in Finnish desiderative constructions, but not in English anticausatives. In fact, she explicitly argues that English alternating verbs ‘indeed lack a causative semantics in their intransitive use’ (2008: 132). Most of her arguments pertaining to this claim are aimed at refuting Levin and Rappaport Hovav’s (1995) analysis represented in (6) above, and are not relevant to my current purposes. I briefly return to her criticism of the by itself test as a causative diagnostic in 7.3.3.

\(^6\) Both Alexiadou et al. (2006) and Schäfer (2008a) claim that a defective VoiceP can be present in particular anticausative constructions in certain languages. I disregard this option now as not directly relevant to the discussion.
the semantically annotated vP\textsubscript{CAUS} in the representations (7b) above with a simple eventive light verbal head v. Notice that this is not simply a notational variant of the vP\textsubscript{CAUS}-analysis. This change entails the claim that ‘causative relations are neither lexically nor syntactically represented, but are read off of the complex event structure which relates an unbounded event with a state’ (Schäfer 2008b: 18).\textsuperscript{7} So in the particular case of anticausatives, this pushes causation out of the semantic structure into a post-syntactic interpretive module, and makes causation itself an interface phenomenon.

I think this move is an important one, since it radically changes the status of the cause relation in anticausative contexts: instead of keeping it within the truth-conditionally interpreted semantic structure, causation now becomes merely an inferential option.\textsuperscript{8} Diverging from the view embraced by Schäfer (2008a; 2008b), I think this step allows us to view anticausative structures as naturally, but not necessarily, triggering causative interpretations upon every instance of use.

Such a view is defended at length by Härtl (2003). I quote him for an illustrative passage (the emphasis is mine):

\begin{quote}
...we can conclude that the extralinguistic episodic knowledge underlying intransitive decausative verbs must indicate that the corresponding change of state can be conceptualized as being caused by an initiating activity involving a specific entity. … \textit{This information is part of the conceptual knowledge base and need not be activated necessarily in the actual conceptualization process}. (p. 910)
\end{quote}

To substantiate the claim that anticausative structures do not inherently express a direct cause, Härtl mentions, among others, the following contrast (2003: 900–901):

\begin{enumerate}
\item[(8)] \textit{Sigrid trocknete das Hemd, weil sie es bügelte.}
\begin{quote}
‘Sigrid dried the shirt because she ironed it.’
\end{quote}
\item[(9)] a. \textit{Das Hemd trocknete, weil Sigrid es bügelte.}
\begin{quote}
‘The shirt dried because Sigrid ironed it.’
\end{quote}
\item[(9)] b. \textit{Das Hemd trocknete, weil der Wind wehte.}
\begin{quote}
‘The shirt dried because the wind blew.’
\end{quote}
\end{enumerate}

The infelicity of the transitive structure is caused by a clash between the inherent causal relation expressed by the matrix predicate and the direct cause introduced by the \textit{because} clause (8). No such clash occurs in (9) because the anticausative structure does not inherently express a causal relation. Considerations of this sort lead Härtl to

\textsuperscript{7} This idea is well represented in the linguistic literature on causation. See Schäfer (2008a; 2008b) for references.

\textsuperscript{8} Obviously, this does not mean that causation cannot be directly coded either in the lexical semantics of certain groups of verbs or even in certain syntactic structures. The claim is simply that neither is the case with anticausatives.
claim that anticausatives involve no causative component in their linguistic representation.

Reinhart’s decausativization approach to anticausatives shares this basic contention (see esp. Reinhart forthcoming, a; Reinhart and Siloni 2005).9 This may not be immediately obvious, and Reinhart’s proposal has sometimes been treated on a par with Levin and Rappaport Hovav’s (1995) analysis summarized in 7.2.1. It is important to see nevertheless that the two are not equivalent in a crucial respect that is relevant for us.

The decausativization operation is defined below (adapted from Reinhart and Siloni 2005: 419):

(10) Decausativization: reduction of an external [+c] role

\[ V_{\text{acc}} < \theta_1(\text{+C}), \theta_2 > \rightarrow V_{\text{intr}} < \theta_2 > \]

What this approach shares with Levin and Rappaport Hovav’s analysis in (6) is the following. First, the transitive alternation is a lexical process. Second, it is the intransitive entry that is derived from the transitive entry. Third, the intransitive input must have a first argument that can be interpreted as an agentive or a non-agentive cause. This is coded in Reinhart’s Theta System as a [+c] argument, whose second thematic feature—[+/-m(entally involved)]—is left unspecified (see Chapter 1 above).

An important difference between the two approaches is that Reinhart assumes that decausativization completely eliminates the [+c] argument and ‘leaves no residue of the role in either the syntactic structure or the interpretation’ (Reinhart and Siloni 2005: 418), whereas Levin and Rappaport Hovav believe that this argument is existentially bound but still present as such in the Lexical Semantic Representation.10 In other words, Reinhart assumes no causal component to be present in the

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9 This analysis was gradually developed in Reinhart (1991; 1996; 2000; 2002; 2006; forthcoming, a) and in Reinhart and Siloni (2005). In earlier versions of the theory, the lexical operation that creates anticausatives was referred to as ‘expletivization’. Reinhart adopted this term under the influence of Chierchia (1989/2004) and in partial recognition of the reflexivization analysis of unaccusative formation that Chierchia proposes. In the course of time, the name was altered to decausativization. This was done partly for expository purposes, but more importantly, it also explicitly indicated the fact that Reinhart retracted from the reflexivization analysis (see Reinhart 2006; forthcoming, a; Reinhart and Siloni 2005).

10 As a reviewer of this chapter points out, it is a prima facie argument against Reinhart’s analysis that it is non-monotonic. The proposal of Levin and Rappaport Hovav (1995) does observe monotonicity, since it does not eliminate the external argument but only binds it existentially (see Piñón 2001a; 2001b; Koontz-Garboden 2009; Rappaport Hovav and Levin, Ch. 6 above, for other monotonic analyses of anticausatives). While this objection is valid, Reinhart herself stresses the point several times that non-monotonic operations must be relegated to the lexicon, and no such operation can take place within syntax (see also Dimitriadis, Ch. 12 below, for an in-depth discussion of this issue). Decausativization is a lexical process by definition. Surely, a view of grammar which bans non-monotonic processes even in an operative lexicon is more restricted than one that allows for this possibility. Whether we are really forced to be that restrictive is an issue that I cannot discuss here. I give a summary of the arguments for the decausativization approach to anticausatives in Rákosi (2009).
semantics of anticausatives, which are one-place predicates both semantically and syntactically. As opposed to this, Rappaport Hovav (1995) explicitly claim that anticausative verbs are always dyadic semantically, even if they have no syntactically active external argument. It is true that for Reinhart the two members of a transitive/intransitive pair share the same underlying concept, but, as she explicitly argues, that representation is conceptual and not semantic in nature.

This is the vantage point where I intend to embark on an inquiry into ablative causes in Hungarian. If anticausatives are causative neither in their syntax nor in their semantics, then these ablatives must themselves introduce causation into the structure. This is actually the claim that I would like to substantiate here, so the forthcoming discussion should proceed along an argumentation in the reversed direction. Accordingly, I aim to show that ablative causes are grammatical in different syntactic contexts in Hungarian and their basic function seems to be the same: they genuinely introduce a direct cause into the construction. This is what they do in anticausative structures, too, and this in turn lends further support to the non-causative analysis of anticausatives.

7.3 Ablative causes in Hungarian in non-anticausative constructions

7.3.1 High ablative causes
Alexiadou and Anagnostopoulou (2009) and Levin (2009) both discuss certain non-anticausative syntactic contexts where from-PPs that appear to be prima facie causes are grammatical. (11) is such a putative example.

(11) a. She jumped from happiness.
   b. ??Happiness made her jump.

Alexiadou and Anagnostopoulou (2009) argue that the preposition here has a locative/source meaning, and a not a causative one. Example (11b) may serve as evidence to prove this point. As a causative sentence, (11a) should have the periphrastic paraphrase (11b)—but (11b) is very marginally acceptable, if at all. In fact, Alexiadou and Anagnostopoulou predict the from-PP in (11a) to be different from anticausative from-PPs. Unergative predicates are not causative in their analysis, and therefore the structure in (7b) is not available for (11a) to host the from-PP as a cause-phrase adjoined to vPCAUS.

Levin (2009) also comes to the conclusion that we should treat data like (11a) with caution. English from-phrases may only introduce an additional, less direct notion of cause that is not inherent in the modified verb. Therefore, she argues, they need not be reliable indicators of the causal relation assumed to be coded on the verb. Or, from

11 Unlike in Reinhart’s Theta System, where agents are coded as [+c+m].
our current perspective, they need not represent the type of direct cause that we are after.

If we disregard emotion NPs and similar potentially problematic examples, at first sight it is true of Hungarian that ablative causes are restricted to anticausative contexts and are unacceptable elsewhere. Compare the anticausative (12a) with (12b), which contains an unergative verb and is unacceptable to the point of ungrammaticality.

(12) a. Az ablak kinyílt a huzat-tól.
   the window.NOM opened the draught-ABL
   ‘The window opened from the draught.’

   b. *János dolgozik a gyógyszer-tól.
      John.NOM works the medicine-ABL
      int ended: ‘Medicine makes John work.’

This situation, however, is more complex than (12) suggests. As I argue in Rákosi (2009), ablative causes can actually appear in a wide variety of contexts and are not confined to anticausative constructions in Hungarian. It is true that ablative causes are generally more marked in transitive and (agentive) unergative constructions than in anticausatives, but they are not always completely unacceptable. In fact, often they are fully acceptable.

The use of ablative causes with unergative or transitive predicates is often facilitated by non-veridical contexts. Negation (13), conditionals (14) or questions (15), for example, can license ablative causes:

(13) Az esőtől nem hallott-am a koncert-et.
    the rain-ABL not hear-1SG the concert-ACC
    ‘I did not hear the concert from the rain.’

(14) Ha a gyógyszer-tól dolgoz-na János,…
      if the medicine-ABL work-COND John.NOM
      ‘If medicine made John work,…’ [then I myself would give him a big portion].

(15) Ki énekelt egy dal-t a bor-tól?
      who.NOM sang a song-ACC the wine-ABL
      ‘Who did the wine make sing a song?’

Another typical context that facilitates the insertion of such ablative causes is focusing the ablative (16), or the presence of a VP-adverbial (17):

      the medicine-ABL work John.NOM
      ‘It is the medicine that causes John to work.’
The ablative causes in these contexts are marked in comparison to anticausative ablatives in the sense that they generally need some contextual support to be acceptable, and they are also less frequent in corpora than anticausative ablatives. The use of the ablative type represented in (13)–(17) tends to require the comparison of two states of affairs.12 For example, (16) has the implicature that John would not work without the medicine, and (17) implies that John would have worked faster if he had not taken medication. In contrast, ablative causes in anticausatives generally require no such contextual support.

I argue in Rákosi (2009) that the ablative causes in (13)–(17) are of a different grammatical type than anticausative ablatives. The former group I will be referring to as ‘high ablative causes’, whereas I call the latter ‘low ablative causes’. The two are merged into different positions in the clause structure. Here I present some empirical arguments that support this distinction, and I outline an analysis in section 7.4.

The most obvious reason not to collapse the grammar of the two types of ablatives is that they can co-occur:

(18) [I made a very strong iron frame for the window, and I changed the lock.]

Ettől az ablak nem nyílt ki a robbanások-tól.

‘This caused the window not to open from the explosions.’

Here the sentence-final low ablative is licensed by the anticausative verb itself, and the sentence-initial ablative is a high ablative cause. High ablative causes, unlike low

12 That this is so is not entirely unexpected under the standard counterfactual approach to causality, wherein an event e is taken to causally depend on c just in case e would not have occurred unless c had happened before (see Lewis 1973 for technical details). I thank Torgrim Solstad for pointing this out to me and for clarifying some pertinent issues.

If such considerations indeed play a role in the licensing of high causer PPs in general, then we expect the constructions in (13)–(17) to be possibly available in other languages. As Florian Schäfer and Torgrim Solstad both inform me, the German versions of (13)–(17) with causative durch are either fully or at least marginally acceptable. Solstad (2006) discusses such German data in detail and comes to the conclusion that two grammatically different uses of causal durch must be distinguished. This is essentially the same claim that I make here for Hungarian ablative causes, though our particular analyses differ.

The confines of this chapter do not allow me to discuss other languages in detail, but the similarities between the Hungarian and German data are striking and the issue merits further attention. I also add that English differs from both German and Hungarian, inasmuch as it does not readily allow from-causes in the contexts represented by (13)–(17). It should be noted nevertheless that from-causes in English have a marked character in anticausative constructions, too. The reasons are poorly understood and I will not speculate here.
ablative causes, are generally not acceptable postverbally in neutral sentences. Consider the following example for illustration:

the boxes-ABL not opened out the door.NOM the draught-ABL
‘The boxes caused the door not to open from the draught.’

b. *A huzattól nem nyílt ki az ajtó a dobozktól.
the draught-ABL not opened out the door.NOM the boxes-ABL
intended: ‘The boxes caused the door not to open from the draught.’

In (19a), the high ablative is again sentence-initial and the low ablative is sentence-final. If we reverse the order of the two, the result is essentially unacceptable (19b).

(19a) also calls attention to another important aspect of the grammar of high ablative causes: they can take scope over scope-sensitive operators, like negation. Compare (20a) with (20b).

(20) a. Pont attól a kis bor-tól nem dolgozik János.
right that.ABL the little wine-ABL not work John.NOM
‘It is exactly that little amount of wine that causes John not to work.’

b. At-tól a néhány robbanás-tól nem nyílt ki az ablak.
that-ABL the some explosion-ABL not opened out the window.NOM
‘As for those few explosions, it is not the case that they caused the window to open.’

(20b) contains a low ablative cause which has been contrastively topicalized and thus occupies a preverbal position, preceding negation. The ablative is only acceptable as a contrastive topic in this sentence, and as such, it takes low scope with respect to negation. In contrast, the high ablative cause in the unergative construction (20a) is focused, and scopes over negation.

Thus high and low ablative causes indeed have non-identical grammatical properties. I want to argue here nevertheless that ablative case is a marker of essentially the same type of direct causal relation in both cases. To see this, it is important to realize that a high ablative cause is not an all-purpose cause marker. The English because of, and its Hungarian counterpart, the postposition miatt, can be freely inserted in just about any syntactic structure and can introduce indirect causes heading causal chains of any conceivable arbitrary length. Ablatives never can do that, irrespective of whether they are inserted high or low.

The intuitive difference between direct and indirect causes is clear, or at least it appears to be so at first sight. Indirect causation allows for intermediate causes to be present, but direct causation requires contiguity between cause and effect—the question is what exactly we mean by intermediate cause and contiguity. Kratzer (2005) is a recent attempt at formalizing the contiguity condition on direct causation,
by arguing that a direct causal relation is such that the causing event has the caused event as its part (see her paper for the technical details). The intuitive idea is that the causing event includes the caused eventuality in our conceptualization of direct causation. This will suffice for my purposes here, and I refer the reader to Wolff (2003) for an overview of the pertinent literature (see also Chapter 6 above by Rappaport Hovav and Levin as well as Chapter 2 by Neeleman and van de Koot for some discussion of the notion of direct causation).

Reinhart (1996; 2000; 2002; forthcoming, a) takes a somewhat different approach when she argues that a causal relation holds between two events when one event is conceived as a sufficient condition for the other. This actually describes direct causation, though Reinhart does not use this term. If, for example, the glass falls, then it is a sufficient condition for it to break, given our perception of the world (21).

(21) The glass fell on the floor and broke.

It is obviously not necessary that the glass breaks when it falls, and the fact that the glass falls does not therefore entail that it breaks. This, however, only tells us that causation is not a logical notion, but a structuring force behind how humans organize the facts of the world around them. Thus there is no strict truth-conditional definition for direct causation, whether we aim to capture it in terms of a contiguity requirement of some sort or via a sufficiency condition. Nevertheless, the notion is evidently conceptually grounded and as such, it has its linguistic reflexes.

Consider now the following anticausative example of Alexiadou et al. (2006: fn. 7) for illustration. They discuss Greek PP-modification data in anticausative structures. In Greek, two prepositions are available for the purposes of coding causer PPs, but only me can express indirect causes (see further Alexiadou and Anagnostopoulou 2009):

(22) *I dimosia sinkinonia alakse me tus Olimbiakus agones

'Public transportation changed with the Olympic Games/*by the Olympic Games.'

The Olympic Games is not a direct cause for the change in public transportation under either approach described above. Neither is it the case that the Games represent a sufficient condition for this change, nor does this change form part of the event of the Olympic Games.

The Hungarian ablative can only introduce a direct cause in this sense, and thus it resembles the Greek preposition apo.

(23) A közlekedés megváltozott *az olimpiától / az olimpia miatt.

'the transport.NOM changed *from / because of the olympics-ABL the olympics because of'

'Public transport changed *from / because of the Olympic Games.'
As (23) shows, me can only be translated with the all-purpose cause marker miatt, the ablative is not acceptable at all.

Example (23) is an anticausative construction, and the ungrammatical ablative should in principle function as a low ablative cause. Importantly, a high ablative cause can also only introduce a direct cause. I repeat (13) as (24) and (25) to illustrate that. Consider the following three scenarios. First, it starts raining during a concert that you attend, so you cannot hear the music. Second, you listen to a concert on the radio. You cannot hear the music properly because it rains at the concert venue (though not at your location). Third, you cannot even leave your flat because of the rain, so you do not attend the concert. Now consider the distribution of these three readings with the ablative (24) and with the postposition miatt (25).

(24) Az eső-től nem hallott-am a koncert-et.
the rain-ABL not heard-1SG the concert-ACC

(i) √ ‘I was present at the concert, and I couldn’t hear it because of the rain there.’
(ii) * ‘I was listening to a radio broadcast. It was raining at the concert venue.’
(iii) * ‘The rain prevented me from leaving the flat, so I didn’t go to the concert.’

(25) Az eső miatt nem hallott-am a koncert-et.
the rain because.of not heard-1SG the concert-ACC

(i) √ ‘I was present at the concert, and I couldn’t hear it because of the rain there.’
(ii) √ ‘I was listening to a radio broadcast. It was raining at the concert venue.’
(iii) √ ‘The rain prevented me from leaving the flat, so I didn’t go to the concert.’

As is clear from the data, the high ablative not only expresses a direct cause but, as the absence of reading (ii) in (24) suggests, it must express a cause that is contiguous (in this case, both in space and in time) with the event expressed by the verb.\(^{13}\)

The same interpretative constraint characterizes every high ablative cause. In this sense, there is no difference between high and low ablatives: the causal relation must be a strictly direct one in both cases. It is a plausible assumption therefore that high

\(^{13}\) One reviewer finds reading (ii) of (24) acceptable once the sentence is modified to better allow for the rain to be at the concert venue. For me and for the speakers I have asked, reading (ii) is still not available even if I try to fiddle around with the sentence to include reference to the radio broadcast. The point is nevertheless that everyone finds reading (i) of (24) acceptable, and everyone rejects reading (iii) for this sentence. Reading (ii) might be an intermediate case as far as judgements are concerned exactly because our perception of what can be construed as a direct cause is to some extent subject to variation across individuals.
and low ablatives are in fact instances of the same lexical item. This item, however, can occupy different positions in syntax, which induces the grammatical differences we have observed above (18)–(20). I spell out an analysis in more details in section 7.4, but let me first discuss two further contexts where ablative causes are grammatical.

7.3.2 Ablative causes in stative contexts
As discussed in 7.2.3, the presence of a change-of-state context is often viewed as a prerequisite for causativity. If, however, cause-PPs can introduce causation themselves, they should not in principle be barred from stative contexts. Levin (2009: fn. 4), quoting Koontz-Garboden (p.c.), mentions the following putative example:

(26) Her face was red from embarrassment.

This example may raise some philosophical concerns about whether we are dealing here with the same type of direct cause PP as what we have in anticausatives, but much less problematic examples are in fact easy to find. The following sentences have all been gathered from the British National Corpus (as made accessible via Davies 2004–):

(27) a. The wooden slats were already warm from the sun.
   b. His skin was brown from the wind and the sun.
   c. She was somewhat tired from the journey.
   d. He looked at my clothes, all creased and still damp from the night’s activities.
   e. He was fresh from the shower.

If the appropriate verb is available, then these sentences have a natural transitive paraphrase (cf. The journey tired him somewhat, etc.), suggesting that we are dealing here with a type of cause that is not unlike the one that occurs in anticausatives.

All the sentences in (27) can be translated into Hungarian by using ablative case. Instead of translating them, let me provide here two additional examples. Example (28), a real-life example from an email, shows that ablative causes are also licensed by purely existential uses of the copula. Example (29) shows that the (result) state can hold even when it is no longer connected to the cause.

(28) Ez a blank page feeling a fáradtság-tól van.
   this the blank page feeling.NOM the tiredness-ABL is
   ‘Tiredness causes this blank page feeling.’

(29) Még a ház-ban is piros volt a fül-em a kinti fagy-tól.
   still the house-in too red was the ear-1SG.POSS the outside frost-ABL
   ‘My ears were still red even in the house from the outside frost.’
Just like the high ablative discussed in the previous subsection, the ablative must introduce a direct cause in stative contexts, too. Only the all-purpose cause marker postposition *miatt* 'because of' can introduce an indirect cause. Compare (30a) and (30b):

(30) a. A szobá-ban meleg volt a beáramló szellő-től / a *klímaváltozás-tól.
    the room-IN warm was the inflowing breeze-ABL the climate.change-ABL
    ‘It was warm in the room from the breeze blowing in / *from the climate change.’

    b. A szobá-ban meleg volt a beáramló szellő *miatt* / a klímaváltozás *miatt*.
    the room.-IN warm was the inflowing breeze CAUSE the climate.change CAUSE
    ‘It was warm in the room because of the breeze blowing in/the climate change.’

The climate change in itself is not a sufficient condition to cause the warm state of the room. Nor can we view this state as part of the climate change. Since (thus) the climate change cannot be construed as a direct cause, the ablative is not acceptable in (30a).

I consider the ablative to have essentially the same function here as in anticausative contexts and in the high ablative contexts discussed in the previous subsection. It introduces a direct cause, and it can do so because ablative case can generally introduce a causal relation by itself. This also entails that I regard these stative contexts as causative in possibly the same sense as anticausative contexts are. If, as discussed in 7.2.3, causation can be an inferential option arising at a post-syntactic interface, then I see nothing a priori wrong with making this assumption. Given the fact that *she was tired from the journey*, it is easy to infer even in the absence of a telic syntax that her tiredness is the result state caused by her performing a journey.14

Having established this background, I now turn to a discussion of *by itself* modification. Such data have been used to argue for a causative analysis of anticausatives but, as I show directly, they can receive an alternative explanation that supports the framework I am developing here.

7.3.3 An aside on *by itself* modification

The Hungarian equivalent of the English *by itself* is in fact the ablative-marked form of the reflexive anaphor: *magá-tól* 'himself-ABL'. It mostly occurs in anticausative contexts.

(31) Az ajtó *magá-tól kinyílt*.
    the door.NOM itself-ABL open-PAST
    ‘The door opened by itself.’

---

14 But see Ioannidou (forthcoming) for a syntactic analysis of causer PPs in stative contexts.
Besides the causal reading, which denies the existence of an outside causer, the English *by itself* also has the meaning ‘alone’, as in the case of the most salient reading of the sentence *He came by himself*. The Hungarian *magától* does not have this second reading.

The causal reading of *by itself* in anticausatives has been used as an argument supporting the causal nature of the anticausative verb by Chierchia (1989/2004), Levin and Rappaport Hovav (1995), and Koontz-Garboden (2009). Though the analyses differ, these authors share the contention that the *by itself* phrase is anaphorically linked to an underlying cause argument. Therefore it detects the presence of a causative component in anticausatives.

This interpretation of the data has been criticized by, among others, Piñon (2001b) Pylkkänen (2002; 2008), and Schäfer (2007). Piñon (2001b: 288) points out, for example, that if *by itself* phrases were really anaphorically dependent on an underlying cause, then (31) should have the meaning ‘The door did something that caused it to break’. But this is not what (31) means. What I aim to add to this discussion here is that *magától* is in fact a high ablative cause in Hungarian. As such, its presence in an anticausative construction does not force us into a causative analysis of anticausatives.

Both Schäfer (2007) and Piñon (2001b) show that *by itself* generally denies the existence of an outside causer or force, and it is felicitous with any predicate type if the context is such that the event could in principle be caused. Thus they can even be licensed by stative predicates. (32) is a Hungarian example modelled on Schäfer’s (19).

(32) Magam-tól tud-om a válasz-t.
    myself-ABL know-1SG the answer-ACC
    ‘I know the answer by myself.’

This sentence is perfectly acceptable in a context in which I have been accused of having relied on someone else in learning the answer. Sentence (32) is used to deny the existence of such an external cause.

Notice that *magától* is in the preverbal focus position in (32). This is not an accident, *magától* is frequently focused. This neatly ties in with an observation that Reinhart (2000) makes, namely that *by itself* modification is not acceptable out of the blue even in anticausative contexts. We tend to use it only if a contrast is to be set up in the discourse, for example, if ‘someone suggests an implausible natural cause for the event’. Contrastive focusing is a grammatical reflex of such discourse structure. In fact, *magától* rarely occurs in the postverbal field, and it only does so in non-neutral sentences. Given that Hungarian has a designated preverbal position for contrastive focus, this is hardly surprising.

These distributional facts thus both point toward the conclusion that *magától* is a high ablative cause. A third argument is that *magától* can co-occur with a low (anticausative) ablative cause, cf. (33):
(33) —Do you think that John did something to the window?
—Nem, magától nyílt ki a huzat-tól.

‘No, it opened from the draught by itself.’

For these reasons, the presence of magától in anticausatives does not detect an underlying causal relation. It is used to deny the existence of an external instigator of the event if, for some reason, the existence of such an external instigator has been asserted in the discourse. That it can introduce a causal relation by itself should come as no surprise, given that I have been arguing that both low and high ablative causes are genuine introducers of causation.

7.4 Ablative causes and the Theta System

I have argued in the previous section that ablative causes in Hungarian have a distribution that reaches well beyond the confines of anticausative structures, and there is a sense in which they play the same role in each of these licensing contexts. They are markers of direct causes that are contiguous with the event described by the main predicate. It is a plausible assumption that they always introduce a causal relation by themselves. Consequently, ablative causes do not provide evidence that anticausative structures are underlyingly causal.

I also make the claim that a distinction must be made between what I refer to here as high and low ablative causes. Low ablative causes are licensed in anticausative structures and in stative constructions. High ablative causes (including magától ‘by itself’) can occur beside any predicate type, and they need strong contextual support to be acceptable. These facts raise (at least) two questions, which I briefly try to answer here. First, why is it that transitive and unergative verbs do not license low ablative causes? Second, is there any further difference between high and low ablatives beyond the assumed difference in the merging positions? The account I describe presupposes the Theta theoretic view of grammar.15

I take Reinhart’s (2006) observation as a starting point. She forms the hypothesis that what licenses from-PPs in English anticausative constructions is the underlying conceptual representation of the predicate and associated world knowledge. As I have argued in section 7.2.3, this does not per se entail a causative semantics for anticausatives. The claim is simply that anticausative semantics is naturally compatible with causation. The causal relation is contributed by the from-phrase itself, which Reinhart (2006) refers to as a ‘quasi argument’.

15 Some further details of this account which are not directly relevant for the argumentation in this chapter can be found in Rákosi (2009).
Suppose now that from-causes in English, just like low ablative causes in Hungarian, are in fact adjuncts. In this, I agree with Alexiadou et al. (2006) and Schäfer (2008a; 2008b), whose analysis is summarized in the tree in (7b). Furthermore, I consider low ablatives and anticausative from-causes (34a) in English to belong to the same grammatical type as instruments (34b), benefciaries (34c), or the directional in (34d):

\[ (34) \begin{align*}
a. & \text{The door opened from the draught.} \\
   b. & \text{I opened the door with a key.} \\
   c. & \text{I opened the door for John.} \\
   d. & \text{I sent him a book to London.}
\end{align*} \]

Such ‘participant phrases’ have traditionally been treated as arguments, but there are reasons not to treat them on a par with true argument phrases (such as the non-underlined NPs in (34)).

Within the research programme of the Theta System, it was Marelj (2004) who proposed that a participant phrase can be treated as an adjunct that receives a thematic role. In particular, she argues that the directional in (34) is an adjunct but bears the Theta theoretic thematic specification \([-c]\).\(^{16}\) In Rákosi (2006), I extend this analysis to certain types of dative experiencers and to participant phrases in general. The empirical coverage of the thematic adjunct hypothesis is essentially identical to the domain that the generalized theory of applicatives (see Pylkkänen 2002; 2008) is aimed at capturing, and the underlying intuition is also similar. Participant phrases have a cluster of properties that distinguish them from true arguments (most importantly, they are truly optional), but the semantic role types they instantiate overlap to a great extent with those borne by arguments. In Pylkkänen’s constructionist framework, a participant phrase is licensed as a specifier of a special applicative phrase. In the extension of the Theta System that I propose in Rákosi (2006), participant phrases are licensed by lexical conventions qua adjuncts that bear Theta theoretic thematic specification.

The particular claim I make here is that from-causes in English and low ablative causes in Hungarian are ‘thematic adjuncts’ in the same sense as the other underlined phrases in (34) are. Their feature specification is \[+c−m\], since they are causally related, but mentally non-involved, participants of the event. This coding reflects the fact that they cannot be interpreted agentively. Of course, the deeper question is why they must be coded this way. I do not have a definitive

\(^{16}\) This coding is a generalization over different types of directional, goal, and recipient phrases as well as over dative experiencers. By underspecifying the \[+−m\] feature, we allow these phrases to refer to participants who are mentally involved in the event. Whether such a reading is possible or not depends on further properties of the construction (see Marelj 2004 and Rákosi 2006 for pertinent discussions).
answer, but one can think of two putative explanations. First, it seems to be a universal that non-canonical PP causes in anticausative structures have event-type denotations (cf. also Neeleman and van de Koot, Chapter 2 above, fn. 5). Events, by definition, must bear negative specification for the `mentally involved’ feature. Second, the necessity for the [+c–m] coding may in fact arise from independent properties of the Theta system. The [+c] clusters of the Theta system ([+c+m], [+c], and [+m]) are destined for external merge according to the mapping conventions that Reinhart proposes (see Chapter 1 above). The cluster [+c–m] does not receive a merging index and in principle is free to merge either internally or externally. Given that anticausative structures have unaccusative properties both in the presence and in the absence of a cause thematic adjunct, [+c–m] can be regarded as an optimal coding for such adjuncts since it allows for relatively free insertion. This reasoning rests on the assumption that a hypothetical [+c] thematic adjunct could receive a merging index, which is a non-trivial extension of the use of merging indices from the domain of arguments to the domain of thematic adjuncts. But even if this assumption is not justified, the [+c–m] feature specification of anticausative from-PPs and their cross-linguistic equivalents appears to be the optimal choice for the reasons presented here, and it is at least motivated if not explained within the framework of assumptions that constitute the Theta System.

Instruments are also coded as [+c–m] in the Theta System. Thus the feature cluster [+c–m] can in principle be interpreted either as an instrument or as a causer, the choice between the two readings being conditioned primarily by the choice of the P-marker (a with-type or a from-type morpheme).17 What licenses them as thematic adjuncts is a set of lexical licensing conditions. An instrument thematic adjunct is licensed in the presence of an agent [+c+m] argument (see Reinhart forthcoming, a: 24). As such, it is interpreted as a secondary cause of some sort. A causer PP is licensed as a thematic adjunct, and at the same time as a primary cause, if the argument structure contains no other element that is causally responsible for the event. Anticausatives and stative predicates satisfy this condition.18 Since, in the Theta System, agents ([+c+m]) are considered to be participants that are causally related to the event, agentive transitive and unergative verbs license instruments, but they do not license causer-PPs as thematic adjuncts. The underlying idea is that the core event structure of the predicate can include at most one primary cause participant. I leave it open whether this constraint can be derived from a generalized uniqueness condition on theta-roles or whether it is a

17 See Potashnik (Ch. 10 below) for interesting arguments that these two interpretations are inherently related and that their convergence plays an important role in the grammar of emission verbs.

18 If adjectival predicates have no argument structure, then they vacuously satisfy this licensing condition.
restriction that follows from more general properties of human conceptualization of events.\footnote{See Carlson (1998) for a discussion on the roots of thematic uniqueness.}

I assume here that low ablative causes (and from-PPs in English) are adjoined to the VP, and are part of the syntactic domain that has recently been referred to as the ‘thematic phase’ (see Horvath and Siloni 2011). High ablative causes are merged outside of this syntactic domain, in the left periphery of clause structure. I assume that they can be merged relatively freely within the functional domain and they have no fixed position there, but nothing crucial hinges on this assumption. The point is that they cannot receive a theta cluster in this syntactic domain; therefore their distribution is not limited the way that of low ablatives is. Unlike low ablative causes, they can take scope over other functional material. Diagram (35) schematizes this analysis. The brackets around the vP indicate that the vP is only present if the argument structure includes an external argument.\footnote{The Theta System postulates only a minimal degree of argument structure decomposition in syntax, wherein a vP functions as an introducer of external arguments. See É. Kiss (2008) for a similar approach to Hungarian clause structure.}

\begin{center}
\begin{tikzpicture}
  \node {CauseP} edge [->] node {high ablative cause} (vP)
  \node (vP) at (0,0) [below] {VP}
  \node (VP) at (-1.5,-1) [below] {CauseP}
  \node (VP) at (-2.7,-2) [below] {vP \rightarrow low ablative cause}
\end{tikzpicture}
\end{center}

Summing it up, high ablative causes differ from low ablative causes in that (i) they are merged in the left periphery of the clause, outside of the extended VP, and (ii) they do not receive a theta cluster. Both types of ablatives are adjuncts nevertheless, and both introduce a direct cause into the syntactic as well as the semantic structure of the clause.

As I already suggested in section 7.3, the two ablative types can be regarded as instances of the same lexical category. In other words, there is but one causal lexical entry for ablative case, and it can head PPs that are merged in two different syntactic positions. As a result, high and low ablative causes modify different parts of the clause, and thus take complements that are not necessarily of the same semantic type. I believe that any semantic difference between the two ablatives should be derived from this fact alone: it is quite possible that, whereas low ablatives make reference to events, high ablatives are sensitive to facts. Solstad (2006; 2007) in fact interprets related German data concerning the causal uses of $durch$ within
such a framework of assumptions. He argues that whereas low(er) *durch* phrases mark a causal relation between events, high(er) *durch* phrases causally relate facts. It is quite plausible that a similar division of labour exists between high and low ablatives in Hungarian, but I leave a more comprehensive study of the data to another occasion.

### 7.5 Conclusions and outlook

This chapter is a contribution to the debate on the causal nature of anticausative constructions. Much of the recent literature on this issue treats anticausatives as causal in their semantics, and it has also been claimed that they even involve a causative layer of decomposition. One prominent argument for this position is the cross-linguistic possibility of inserting a causer PP into anticausative structures. It can be argued that such PP-modification is licensed by the causal nature of the construction.

In this chapter, I have made an attempt at putting this argument under scrutiny via a study of ablative causes in Hungarian. Ablative causes figure in anticausative constructions and function similarly to the English *from*. But they are also grammatical in stative sentences and, with some contextual support, they are licensed in non-anticausative constructions too. It is a common denominator across these uses that the ablative always genuinely introduces a direct cause. Ablative causes introduce a direct cause into anticausative constructions too, and therefore their presence is not a sign of the putative underlying causal nature of the construction. Thus, ablative causes provide an argument against, rather than for, the causal analysis of anticausatives.

This conclusion fits naturally within the decausativization approach to anticausatives that Reinhart (1996; 2000; 2002; forthcoming, a) and Reinhart and Siloni (2005) proposed as an integral part of the Theta System. In this sense, the current work is hoped to give further support to Reinhart’s analysis. Furthermore, the chapter extends this analysis by assuming that ablative causes come in two grammatically distinct varieties, depending on where exactly they are merged. The ablatives that occur in anticausative constructions, and which I have called ‘low ablative causes’, receive thematic specification in terms of the Theta System as thematic adjuncts.

The chapter has focused on Hungarian data, and much needs to be done in search for a better understanding of cross-linguistic variation within this domain. In particular, P-elements that head causer PPs may have idiosyncratic semantic and combinatorial properties. Some can be used to refer to (more) indirect causes, and some can only code direct causes (for discussion, see Alexiadou and Anagnostopoulou 2009; Levin 2009). Some may only establish a relation between events, whereas others may also take facts (cf. Solstad 2006; 2007). I believe nevertheless that a careful
cross-linguistic investigation of PP-modification facts will only add to the weight of the arguments presented here.

Modulo this potential area of parametric variation, I was working under the assumption that anticausative grammar is cross-linguistically stable in its decisive properties. This assumption is frequent in the literature but, as Koontz-Garboden argues (2009), it is not necessarily valid. He gathers a careful selection of arguments to show explicitly that Spanish *se*-marked anticausatives are semantically causative. Whether the morphological makeup of the anticausative verb may have a decisive role in determining its semantic and syntactic properties is another issue that commands more attention.
Hidden Entries: a Psycholinguistic Study of Derivational Gaps

JULIE FADLON

8.1 Introduction

A well-known fact about verbs is that they appear in different diatheses (voices). For example, the notion of ‘opening’ can be realized as a transitive verb (Mary opened the door), as an unaccusative verb (the door opened), and as a verbal passive (the door was opened by Mary). Among scholars addressing this phenomenon, there is a consensus that different verbal alternant of the same thematic notion are derivationally related. In other words, it is widely agreed that there is a systematic, rule-governed connection between the various diatheses.

When attempting to form a specific generalization regarding any derivational alternation, one of the issues that must be addressed is derivational gaps: cases in which one alternant is idiosyncratically absent from the vocabulary of a certain language. Consider, for example, unaccusative verbs and their transitive alternates. A model which views these voices as derivationally related is not complete if it does not account for the fact that in English, for instance, the unaccusatives roll and close have a transitive alternative (Mary rolled the ball/closed the window) while the unaccusatives collapse and vanish do not (*Mary collapsed the sand castle/vanished the diamonds). If unaccusative and transitive verbs are connected by a systematic rule, the fact that some transitive equivalents of existing unaccusatives are absent from the English vocabulary cannot be overlooked. An exhaustive analysis of this alternation would have to take a stand regarding this absence. A priori, two types of

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approaches are possible: (a) the derivational rule is an operation that is not always productive, therefore some forms do not exist; let us label this view ‘the nonexistence approach’; (b) there is a mechanism that sporadically excludes some lexical entries from the vocabulary of a certain language. Let us label this ‘the hidden representation approach’.

Two implementations of the latter approach can be found in Halle (1973) and Jackendoff (1975), which attempt to provide an exhaustive analysis for the regularities observed between different lexical items. Both analyses employ verbs and their corresponding deverbal nouns to demonstrate the accounts they propose for derivational gaps, each targeting an opposite end of this alternation. Halle notes that assuming a rule that creates the noun \textit{transformation} from the verb \textit{transform} and the noun \textit{proposition} from the verb \textit{propose} erroneously predicts the existence of nouns like \textit{*arrival} and \textit{*refusation} created from the verbs \textit{arrive} and \textit{refuse}, respectively. There is no particular independent (semantic or morphophonological) reason for these forms to be excluded from the vocabulary of English. Therefore, a model which assumes a rule-governed connection between verbs and the corresponding deverbal nouns must provide an account for the fact that some of this rule’s potential outputs are absent from the vocabulary. To account for this phenomenon, Halle suggests that these are cases of ‘accidental gaps’ between the lexicon and ‘the list of actual words’ that occur when outputs of lexical rules are arbitrarily marked \([–\text{lexical insertion}]\), which results in their exclusion from the list of actual words.

Jackendoff (1975) notes that this paradigm also exhibits cases of gaps in the input, as it implies a derivational connection between the noun \textit{retribution} and the nonexistent verb \textit{*retribute}, and a similar connection between the noun \textit{aggression} and nonexistent verb \textit{*aggress}. To account for these cases, Jackendoff suggests that these forms are not independently represented in the mental lexicon as an actual word would be; rather, they are sub-parts of the lexical entries corresponding to the words with which they are connected. Accordingly, a form like \textit{*retribute}, for instance, would be listed in the mental lexicon as a sub-part of the lexical entry corresponding to the verb \textit{retribution}, but would lack an independent lexical representation and therefore would not exist as an actual word.

The accounts Halle and Jackendoff provide for derivational gaps are similar. Both their models assume that the missing forms exist at some level of linguistic representation, but are prevented from appearing as actual words. To refer to this type of

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1 Halle (1973) and Jackendoff (1975) offer lexicalist models of the mental lexicon, i.e. models that view the mental lexicon as an active component of grammar, which includes rule-governed derivational relations between the entries listed in it (see also e.g. Chomsky 1970; Aronoff 1976; Reinhart 1996; 2002; Siloni 2002).
linguistic encoding, I use the term ‘hidden lexical entries’. I adopt Horvath and Siloni’s (2008a) terminology, which distinguishes between ‘the mental lexicon’—a component of grammar consisting of lexical entries—and ‘the actual vocabulary’ of a particular language—the set of words speakers use. Accordingly, I define hidden lexical entries as forms that do not exist in the vocabulary of a language, but are assumed to have a representation in the mental lexicon.

The assumption of lexical entries that lack a corresponding vocabulary item is often perceived as an ad hoc, unfalsifiable theoretical tool, whose postulation should be avoided (Aronoff 1976; Anderson 1992). Lacking a corresponding vocabulary item, these forms are always hidden in the mental lexicon and are never used in an utterance. Consequently, there appears to be no way of providing theory-independent evidence for their existence.

In this chapter I demonstrate that a psycholinguistic research can be employed to decide between ‘the nonexistence approach’ and ‘the hidden representation approach’. I argue that given the common assumption that the lexical component of a language interfaces with the conceptual system (e.g. Fodor 1975; Pinker 1994; Sperber and Wilson 1997), it is not unreasonable to assume that lexical encoding affects the perception of the matching concept, i.e. the mental notion corresponding to it. Therefore, keeping in mind that the language faculty interacts with other components of the human cognitive system, the existence of a lexical representation should be traceable even when there is no direct evidence for it, i.e. no corresponding vocabulary item. Based on this assumption, I conducted an experimental study that explores the psychological reality of hidden lexical entries. This research used the transitive–unaccusative verbal alternation as a case study, and its results support the psychological reality of the hidden lexical entries mechanism suggested by Reinhart (2002; forthcoming, a) and Horvath and Siloni (2008a). The chapter shows that, even though hidden lexical entries are missing from the list of actual words, they are not unfalsifiable theoretical constructs.

The chapter is structured as follows: Section 8.2 presents the transitive–unaccusative alternation and two alternative derivational gaps accounts (Arad 2005 v. Reinhart 2002; forthcoming, a; Horvath and Siloni 2008a) suggested in this context. Section 8.3 discusses a distinction made by Horvath and Siloni (2008a), which provides a natural ground to compare the validity of the accounts discussed in section 8.2. Section 8.4 suggests a general hypothesis regarding the relation between lexical encoding and the conceptual system and presents an experiment designed to test the predictions of this hypothesis. In section 8.5 I present a subsequent experiment conducted to provide further reinforcement to my analysis of the experimental results, and section 8.6 brings my conclusion.
8.2 Unaccusative verbs and gaps in the transitive–unaccusative alternation

Perlmutter’s (1978) unaccusativity hypothesis splits the class of intransitive verbs into two distinct sub-types, unaccusative verbs (*break, vanish, roll*, sometimes referred to as inchoative verbs) and unergative verbs (*run, walk, sneeze*). Ever since its formulation, unaccusativity has been the target of many analyses within different frameworks and views of grammar. Within the principles and parameters framework (Chomsky 1981), it is argued that unaccusative verbs lack an external argument; their grammatical subject is an underlying object, i.e. an internal argument. Indeed, across languages, the subject of unaccusatives passes tests diagnosing internal arguments, unlike the subject of unergative verbs (e.g. Perlmutter 1978; Burzio 1986; Chomsky 1981; Reinhart 1991; Borer 1994; Levin and Rappaport Hovav 1995; Meltzer and Siloni forthcoming; Pesetsky 1995; Reinhart 2002; forthcoming, a; Alexiadou, Anagnostopoulou, and Everaert 2004; Reinhart and Siloni 2005). I adopt this view of unaccusativity.2, 3

A prominent cross-linguistic fact about unaccusative verbs is that they tend to have a transitive alternative, a phenomenon I will refer to as the transitive–unaccusative alternation (also known in the literature as the causative–anticausative alternation). Some examples of the alternation are given in (1)–(4):

**English:**

(1) a. The window broke
   b. The girl/stone/wind broke the window

(2) a. The ball rolled
   b. The girl/wind rolled the ball

**Hebrew:**

(3) a. *ha-kadur hitgalgel*
   The-ball rolled
   ‘The ball rolled’

b. *Roza/ha-ru’ax gilgela ’et ha-kadur*
   Roza/the-wind rolled.TRANS the-ball
   ‘Roza rolled the ball’

2 For psycholinguistic and neurolinguistic evidence in favour of the unaccusative hypothesis, see e.g. Costa and Friedmann (Ch. 13 below), Friedmann et al. (2008), Shetreet, Friedmann, and Hadar (2010).
3 There are other views. For example, Van Valin (1990) claims that unaccusativity should be given a semantic analysis and need not be encoded in syntax. Sorace (1995; 2000) maintains a completely different concept of unaccusativity. According to her, there is no distinct unaccusative subset. Rather, there is an unaccusativity hierarchical scale based on aspectual and thematic properties, where unaccusatives and unergatives are at opposite ends, and in between there are verbs not unequivocally one or the other.
(4) a. **ha-’agartal nafal**
   The-vase fell
   ‘The vase fell’

   b. **ha-tinok/kadur hipil ’et ha-’agartal**
   The-baby/ball fall_TRANS ACC the-vase
   ‘The baby/the ball caused the vase to fall’

The transitive–unaccusative alternation inspired researchers to assume a derivational relation between the two alternants. Thus, it is a widely held assumption that unaccusative verbs and their transitive counterparts are derivationally related (e.g. Levin and Rappaport Hovav 1995; Harley 1995; Pesetsky 1995; Marantz 1997; 2006; Reinhart 2002; forthcoming, a; Doron 2003; Reinhart and Siloni 2003, 2005; Chierchia 1989/2004; Arad 2005; Alexiadou Anagnostopoulou, and Schäfer 2006; Ramchand 2006; Horvath and Siloni 2008a; 2008b; Koontz-Garboden 2009 among many others).

Similarly to other derivational alternations, the transitive–unaccusative alternation also exhibits derivational gaps. As illustrated and listed below, there are cases in which the transitive counterparts of certain unaccusative verbs are idiosyncratically missing from the vocabulary of a given language:

(5) a. The tower collapsed
   b. *The wind/the emperor collapsed the tower

(6) a. The spot vanished
   b. *The cleaners/the detergent vanished the spot

(7) a. **ha-cemax naval**
   the-plant wilted
   ‘The plant wilted’

   b. *ha-zman/ganan hinbil/nibel⁴ ’et ha-cemax
   the-time/gardener wilt_TRANS ACC the-plant
   ‘Time/the gardener caused the plant to wilt’

(8) Further examples for non-alternating unaccusatives:
   Hebrew: **hirkiv** ‘got rotten’, **kamaš** ‘withered’, **daha** ‘faded’, **hexmic⁵** ‘turned sour’, **hexlid** ‘became rusty’.

⁴ These nonexistent Hebrew verbs are given in the CiCeC (**pi’el**) and hiC.CiC (**hif’il**) verbal templates which are typical of Hebrew transitive verbs.

⁵ **hexmic** is ambiguous between ‘turned sour’ (an unaccusative) and ‘pickle’ (a transitive). But the latter is not the transitive alternative to the former.
The examples above are of sporadic gaps. Because these gaps occur idiosyncratically in some languages and not in others, their absence from the vocabulary cannot be explained semantically. Thus, for example, *collapse* and *vanish* have a transitive alternant in Hebrew (*motet* and *heʾelim* accordingly) and *wilt* has a transitive alternant in Hungarian (*elhervaszt*). It seems unreasonable to argue that the semantics of a transitive lexical entry would prevent it from having a corresponding vocabulary item in one language, while a semantically identical verb can be found in the vocabulary of another. There is also no morphophonological generalization that can provide an explanation for the absence of these transitive forms. First, in English the transitive and unaccusative forms are identical; so there could be no morphophonological reason ruling out the one but not the other. Second, in Hebrew the unaccusative *nafal* ‘fall’, for instance, has a transitive counterpart in the vocabulary (*hipil*) while the phonetically minimally different *naval* ‘wilt’ does not. Finally, these gaps cannot be accounted for by a process of ‘blocking’: Aronoff (1976) suggests that a rule can be blocked when its output is semantically equivalent to an item already existing in the mental lexicon. Importantly, the transitive alternates in (6) and (7), for example, missing from Hebrew and English respectively, do not have a semantic equivalent, which could have blocked them from appearing in the vocabulary of these languages.

As demonstrated above, there is no characteristic that singles out the absent transitive forms from the existing ones. Some forms are idiosyncratically absent from specific vocabularies and their absence cannot be attributed to any independent constraint. Consequently, an analysis of the transitive–unaccusative alternation (like other analyses of derivational alternations), would not be complete without addressing this phenomenon.

As mentioned in section 8.1, a priori there are two possible approaches. (i) ‘the nonexistence approach’: the corresponding entries do not exist; (ii) ‘the hidden representation approach’: the corresponding entries exist, but are prevented from occurring as actual vocabulary items. According to the nonexistence approach, then, certain transitive alternates of unaccusatives are missing because the derivational operation which connects unaccusatives to their transitive counterparts is not always productive. According to the hidden representation approach, the missing transitives exist, but are prevented from being part of a particular language’s actual vocabulary by some mechanism.

A discussion of possible accounts for derivational gaps in the transitive–unaccusative alternation can be found in Arad’s (2005) study of the morphosyntax of Hebrew. Arad assumes that the primitives mapped to the syntax are category neutral

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6 Some of the Hebrew unaccusatives presented in (8) (e.g. *hirkv*, *hexlid*) appear in the *hipil* (hiC.CiC) template, which is typically a transitive template. Nonetheless, this cannot be the reason for the absence of their transitive counterparts from the vocabulary, as there are many instances where the same *hipil* form is used for both unaccusatives and transitives. Some examples are *hexsi̯x* (became dark/made dark), *hisri̯ax* (smelled/ made smell), *heʾmik* (deepen), and *hivṣil* (ripen).
‘atomic roots’ and functional heads/features merged together in the syntactic component, which is the only computational component of grammar. Accordingly, within Arad’s analysis, roots turn into words only after they have merged with a category determining head in the syntax. In the case of verbalized roots, their unaccusative or transitive properties are determined by the type of verbalizing head that attaches to them. As schematized in Fig. 8.1, the relation between the transitive and the unaccusative alternants of the same verbal concept directly results from originating from the same root.

Arad mentions two alternative ways of accounting for derivational gaps, and considers them empirically equal: (a) The missing items are absent because they lack an interpretation. There is no suitable item to match their syntactic structure in the encyclopedia; therefore, they crash at LF. (b) Certain roots are marked as unable to be combined with certain verbalizing structures. These two alternatives are varieties of the nonexistence approach, as both view the missing alternant as nonexistent.

A hidden lexical representation approach to the missing alternants in the transitive–unaccusatives alternation is provided by Reinhart (2002; forthcoming, a) and Horvath and Siloni (2008a; 2008b). Let us first summarize their approach to unaccusative verbs. As will be discussed in more detail in section 8.3, following Pesetsky (1995), they distinguish between one-place unaccusatives and two-place unaccusatives. While the latter are underived entries, the former are always derived by a lexical operation applying to the theta grid of the transitive. The operation, which is labelled ‘decausativization’, reduces the transitive verb’s Cause (external) role altogether. A cause role, contrary to the Agent, is unspecified with regard to the mental state of the (corresponding) argument, and can therefore be assigned to either an animate or an inanimate argument. Thus, for example, the verbs open and break, which assign a Cause role, undergo decausativization, and have unaccusative alternants (9)–(10), unlike eat, whose external role is an Agent (11) (for more on decausativization, see Reinhart forthcoming, a; for the semantics of the operation see Dimitriadis, Chapter 12 below).

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**Figure. 8.1** The syntactic representation of unaccusatives and their transitive counterparts (Arad 2005)
(9)  
a. The boy/the wind opened the door  
b. The door opened

(10)  
a. The boy/the stone broke the window  
b. The window broke

(11)  
a. The boy/*the spoon/*hunger ate the soup  
b. *The soup ate

The operation that creates unaccusatives from their transitive alternants is schematized in (12) (abstracting away from details):

(12)  Decausativization: $V (\theta_{\text{Cause}} \theta_{\text{Theme}}) \rightarrow V \theta_{\text{Theme}}$

If so, then how come certain transitive alternates of one-place unaccusatives are missing? Reinhart (2002; forthcoming, a) and Horvath and Siloni (2008a) observe that all one-place unaccusative verbs seem to have a transitive alternant in one language or another, or had one in an earlier stage of the language. They assume with Fodor (1975) (among others) that lexical information is largely universal, i.e. that apart from phonological matrixes, information coded in the lexicon is by and large common across natural languages. This means that transitives that are missing from the vocabulary of a particular language but exist in other vocabularies must be listed in the lexicon. Following Chierchia (1989/2004), Reinhart and Horvath and Siloni suggest that in such cases the representation in the mental lexicon is abstract or ‘frozen’. Frozen lexical entries are entries that cannot be inserted into the syntax, and hence are not part of the language’s actual vocabulary. However, being lexical entries, they can serve as inputs to lexical operations; specifically, they can feed decausativization (12b) on a par with non-frozen entries (12a) (the nonexistent form is marked by *):

(13)  Decausativization: $V_{\text{ACC}} (\theta_{\text{Cause}} \theta_{\text{Theme}}) \rightarrow V \theta_{\text{Theme}}$

a. open-TRANS $\rightarrow$ open-UNACC  
   And also:
   b. *vanish-TRANS $\rightarrow$ vanish-UNACC

Thus, while Arad’s account is a nonexistence approach, Reinhart and Horvath and Siloni believe that there are hidden lexical representations. At first blush, the former seems like the preferable option. It seems like the null hypothesis—a transitive form is missing in a certain language because it simply does not exist. Nevertheless, if there is independent evidence supporting the hidden representation approach, the nonexistence approach should be abandoned. But is there a way of distinguishing a hidden lexical representation from a nonexistent one? After all, what type of evidence can support the claim that a missing form is in fact listed in the mental lexicon?
8.3 Three classes of unaccusative verbs and three types of transitive concepts

Horvath and Siloni (2008a) classify unaccusative verbs with no transitive counterpart in the vocabulary into two types: the arrive class and the appeal class. The arrive class consists of unaccusative verbs for which the transitive altarnates are idiosyncratically absent from the vocabulary of certain languages while existing in others. For example:

(14) a. Hungarian
   Unaccusative: összeesik ‘collapse’
   No transitive alternative
   Hebrew
   Unaccusative: hitmotet ‘collapse’
   Transitive: motet

b. Hebrew:
   Unaccusative: naval ‘wilt’
   No transitive alternative
   Hungarian:
   Unaccusative: elhervad ‘wilt’
   Transitive: elhervaszt

c. English:
   Unaccusative: vanish
   No transitive alternative
   Hebrew:
   Unaccusative: ne’elam ‘vanish’
   Transitive: he’elim

In languages that morphologically mark valence reduction, these unaccusatives often bear morphological forms typical of valence-reducing operations.

The appeal class consists of two-place unaccusative Experiencer verbs with a nominative Theme argument that is generated internally and an Experiencer, which (in most cases) bears an oblique case (Belletti and Rizzi 1981; Pesetsky 1995). Importantly, this class constitutes a cross-linguistic phenomenon. Unlike the arrive class, these verbs systematically do not have a transitive alternative across languages (as far as is known). There is thus no cross-linguistic evidence to assume the existence of frozen transitive alternants (Reinhart 2002; forthcoming, a). Moreover, these verbs do not appear in a morphological form typical of valence-reducing operations:

(15) ha-ra’ayon xamak mimeni
   The-idea escaped from+me
   ‘The idea escaped me.’

(16) ze medaber elay
   It talks to+me
   ‘It appeals to me.’

Another characteristic that distinguishes the appeal class from the arrive class is that the arrive class unaccusatives have adjectival passive counterparts, while the appeal class unaccusatives do not (Pesetsky 1995). For example:
Based on these observations, Horvath and Siloni (2008a) conclude that unaccusatives of the arrive class have frozen (hidden) transitive alternants that serve as input for the lexical operation that creates unaccusative verbs (decausativization) and for the lexical operation of adjectival passive formation, while unaccusatives of the appeal class are cross-linguistically underived and have no corresponding transitive entry, not even a frozen one.7

This classification enables us to tease apart hidden representation from nonexistence, because it allows comparison of items with no transitive alternative whatsoever to those argued to have frozen/hidden alternants. If the behaviour of the two sets can be shown to be different in a relevant way, the hidden existence approach would receive significant support. The existence of a class of underived unaccusative verbs, then, turns out to be crucial for our purposes.

Given Horvath and Siloni’s distinction, there are three possible types of unaccusative verbs:

(i) derived, with a transitive alternant in the vocabulary (e.g. open);
(ii) derived, with a frozen transitive alternant (e.g. collapse, vanish);
(iii) underived, with no transitive alternant at all (e.g. appeal, escape).

These three types of unaccusatives are related to the following three types of logically possible transitive concepts:

1. type I transitive concepts: with a corresponding vocabulary item (e.g. making something open);
2. type II transitive concepts: with a corresponding hidden lexical representation (e.g. making something vanish);
3. type III transitive concepts: with no lexical representation at all, not even a hidden one (e.g. making something escape the mind of someone).

I hold that the different nature attributed to each type of transitive concept is predicted to reflect on their accessibility. In the following section, I show how the

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7 Horvath and Siloni suggest that the operation forming adjectival passives applies in the mental lexicon and requires transitive entries as input. This accounts for the correlation between the lack of cross-linguistic evidence for transitive entries and the absence of adjectival passive alternants. For further details, see Horvath and Siloni (2008a).
connection between the lexical encoding and the accessibility of a concept can be used to explore the psychological reality of hidden lexical representations.

8.4 The GABLE hypothesis: predictions and experiment

The effect the existence of a vocabulary item has on the perception of the corresponding concept is a well-studied topic in the psycholinguistic research of colour terms. Kay and Kempton (1984), for example, found that even though colour concepts are universally defined, speakers of languages which use separate vocabulary items to refer to perceptually close colours such as blue and green utilize the linguistic classification when asked to categorize intermediate shades of these colours.

Kay and Kempton label this phenomenon 'the name strategy', and suggest that the existence of a parallel word affects the facilitation of a concept. I take this view one step further, and argue that in light of the fact that the mental lexicon is commonly assumed to have an interface with the conceptual system, any type of lexical representation, even a hidden one, is predicted to have an effect on the perception of the corresponding concept. I therefore formulate the following general hypothesis regarding the connection between lexical encoding and the accessibility of concepts:

\[(18) \quad \text{GABLE (graded accessibility by lexical encoding)}\]

The relative accessibility level of a concept is affected by its lexical encoding:
(a) The existence of a word in the vocabulary of a language X is an accessibility enhancer for the concept it represents.
(b) The existence of a lexical entry (with or without a corresponding vocabulary item) is also an accessibility enhancer for the concept it represents.
(c) The enhancing effects of (a) and (b) are additive.

According to the GABLE hypothesis, a concept with a corresponding vocabulary item will be more accessible than a concept without a corresponding vocabulary item, and a concept with a corresponding lexical entry will be more accessible than a concept without a corresponding lexical entry. In other words, it predicts a difference between hidden and nonexistent lexical entries corresponding respectively to type II and type III concepts. Thus, provided with a method designed to measure the accessibility levels of concepts, the GABLE hypothesis can be used to detect the existence of hidden lexical entries.

With regard to gaps in the transitive-unaccusative alternation, the GABLE hypothesis makes two predictions. First, if frozen lexical entries are psychologically real, the GABLE hypothesis predicts that type I transitive concepts, with two accessibility
enhancers (vocabulary item and lexical entry), will be more accessible than type II transitive verbal concepts, with one accessibility enhancer (a hidden lexical entry), and that type II concepts will be more accessible than type III transitive concepts, which have no accessibility enhancers. This three-way distinction is schematized in Fig. 8.2.

A three-way distinction is consistent with Reinhart’s (2002; forthcoming, a) and Horvath and Siloni’s (2008a) hidden representation account, since it uses the notion of hidden lexical entries (‘frozen lexical entries’) to explain gaps in the transitive–unaccusative alternation. In contrast, a three-way distinction of this kind would be inconsistent with Arad’s (2005) nonexistence account. This is because it only distinguish between concepts with a corresponding vocabulary item (hence, with a lexical representation) and concepts without a vocabulary item (hence, with no lexical representation).

The second prediction the GABLE hypothesis makes regarding gaps in the transitive–unaccusative alternation is that, if frozen lexical entries are not psychologically real, a two-way distinction should be observed. If type II unaccusatives do not have a hidden transitive alternate and are identical to type III unaccusatives with regard to lexical encoding, the prediction is that type I transitive concepts (two accessibility enhancers) will be more accessible than type II and III transitive concepts (no accessibility enhancers). In other words, as shown in Fig. 8.3, the accessibility levels of types II and III are not expected to be different.

A two-way distinction would be inconsistent with Reinhart (2002; forthcoming, a) and Horvath and Siloni (2008a), who predict a three-way distinction, but compatible
with Arad (2005), who assumes only two types of unaccusatives—those with a corresponding transitive in the vocabulary and those without one.

8.4.1 Experiment 1

The following experiment was designed to measure the relative accessibility levels of type I, II, and III transitive concepts once a speaker is exposed to their unaccusative verbal variant, hence to compare the validity of the approaches described above.

8.4.1.1 Participants  Participants included twenty adult native Hebrew speakers, ten male and ten female, with an education level of thirteen years or more. Participants’ age ranged from 19 to 29 (mean age 24.1). None had any relevant prior linguistic education.

8.4.1.2 Materials and design  The stimuli consisted of nine unaccusative verbs with a corresponding transitive in the vocabulary (type I); six unaccusative verbs with no transitive alternate in the vocabulary, but with a parallel adjectival passive alternate, which, following Horvath and Siloni (2008a), was taken to suggest that they have a frozen/hidden transitive alternate (type II); and six two-place unaccusative verbs with no transitive alternate, no adjectival passive alternates, and no known cases of transitive alternates in the vocabulary of languages other than Hebrew (type III). Unaccusatives were identified based on two Hebrew unaccusativity diagnostics: modification by a possessive dative and simple inversion (Borer and Grodzinsky 1986; Shlonsky 1997; Meltzer & Siloni forthcoming). For the full list of unaccusative verbs used in experiment 1, see appendix A.

For each of the twenty-one unaccusative verbs, a very short story was composed. The stories included scenarios that established the status of an entity as the causer of some event through relevant content. In each story, the event was only labelled towards the end of the vignette, using a sentence with one of the unaccusative verbs (‘the unaccusative sentence’). The very last sentence of the story described an outcome of the event (‘the outcome sentence’).

Subjects were then asked to rate from 1 (least acceptable) to 8 (most acceptable) the extent to which they perceived the causer of the event to be ‘the executor of a specific action’ that resulted in whatever the outcome sentence described. Examples (19) and (20) are translations of stories, stimuli sentences, and tasks composed for the unaccusatives nafal ‘fall’, a Hebrew type I unaccusative, and xamak me- ‘escape (the mind of)’, a type III unaccusative.

(19)  John and Mary are twins. They are a bit similar and a bit different. John, for example, is a clumsy boy who always drops stuff and Mary is not clumsy at all. In fact, teasing John about his clumsiness is Mary’s very annoying habit. Last week they were on their way to Grandma’s house for a holiday dinner. John
carried the cake and his sister Mary carried a glass dish that contained some fish. The dish was cold, slippery and heavy. Mary felt how it began to slip out of her grip.

The dish fell on the sidewalk. John gloated.

On a scale of 1–8, how acceptable/conceivable for you is it to consider Mary as the executor of one specific action that resulted in the gloating of John?

(20) Danny was very happy, he was elected chairman of the prom’s decoration committee. He was excited about the chance to finally express his creative side. Unfortunately, as the date approached, Danny found it very difficult to come up with a good enough decorating idea. It was about two days before prom night when Danny made himself sit in his room and think really hard. After sitting there for nearly two hours, it seemed to him that this method might be working and that an idea should pop up very soon. But—alas! in the exact moment he felt an idea getting structured in his mind, his sister shouted from the other room: ‘Danny, would you be a dear and make me a sandwich?’

The idea escaped Danny’s mind. It was now completely empty.

On a scale of 1–8, how acceptable/conceivable for you is it to consider Danny’s sister to be the executor of one specific action that resulted in the emptiness of his mind?

The rationale behind this task is that in order to grade the extent to which the causer (e.g. Mary, Danny’s sister) is the executor of the event described by the unaccusative verb (e.g. the falling of the dish, and the escaping of the idea from Danny’s mind), participants must facilitate the transitive concept corresponding to it. Recall that the GABLE hypothesis predicts that for each unaccusative, if the relevant transitive concept has a parallel vocabulary item in Hebrew, it should be more accessible than transitive concepts without a parallel vocabulary item, and that if the relevant transitive concept does not have a parallel vocabulary item, but does have a parallel lexical entry (a hidden lexical entry), it should be more accessible than a concept with no representation in the mental lexicon at all. The more accessible a transitive concept is for speakers, the more prominent the role of the causer as the event’s executer should be. Therefore these different accessibility levels should positively correspond with the acceptability ratings participants give to causers.

Finally, as described and illustrated above, this experimental design used outcome sentences as mediators between the unaccusative sentence and the task. This was done for two reasons. First, a question that directly concerns the event described in the unaccusative sentence (e.g. how acceptable/conceivable for you is to consider Mary as causing the dish to fall?) would have to include the unaccusative counterpart of the transitive concept whose accessibility we wish to measure. This might blur the
picture, since it might induce the facilitation of all three types of transitive concepts, thus masking the differences between them. Second, the use of outcome sentences differentiates the task from a simple content question. This is important, since it ensures participants will not concentrate on memorizing the details of the stories, which could disrupt the process of providing an intuitive judgement.

8.4.1.3 Procedure Each subject participated in a short, one-on-one training session which included two items. Two subjects who did not show a full understanding of the task were excluded from the experiment.

The experiment was conducted using a PowerPoint slide show and an answer form. The first slide included the first story. Only in the next slide, after pressing the ENTER key, did the subject encounter the unaccusative sentence, the outcome sentence, and the task. This separation was maintained in order to ensure that it was the unaccusative’s verbal concept participants were considering while answering, and not any other verbal concepts mentioned in the story. Also for this purpose, participants were instructed that once they have moved on to the next slide they cannot go back. In addition, the unaccusative verbs appeared in boldface.

8.4.1.4 Results Since the data was measured on an ordinal scale, non-parametric statistics were used to analyse the results. A Friedman test revealed a significant effect of verb type on median ratings per subject ($X^2 (2) = 25.73, p < 0.0001$) (see Figs. 8.4 and 8.5). A post hoc Wilcoxon signed-rank test comparing median acceptability ratings per participant per verb type showed that the median ratings for type I unaccusatives (median = 8, inter-quartile range = 1) are significantly higher than the median ratings for type II (median = 6, inter-quartile range = 1.75) (one-tailed: $W(18) = 171, p < 0.0001$), and that the median ratings for type II unaccusatives are significantly higher than the median ratings for type III unaccusatives (median = 5, inter-quartile range = 5) (one tailed : $W(19) = 119, p = 0.0087$). When $p$ is corrected for multiple comparisons, this pattern remains intact (i.e. Type I > Type II > Type III).

8.4.2 Discussion As detailed above, a statistical analysis of the participants’ performance found the ratings for type I concepts significantly higher than the ratings for type II concepts, and the latter significantly higher than the ratings for type III concepts. Hence, type I concept were found to be more accessible than type II concepts and type II were found to be more accessible than type III.

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8 These participants provided long and detailed philosophical explanations for their performance in the training session, thus demonstrating a clear misconception of the intuitive judgement they were asked to give.
Furthermore, as schematized in Fig. 8.6 below, the collected ratings are not distributed evenly across the accessibility scale. The difference in the ratings provided for type I concepts and type II concepts, is greater than the difference between type II and type III. This suggests that the enhancing effect a vocabulary item has on the accessibility of the corresponding concept is greater than that of a (hidden) lexical
entry. This observation is interesting but not at all surprising. It shows that the accessibility-enhancing effect of a vocabulary item used in spoken and written language is greater than the effect a hidden lexical entry has on a concept’s accessibility. This is an expected outcome, since the recurring use of these vocabulary items is predicted to render the corresponding concept highly accessible.

In addition, the variance among speakers is rather small when rating the causer of a type I transitive concepts (inter-quartile range = 1), higher (inter-quartile range = 1.75) when rating the causer of a type II concept, and much higher (inter-quartile range = 4) when rating the causer of a type III concept. This pattern of a decreasing consistency among speakers’ ratings of causers as the accessibility enhancers associated with it become fewer is also expected. When the accessibility of a transitive concept is lower, speakers’ automatic certainty in a causer’s responsibility weakens, which might bring other considerations into play, for instance the specific scenario set as context for the causer’s involvement. This type of consideration is very likely to be individual and to vary among speakers, as observed.

Another issue concerning the particular details described in the context scenarios that is worth mentioning. As pointed out by an anonymous reviewer, scenarios used as contexts for verbs like naval ‘wilt’ and kamaš ‘wither’ described the event as coming about by the means of not acting (e.g. forgetting to water a plant). Consequently, causers of these eventualities might have been assigned lower ratings, since it was their lack of action that caused the event. Therefore, a further statistical analysis was conducted: this time, one type I unaccusative and two type II unaccusatives preceded by a context describing a causer avoidance of an action (hitrofēf ‘loosen’, naval ‘wilt’, and kamaš ‘wither’) were removed. An analysis of the remaining unaccusatives reveals an accessibility pattern identical to the one reported above. The median ratings for type I unaccusatives (median = 8, inter-quartile range: 1) are significantly higher than the median ratings for type II (one tailed: W(13) = 91, \( p = 0.0008 \)), and the median ratings for type II unaccusatives (median = 6, inter-quartile range: 2) are significantly higher than the median ratings for type III (median = 5, inter-quartile range = 4) (one tailed: W(15) = 73, \( p = 0.02 \)). Therefore, speakers’ judgements were not influenced by this variable.

The results of experiment 1 reveal a three-way distinction between type I, type II, and type III transitive verbal concepts. Considering the observed pattern of

![Figure 8.6 Observed accessibility pattern](image-url)
accessibility, it is clear that some property, uniquely possessed by type II transitive concepts, renders them more accessible than type III transitive concepts, even though both types lack a corresponding word in the vocabulary of Hebrew. This is evidence in favour of Reinhart’s (2002; forthcoming, a) and Horvath and Siloni’s (2008a) hidden representation account, and against nonexistence accounts like Arad’s (2005).

Recall that, according to the nonexistence accounts, derivational gaps occur when a part of a derivational alternation simply does not exist in a particular language. Consequently, for these accounts, type II and type III transitive concepts are identical. They both lack a corresponding vocabulary item as well as a lexical representation, and are therefore not expected to trigger different accessibility for their transitive alternates, contrary to fact. On the other hand, according to the hidden representation account assumed by Reinhart (2002; forthcoming, a), and Horvath and Siloni (2008a), while type II transitive verbal concepts are listed in the mental lexicon in a hidden manner (idiosyncratically marked as unable to be inserted into the syntax), type III verbal concepts are not listed at all. As a result (under the assumption that the lexical encoding of a concept affects its perception), this account predicts that the accessibility levels of type III concepts will be lower than the accessibility levels of type II concepts. As stated, this prediction is borne out by the results of the experiment.

8.5 Hidden Cause subject-Experiencer verbs

As pointed out by an anonymous reviewer, the difference suggested by Horvath and Siloni (2008a) between unaccusatives of the arrive class (type II) and unaccusatives of the appeal class (type III) (derived v. underived, respectively) is not the only way to distinguish between these two classes of verbs. They also differ regarding their argument structure (type II are one-place predicates whereas type III are two-place predicates) and in the fact that type III verbs are psychological, whereas type II are not. It may be that it is these differences that influence the corresponding transitive concepts’ imageability and concreteness, and are responsible for the significant difference between type II and type III concepts. Thus, if the conditions of the experiment can be controlled with regard to these factors, the conclusions drawn from its results will possess a higher degree of certainty. With these particular classes of verbs, such an experimental design is impossible, since the class of unaccusatives suspected as underived are two-place psychological verbs, while the other two classes are not.

Nevertheless, there is a class of two-place psychological verbs argued to be derived from a hidden transitive lexical representation that can be compared with type III unaccusatives.9 Before introducing this set of verbs, we have to discuss the verbal

9 The relevance of these verbs for the purposes of this study was pointed out to me by Tal Siloni (p.c.).
alternation relevant for them: the alternation between object-Experiencer verbs (as in *The doctor worried John*) and their one-place, subject-Experiencer counterparts (*John worried (about his health)*).

Normally, object-Experiencer verbs do not entail their subject-Experiencer counterparts. For example, (21a) does not entail (21b), since in a scenario where Dan caused Dina to be afraid of something other than himself, (a) is true while (b) is false:

\[(21)\]
\[
\begin{align*}
(a) \quad & \text{Dan} \text{ hifxid } \text{et } \text{Dina} \quad \text{(object-Experiencer)} \\
& \text{(Hebrew)} \\
& \text{Dan frightened ACC Dina} \\
& \text{‘Dan frightened Dina.’}
\end{align*}
\]

\[
\begin{align*}
(b) \quad & \text{Dina} \text{ Exp} \text{ paxada } \text{mi-Dan.} \quad \text{(subject-Experiencer)} \\
& \text{Dina feared from-Dan} \\
& \text{‘Dina feared Dan.’}
\end{align*}
\]

According to Pesetsky (1995), the theta grid of object-Experiencer verbs is \( \langle \text{Cause, Experiencer, Subject-matter} \rangle \). Pesetsky further argues that Cause and Subject-matter cannot co-occur, and hence one of them must be left out of the derivation.\(^\text{10}\) In (21a), then, Dan can be interpreted as either the Subject-matter of Dina’s fear or as the Cause. Therefore, it does not entail (21b), where Dan can only be interpreted as the Subject-matter.

Siloni (2009) notes that this non-entailment relationship does not always hold. Some Hebrew object-Experiencer verbs do entail their subject-Experiencer counterpart. For example *hiršim* ‘impressed’ in (22a) entails its subject-Experiencer counterpart in (22b):

\[(22)\]
\[
\begin{align*}
(a) \quad & \text{Dan} \text{ hiršim } \text{et } \text{Dina} \quad \text{(object-Experiencer)} \\
& \text{Dan impressed ACC Dina} \\
& \text{‘Dan impressed Dina.’}
\end{align*}
\]

\[
\begin{align*}
(b) \quad & \text{Dina} \text{ Exp} \text{ hitrašma } \text{mi-Dan.} \quad \text{(subject-Experiencer)} \\
& \text{Dina got+impressed from-Dan}
\end{align*}
\]

Siloni (2009) shows that verbs like *hiršim* (*hidhim* ‘amazed’, *sime’ax* ‘made-happy’, *ye’eš* ‘discouraged’) constitute a set of verbs that are singled out by a cluster of additional properties that they do not share with other object-Experiencer verbs: they fail to passivize, do not pass Agenthood tests, and do not have a corresponding nominal.

According to Reinhart (2002; forthcoming, a), similarly to unaccusatives, which are derived from their transitive alternatives, subject-Experiencer verbs are derived

---

\(^{10}\) According to Pesetsky (1995), Cause and Subject-matter cannot be realized as arguments of the same verb as they are not ‘sufficiently distinct’. For a discussion on distinctness, see Pesetsky (1995) and Reinhart (2002; forthcoming, a).
from their object-Experiencer counterparts via the lexical operation of decausativiza-
tion, which removes the inputs’ Cause theta role (as discussed in section 8.2). Siloni
(2009) adopts this view and suggests the following account for the special behaviour of
hiršim type object-Experiencers. According to her, object-Experiencer verbs like hiršim
have a hidden Cause role, which cannot be realized in the syntax. Therefore, unlike
other object-Experiencer verbs, their subject can only be interpreted as Subject-matter.
Consequently, utterances like (22a) above are semantically equivalent to the ones with
their subject-Experiencer counterpart. This means that just like the transitive alternates
of unaccusatives of type II, the basic lexical entries from which subject-Experiencer
verbs like hitrašem are derived are listed in the mental lexicon but never occur in the
actual vocabulary. Henceforth I refer to this type of verbs as ‘hidden Cause Experiencer
verbs’ (see Siloni 2009 for explanation of the additional properties these verbs show).

To summarize, hidden Cause subject-Experiencer verbs are two-place psychologi-
cal verbs. In that respect, they are similar to type III unaccusatives. However, while
the former are argued to have an alternant with a Cause argument hidden in the
mental lexicon from which they are derived, the latter are argued to be underived and
to lack a transitive alternant altogether. For this reason, a comparison between these
two types of verbs can determine whether or not the accessibility differences found in
experiment 1 between type II and type III concepts can follow form the fact that
unaccusatives of type III were two-place psychological verbs, unlike unaccusatives of
type II. Since hidden Cause subject-Experiencer verbs and type III unaccusatives are
both two-place psychological verbs, any significant difference revealed by a compar-
is on of speakers’ performance in tasks involving them would suggest that the results
of experiment 1 cannot be attributed to these two factors. In addition, this compari-
son can provide further support for Siloni’s analysis, since the GABLE hypothesis
predicts that if hidden Cause object-Experiencers are psychologically real, they
should be more accessible than type III concepts.

8.5.1 Experiment 2

The following experiment compared the accessibility levels of hidden Cause object-
Experiencer verbs with the accessibility levels of type III transitive concepts.

8.5.1.1 Participants Participants included twenty-nine adult native Hebrew speak-
ers, eleven male and eighteen female, with an education level of thirteen years or
more. Participants’ age ranged from 21 to 35 (mean age 24.16). None had any relevant
prior linguistic education.

8.5.1.2 Materials and design The stimuli consisted of six hidden Cause subject-
Experiencer verbs, the six unaccusatives of type III used in experiment 1, and a group
of control items consisting of five unaccusatives of type I. For a full list of verbs used
in this experiment, see appendix B.
As described above, the characteristic that sets apart hidden Cause object-Experiencer verbs from other object-Experiencer verbs is that they never realize the Cause theta-role. Thus, in this class, the argument in subject position cannot be interpreted as Cause, but only as Subject-matter. As a diagnostic for this set, I used purpose clauses. The modification by a purpose clause has long been acknowledged as detecting Agenthood because such clauses can only modify verbs whose external argument is interpreted as an Agent (Manzini 1983; Jaeggli 1986). In our case, since the Cause role is unspecified for mental state, it can be assigned to animates and inanimates. An animate argument bearing it is usually interpreted as Agent. An argument bearing the Subject-matter role, however, is not. Therefore, modification of object-Experiencer verbs by a purpose clause can be utilized to distinguish between verbs that allow the realization of the Cause role and verbs that do not; while the former would pass the Agenthood diagnostic, the latter would fail.

Based on this, a separate group of fifteen adult Hebrew speakers were asked to rate from 1 (least acceptable) to 5 (most acceptable) the acceptability of twenty-three sentences with a purpose clause modification. Ten of the sentences included object-Experiencer verbs likely to be hidden Cause object-Experiencers, seven likely to be ‘regular’ object-Experiencer verbs, and six filler sentences with agentive verbs. The object-Experiencer verbs for which the median ratings were 2 or less were viewed as hidden Cause Experiencer verbs. Thus their subject-Experiencer counterparts were included in the experimental stimuli. For example (translated from Hebrew):

(23) Raxel ye’aša ’et rut kedey še-hi
Raxel discouraged Acc Rut so that-she
tafṣik līhiyot kazot optimiṭ kol ha-zman
will.stop to.be such optimistic all the-time

‘Rachel discouraged Ruth so she will stop being such an optimist all the time.’
(Median acceptability rating: 2)

Experiment 2 was similar in design to experiment 1. A very short story that established the status of an entity as the causer of an event was composed for each of the verbs. The events were labelled towards the end of the vignette, using a sentence with one of the verbs (‘the target sentence’11) and the very last sentence of the story described an outcome of the event (‘the outcome sentence’). Subjects were then asked to rate from 1 (least acceptable) to 7 (most acceptable) the extent to which they perceive the causer of the event to be ‘the executor of a specific action’ that resulted in whatever the ‘outcome sentence’ described. Example (24) is a translated story,

11 This label is less specific than its equivalent in the design of experiment 1 (i.e. ‘the unaccusative sentence’), since in this experiment some of the stimuli verbs were unaccusatives and some were subject-Experiencer verbs.
stimulus sentence, and task structured to test the accessibility of the transitive concept parallel to the subject-Experiencer verb *hit anyen* ('got-interested'):

(24) Joey never really cared about clothes. Most of his outfits consisted of jeans and T-shirts. Sometimes, when he was really not in the mood to think about which shirt to wear, he went to work with the same shirt he used as a pyjama. Therefore it was only natural that when his best friend Dave applied for fashion school, Joey thought it was a complete waste of time. However, as time went by, after Dave forced Joey to tag along to countless fashion shows and insisted on hearing his input regarding every design exercise he had to submit, Joey’s attitude began to change.

Joey suddenly got interested in fashion. He now spends most of his pay cheque on clothes.

On a scale of 1–7, how acceptable/conceivable for you is it to consider Dave to be the executor of one specific action that resulted in Joey spending most of his pay cheque on clothes?

8.5.1.3 Procedure Similarly to the previous experiment, following a short training session, stories and tasks were presented to participants using a PowerPoint slide show. The first slide included the first story, and after pressing the ENTER key, participants encountered a separate slide containing the target sentence, the outcome sentence, and the task. Participants then marked their judgments in an answer form. Once again, to further ensure that it is the transitive concept related to the relevant verb that was being rated, target verbs appeared in boldface and participants were instructed not to go back to the previous slide.

8.5.1.4 Results A Wilcoxon signed rank test found the median ratings provided for causers of eventualities described by hidden Cause subject-Experiencer verbs to differ significantly from the median ratings provided for causers of eventualities described by type III unaccusatives (two-tailed: \( W(25) = -162, p = 0.03 \)) (see Figs. 8.7 and 8.8). The direction of this difference is unexpected: the ratings provided for type III unaccusatives (median = 5, inter-quartile range = 1.5) were significantly higher than the ratings provided for hidden-Cause subject-Experiencer verbs (median = 4, inter-quartile range = 2.5).

Not surprisingly, median ratings provided for control items (median = 6.5, inter-quartile range = 1.5) were significantly higher from those provided for both types of target verbs (\( p < 0.0001 \)).

8.5.2 Discussion Assuming the GABLE hypothesis, the accessibility pattern revealed in experiment 2 is rather puzzling. Causers of eventualities described by type III unaccusatives, assumed not to have a transitive alternative in the mental lexicon at all, were rated significantly
higher than causers of eventualities described by hidden Cause subject-Experiencer verbs, assumed to have a hidden transitive alternative (a ‘frozen’ Cause). However, a close inspection of these verbs and the task participants were asked to perform clarifies matters.

Type III unaccusatives and hidden Cause subject-Experiencer verbs differ with regard to the type of argument in their subject position, Theme v. Experiencer,
respectively. This is crucial when these verbs are set in the context of the current experimental design. Compare, for example, the contents of the final slides presented to participants in the task involving the type III unaccusative xamak 'escaped (the mind of)', repeated in (25a), and the task involving the hidden Cause subject-Experiencer verb hit’anyen 'got interested', repeated in (25b):

(25) a. The idea escaped Danny’s mind. It was now completely empty.

   How acceptable/conceivable for you is it to consider Danny’s sister to be the executor of one specific action that resulted in the emptiness of his mind?

b. Joey suddenly got interested in fashion. He now spends most of his pay cheque on clothes.

   How acceptable/conceivable for you is it to consider Dave to be the executor of one specific action that resulted in Joey spending most of his pay cheque on clothes?

Notice that in (a) participants are asked to rate the extent to which Danny’s sister is the causer of an idea escaping Danny’s mind, while in (b) participants are asked to rate the extent to which Dave is the causer of Joey being interested in fashion. In (a), as in all other sentences involving type III unaccusatives, the entity presented as affected by the causer is inanimate (e.g. ‘the idea’), while in (b), as in all other sentences involving hidden Cause subject-Experiencer verbs, the entity presented as affected is human (e.g. ‘Joey’). Considering this along with the fact that participants were asked to rate the extent to which the causer is the executor of the target event, the surprising pattern revealed in experiment 2 can be explained. Causers established in the context as affecting inanimate objects were rated higher, while causers established as affecting humans were rated lower. The reason for this is that when the affected entity is human, it is more likely to share or to be viewed as sharing responsibility for the event taking place. As a result, the causer’s part in the execution of the event is rendered less perceptible. Therefore, when comparing hidden Cause subject-Experiencer verbs and type III unaccusatives, this task cannot be used to detect the existence of a hidden lexical representation, since the difference in the nature of the affected entity slants the results.

Nevertheless, although no conclusion regarding the psychological reality of a frozen Cause role in the lexical representation of hidden Cause object-Experiencer verbs can be drawn from this experiment, its results support this experimental design’s validity, thus reinforcing the conclusions drawn from experiment 1. First, the fact that the introduction of a human affected entity in the target sentence significantly influenced participants’ performance demonstrates that it was the target verbal concept which participants considered while completing the task, and not one of the other verbal concepts they were exposed to during the experiment. Therefore,
it confirms that the precautions taken to ensure that participants provide the required judgements (i.e. the separation of the context slide and the visual emphasis of the target verb) are indeed effective.

Second, the accessibility pattern revealed in experiment 2 shows a clear correspondence between participants’ performance and aspects of causation relevant for the lexical encoding of causative verbs. Recall that this experimental design was employed to test the predictions of the GABLE hypothesis under the assumption that the more accessible a transitive concept is for speakers, the more prominent the role of the causer as realizer of the event should be. Consequently, in the case of a transitive concept with a corresponding lexical entry, the causer is predicted to be rated higher since, according to GABLE, this concept is more accessible than a concept with no lexical encoding. The results of experiment 2 suggest that the connection between this design and the lexical encoding of transitive verbs is more direct. This is so since the contrast between causers affecting humans and causers affecting inanimate objects reveals that speakers’ decisions are guided by the information these lexical entries encode. Neeleman and van de Koot (Chapter 2 above) view the lexical semantics of causative verbs as encoding the existence of a crucial contributing factor (CCF) that is held accountable for the event. The results of experiment 2 show that the notion of CCF played a central role in determining speakers’ performance, since when the affected entity was human, and thus likely to share accountability with the causer, the latter received a lower rating even though it was contextually established as the cause of the event. In other words, participants rated the likelihood of the causer being the event’s CCF. The results of experiment 2 thus support the validity of this experimental design as a mean of detecting the hidden existence of transitive (causative) lexical entries.

Finally, even though both target conditions in experiment 2 were two-place psychological verbs, the accessibility of their corresponding transitive concepts were found to be significantly different. This suggests that these characteristics are not the ones that influence participants’ performance in this experimental design.

12 The notion of CCF in comparable with Reinhart’s +c (cause change/event) feature. For further details, see Reinhart (2002; forthcoming, a), Neeleman and Van de Koot (Ch. 2 above).

13 Nonetheless, to rule out the option that the relevance of these characteristics was masked by the introduction of a human Experiencer as the affected entity in the hidden Cause Experiencers condition, an additional third experiment has recently been completed. In the new experiment, the involvement of a human Experiencer in the eventualities described by hidden Cause Experiencer verbs was made less salient. The analysis of its results shows a pattern opposite to the one observed in experiment 2: causers of eventualities described by hidden Cause Experiencer verbs were rated significantly higher than causers of eventualities described by type III unaccusatives. In other words, the accessibility levels of the transitive concepts corresponding to these two types of verbs were yet again found to be significantly different even though both are two-place and psychological. Thus, apart from providing additional evidence for the existence of a Cause role in the lexical representation of hidden Cause Experiencer verbs, this observation further confirms that participants’ performance in experiment 1 and 2 was not influenced by these characteristics.
8.6 Conclusion

This chapter discussed the phenomenon of derivational gaps, and compared two possible types of explanations for their emergence: the ‘nonexistence approach’ and the ‘hidden representation approach’. It was shown that the assumption of hidden lexical entries is falsifiable: that even though hidden lexical entries are not used in utterances, it is possible to tap into their psychological reality. According to the GABLE hypothesis, the lexical encoding of a concept has an effect on its accessibility level. As a result, the existence of a hidden lexical entry can be revealed through the estimation of the accessibility level of the corresponding concept.

With regard to the case study at hand—gaps in the transitive–unaccusative alternation—GABLE predicts that if unaccusatives that idiosyncratically lack a transitive alternative in the vocabulary have a corresponding hidden (frozen) lexical entry, we get a three-way distinction: transitive concepts related to unaccusatives with a transitive counterpart in a speaker’s vocabulary will be more accessible than transitive concepts related to unaccusatives derived from frozen lexical entries, and the latter will be more accessible than transitive concepts related to underived unaccusatives. In contrast, if the missing transitive alternatives neither exist in the vocabulary nor are hidden in the lexicon, then GABLE predicts a two-way distinction: between those that have an alternative and those that do not. The results of experiment 1 show a three-way distinction, thereby providing evidence in favour of the existence of frozen lexical entries, as suggested by Reinhart (2002; forthcoming, a) and Horvath and Siloni (2008a). The results of experiment 2 provide support for the validity of this experimental design, thus reinforcing the conclusions drawn from experiment 1.

The GABLE hypothesis carries consequences also beyond the issue of gaps in the transitive–unaccusative alternation. It constitutes a step toward a better grasp of the linguistic encoding of concepts and the relation between abstract lexical representations and vocabulary items, a topic that can undoubtedly benefit from further cross-linguistic research involving other derivational alternations.

Appendix A. Verbs used in experiment 1

<table>
<thead>
<tr>
<th>Type I unaccusatives</th>
<th>Transitive (cause-external theta-role)</th>
</tr>
</thead>
<tbody>
<tr>
<td>hitkavec ‘shrank’</td>
<td>kivec</td>
</tr>
<tr>
<td>nafal ‘fell’</td>
<td>hipil</td>
</tr>
<tr>
<td>hitkamet ‘got wrinkled’</td>
<td>kimet</td>
</tr>
<tr>
<td>hitlaxlex ‘got dirty’</td>
<td>lixlex</td>
</tr>
<tr>
<td>nigmar ‘was finished’</td>
<td>gamar</td>
</tr>
<tr>
<td>nišbar ‘broke’</td>
<td>šavar</td>
</tr>
<tr>
<td>nisraf ‘got burnt’</td>
<td>saraf</td>
</tr>
</tbody>
</table>
Hidden Entries

nirtav ‘got wet’  
hirofefer ‘loosen’  

Type II unaccusatives
hirkiv ‘got rotten’  
kamaš ‘withered’  
naval ‘wilted’  
daĥa ‘faded’  
hexmic ‘turned sour’  
hexlid ‘became rusty’  

Type III unaccusatives
medaber (‘el )  
mešane (le)  
xamak (me)  
xaser (le)  
xore (le)  
maca xen (be-einey)  

Appendix B. Verbs used in experiment 2

Hit’anyen ‘got interested’  
tama  ‘was amazed’/’wondered’  
hicta’er  ‘was sorry’  
nidlak ‘got turned on’  
hitageš ‘got excited’  
hitya’eš ‘got discouraged’  

Type III unaccusatives
medaber (‘el )  
mešane (le)  
xamak (me)  
xaser (le)  
xore (le)  
maca xen (be-einey)  

Control items
nafal ‘fell’  
hitkamet ‘got wrinkled’  
nigmar ‘was finished’  
nišbar ‘broke’  
nisraf ‘got burnt’
To Have the Empty Theta-Role

PETER ACKEMA AND MARIJANA MARELJ

9.1 Reinhart’s theta-features and the empty theta-role

In Reinhart’s Theta System (Reinhart 1991; 2000; 2002; forthcoming, a; and Chapter 1 above), θ-roles are not primitives. They are further decomposable in terms of two binary features; \(+c\) (Cause change) and \(+m\) (Mental state). Since a cluster need not be specified for both of these features, the system allows for nine different θ-cluster combinations, i.e. nine different theta-roles. With respect to their semantic import, eight of these clusters roughly correspond to traditional θ-role labels. For example, \([+c+m]\) corresponds to the traditional Agent, \([-c–m]\) corresponds to Theme, and \([+c]\) corresponds to Cause. The ninth logical possibility, however, does not lend itself to such correspondences in a straightforward fashion. This ninth option is the empty list cluster \([\ ]\), first introduced and discussed in Marelj (2004). Marelj argues that the predicted existence of the null cluster is not a quirk of the system, but that this empty theta-role actually occurs as the result of a particular lexical arity operation that derives middles.

In this chapter we argue that the empty role can also occur as a verb’s single theta-role, namely in the argument structure of certain light verbs. Our focus here will be on the verb \textsc{have},\(^1\) and our primary goal is to show that the assumption that this verb assigns the null theta-role is instrumental in an account of this verb’s behaviour in its various uses. Our starting assumption is that \textsc{have}—in all its guises—is a light verb.

The term ‘light verb’, first introduced by Jespersen (1965), refers to the verbs found in expressions such as \textit{take a walk, give a kiss, make an offer}, and \textit{have a party}. The defining characteristic of these expressions is that the semantic content of the

\(^1\) We use small capitals when not referring specifically to the English form \textit{have} of this verb.
predicate is provided not by the verb, but by its complement. For example, *Luka and Sam had a walk* means ‘Luka and Sam walked’.\(^2\) Our assumption that *have* is another light verb, then, means it does not have independent semantic content. If a verb has no independent semantic content, this means that any thematic role such a verb has must be semantically vacuous. We argue that under Reinhart’s binary feature system, the semantically vacuous role of *have* can be successfully formalized: it is the empty cluster \([ \cdot ]\). This cluster is fully unspecified with respect to both features and values. This has direct consequences for the syntax and the semantics of structures in which *have* is involved. Syntactically, we will show that having the null cluster as external theta-role means that *have* provides the syntactic structure necessary for insertion of an external argument. Though the lexical representation of *have* lacks independent semantic content, it provides syntactic space necessary for an external argument. Semantically, such a role has no interpretation of its own. What this means is that *have* lacks semantic content necessary to provide an interpretation for the subject argument. As a consequence, the subject argument must be related in one way or another to some other theta-role in order to get an interpretation. We propose that the subject receives an interpretation by virtue of its association with a theta-role of another constituent, namely the complement of *have*. This association is established via a process of theta merger in which the semantically empty theta-role of *have* is always involved.\(^3\)

### 9.2 Auxiliaries and theta-merger

Our account is based on the analysis of periphrastic perfects and passives in Ackema (1995; 1999), with modifications to be introduced below. We will first outline Ackema’s earlier proposal in this section.

Ackema’s main concern is to explain why, systematically, the same form of the main verb, namely the past participle, occurs in periphrastic passives and perfects in Germanic and Romance. He argues that this is not a historic coincidence, but requires the assumption that in both cases we are really dealing with exactly the same form of the main verb. Building on earlier work by Haider (1984), Hoekstra (1986), and others, Ackema assumes that the crucial property of the past participle is that the participial morphology rather than the syntactic subject is assigned the verb’s external theta-role, and that, given that we are dealing with exactly the same verb form in both cases, this holds in perfects just as well as in passives. The differences

\(^2\) It has long been noted (see e.g. Wierzbicka 1982) that pairs with and without the light verb differ with respect to their aspectual properties, degree of affectedness of the argument, and the like. These differences, though interesting, are not relevant for our discussion here. What is relevant is the fact that the light verb is semantically vacuous.

\(^3\) Siloni (forthcoming) suggests that lexical two-place reciprocal verbs specify an empty cluster as one of their theta-roles; the empty role gets interpreted via its relation to the other role.
between passives and perfects should then follow from the different auxiliaries used, typically *be* in passives and *have* in perfects. Ackema argues that, whereas *be* is genuinely without any argument structure, *have* assigns an external theta-role. He further argues that any auxiliary forms a complex predicate with the main verb. Such complex predicate formation involves ‘theta merger’, the formation of a single argument structure out of the argument structures of the component predicative elements of the complex predicate, in which theta-roles of one part can be collapsed with theta-roles of the other part (see also Rosen 1990; Neeleman 1994; Neeleman and van de Koot 2002).

Since the past participle in passives and perfects is exactly the same, in both cases the verb’s external theta-role is ‘absorbed’ because it is assigned to the participial morphology. Following Reinhart, we assume that the semantics associated with this process of absorption or ‘saturation’ is one of existential quantification over the argument in question. In the spirit of Chierchia (1995; 2004), the notion ‘saturation’ in the Theta System is understood as ‘variable binding’, where a variable is bound by some operator (e.g. an existential or generic operator; see Marelj 2004 for elaboration). The canonical instance of saturation is passivization. Passive saturation closes existentially the external argument of a verb. As a consequence, a role is present semantically, but is syntactically unrealized, at least in an argument position.

As noted, given the assumption that there are no distinct perfect and passive participles, ‘absorption’ of the verb’s subject theta-role by assignment to the participial morphology takes place in a periphrastic perfect just as well. But in contrast to what happens in passives, in perfects the absorbed external role seems to be resurrected, as there is an underived subject present that is associated with this role, just as in other (non-perfect) active sentences. This is the result of theta-merger, under the assumption that, in contrast to *be*, *have* assigns a subject theta-role. This role is merged with the absorbed external theta-role of the main verb (see also Broekhuis and van Dijk 1995 for related discussion). The semantics associated with theta-role absorption, namely the argument being existentially quantified over, is no different from what it is in a passive, but because of theta-merger with *have*’s theta-role, in the complete semantics of a perfect the subject of the sentence is associated with the external role of the main verb after all. This is illustrated in (1) (cf. Ackema 1999: 108, ex.(53)).

In (1c) the assumption that *have* assigns a theta-role, i.e. predicates over the subject, is represented simply by the inclusion of a one-place predicate *have*; we will come back shortly to the fact that the semantics of the role assigned to the subject

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4 We use co-superscripting in (1b) to indicate which element is assigned which theta-role and which theta-roles are identical as a result of theta-merger. These superscripts have no further theoretical significance. Also, note that we deliberately refrain from providing an analysis of the clausal CP/IP/VP structure, as this is not relevant for our concerns; similarly, as word order is irrelevant for these thematic structures, we will present them all with arguments preceding the predicates—again, no theoretical claim is intended by this.
seems to come entirely from the theta-role with which \textsc{have}'s role is merged (the subject role of the main verb) and that \textsc{have} does not seem to contribute anything to this itself. In (1b), 'PM' stands for 'participial morphology'.

(1)  
a. The orchestra has played beautiful music.  
  b. \[\text{subject NP}^i \ [\text{object NP}^j \ \text{HAVE}(\theta^i) \ \text{VERB}(\theta^i, \theta^j)\text{-PM}^i]\  
  c. \[\exists x \ \text{Play}(x, y), \ y = \text{beautiful music} \land \text{Have}(z), \ z = \text{the orchestra} \land x = z\]

Ackema assumes that \textsc{have} must always combine with a secondary predicate and undergo theta-merger with the argument structure of this predicate. The different uses of \textsc{have} should then follow from the differences in the types of complements it combines with. In case this is just another verbal head, we are dealing with auxiliary \textsc{have}, as outlined above. In case we are dealing with a phrasal secondary predicate, we are dealing with main verb use. Ackema (1999) only considers possessive \textsc{have} in this respect, and for the moment we will do likewise. We will return to other uses in section 9.6.

If one wants to maintain a unified analysis of the thematic properties of \textsc{have} in its different uses, it cannot be assumed that 'possessive' \textsc{have} assigns an internal 'Possessed' Theme role to its object. A comparison with verbs like \textsc{possess} or \textsc{own} makes this clear. Simply put, there are countless things that one can have but that one cannot possess or own:

(2) She has/*possesses/*owns a career in physics/the measles/blue eyes/a good idea

In the spirit of Pollock (1989) and Freeze (1992), Ackema assumes that the object receives an abstract Location role that is assigned by a null predicate, a predicate that is also assumed to accompany existential \textsc{be}. 'Possessive' \textsc{have} is combined with this same null predicate, which we will term LocP (for 'Locative Phrase') from now on. The difference between structures with \textsc{be} and structures with \textsc{have} concerns the presence or absence of a second argument in the sentence, an underived subject. The structure with \textsc{be} is unaccusative (as is indeed often seen in languages in which unaccusativity syntactically manifests itself). The single argument in the structure is an underlying object that is theta-marked by LocP and subsequently moves to subject position. This is in line with the observation that secondary predicates of this kind can only predicate over (underlying) objects, not over underlying subjects (see e.g. Williams 1980). But in the case of \textsc{have} we have an unergative structure: the object theta-marked by LocP stays in object position, and the subject is an underived one.\textsuperscript{5} Clearly, this subject must receive a theta-role as well and, Ackema argues, \textsc{have} is responsible for this. This is what motivates ascribing a subject theta-role to \textsc{have}. Hence, the schematic structure of a sentence like (3a) is as in (3b) (compare Ackema 1999: 96 ex. (25); also compare with the auxiliary \textsc{have} structure in (1b)). Under the assumption that the role assigned

\textsuperscript{5} We will come back to the assumption that \textsc{have}'s empty role is an external one rather than an internal one, i.e. that \textsc{have} is unergative rather than unaccusative, in section 9.5; for now we will simply assume this.
by have is a Goal-like role, the associated semantics is roughly ‘at Mary is (located) a great record collection’. This seems to be the correct result; many people have remarked on the fact that in some languages the counterpart to possessive have sentences looks exactly like this, i.e. containing be and with the possessor inside a ‘Goal PP’; see for instance Szabolcsi (1981) and Hoekstra (1994) (see also section 9.5).

(3)  
   a. Mary has a great record collection.  
   b. [subject NP] [object NP] have(θ) LOCP (θ)

Finally, Ackema assumes that examples like (4) are identical to ones like (3), the only difference being that instead of the abstract LocP there is an overt secondary predicate here.

(4)  
   John has the window open.

A problem for this account is that in the case of ‘possessive’ have the subject is supposed to get a semantically contentful, namely Goal, role from this verb. But in perfects with auxiliary have, the content of the thematic role the subject is ultimately associated with is entirely determined by the subject role of the main verb (assigned to participial morphology and merged with have’s theta-role). There is no trace of any ‘Goal’-like content in have’s argument here.

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6 Ever since Pollock’s (1989) proposal that there is a correlation between the thematic structure of verbs and their ability to raise to AGR/I, different researchers (see e.g. Pollock 1989; den Dikken 1997; Ritter and Rosen 1997) have argued that the idea that have assigns a thematic role is problematic, since auxiliary have, and in at least some varieties of English also ‘possessive’ have, differ from proper main verbs in being able to undergo V-to-I (or V-to-I-to-C, as in (ic)):

(i)  
   a. John has never seen a unicorn.  
   b. John hasn’t a clue.  
   c. Have you a daughter?

However, it is not entirely clear that the proposed correlation and the conclusions based on it really hold. Note first that, at least in some dialects (see Cowper 1989), have only optionally undergoes raising; hence both the raised (iia) and the unraised (iib) variants are ok for these speakers.

(ii)  
   a. I haven’t a cold, I have the measles  
   b. I don’t have a cold, I have the measles

If (as under Pollock’s theory), raising is obligatory where possible, that would entail that speakers for whom have optionally raises actually have two separate entries for have: one for the raised and one for the unraised have. The obvious issue with such an account is that one would expect that the sentences that feature the unraised (i.e. theta-assigning) have (which Pollock claims should have thematic structure essentially similar to that of own) differ in terms of thematic structure from those that feature the raised have (which assigns no theta-role). However, as Cowper (1989: 86) notes, ‘sentences containing main verb have exhibit exactly the same range of thematic possibilities, regardless of whether have undergoes raising’. Moreover, considering the fact that one cannot actually own colds or measles in English, one might argue that the very grammaticality of (iib) is quite surprising under Pollock’s account. We leave the issue of the proper account of the behaviour of have with respect to verb movement for further research.

7 A reviewer remarks that this is not obviously true, suggesting that a perfect such as John has collected many records is semantically represented along the lines of the following paraphrase: ‘John is in the state of having collected many records’, and that, in this paraphrase, John simultaneously receives an Agent role
So on the one hand, in structures (1b) and (3b) **HAVE** assigns an external theta-role, but on the other hand we do not want to say that it assigns any contentful theta-roles because there is no trace of any such content, in perfects at least. These statements are only non-contradictory if contentless theta-roles exist—which is precisely what we are trying to establish with regards to Reinhart’s Theta System. In the next section we will set out exactly which assumptions we need to make to account for the properties of clauses headed by **HAVE**.

### 9.3 Properties of **HAVE**

The first two properties we ascribe to **HAVE** are those described in section 9.2:

1. **HAVE** is always combined with a predicative category with which it undergoes theta-merger. In the case of auxiliary **HAVE** this category is a verbal head, in other cases it is a predicative XP.

2. **HAVE** assigns the empty cluster [ ] theta-role as external role.

Following Marelj (2004), we argue that the empty list cluster is fully underspecified with respect to features and values. This has direct consequences for the syntax and semantics of this role. Semantically, this role is vacuous—it has no interpretation of its own. The way to license [ ] is to get it to acquire semantic content via theta-merger with a semantically contentful thematic role (we return to this shortly).

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8 A reviewer asks how contentless theta-roles can be acquired. If the thematic role truly has no semantic content, then of course any such semantic content cannot be an indicator for the presence of the role for the language-learning child. Such a role can nevertheless be acquired because of the syntactic effects its presence has. In particular, if we are correct about the effects of this role, the fact that an underived subject is present in perfects despite the main verb occurring in a form that absorbs this verb’s external theta-role is a sufficient cue. (Note that if Reinhart’s Theta System is indeed part of Universal Grammar, the child will already be primed for the possibility that a verb assigns an empty role, since, as noted, the existence of this role is simply part of the system.)

9 A reviewer remarks that there is an animacy restriction on the subject of possessive **HAVE**, at least in cases of alienable possession (see also Belvin 1996; Ritter and Rosen 1997; Harley 1997, including discussion on why adding a locative secondary predicate lifts this restriction):

(i) John has a book/*The table has a book. (alienable possession)
(ii) John has a sister/The table has four legs. (inalienable possession)

However this selectional restriction on the possessor is to be explained, it does not mean that the theta-role assigned by **have** to the subject in (i) cannot be empty, since, as the result of theta-merger, the subject is...
So, different HAVE constructions are not different because there is more than one HAVE, but because the one and only HAVE takes different complements in different uses. This is similar to Belvin (1993; 1996), Ritter and Rosen (1997), and Harley (1997), who argue that HAVE is a predicate whose interpretation is dependent on the type and relations between its arguments. Just as in our account, the interpretations of the different uses of HAVE is determined by the context in which it appears, rather than by there being different instances of this predicate itself.

That, as stated in (6), the empty theta-role is an external one rather than an internal one follows from the way theta-roles are linked to syntactic structure in Reinhart’s system. Linking in the Theta System is regulated by two types of UG rules, the marking procedures in (7) and the merging instructions in (8); the latter map the semantic onto the syntactic categories.

(7) **Marking procedures**

Given an n-place verb entry, \( n > 1 \),

a. Mark a \([-\) cluster with index 2.

b. Mark a \([+\) cluster with index 1.

(8) **Merging instructions**

a. When nothing rules this out, merge externally.

b. An argument realizing a cluster marked 2 merges internally; an argument with a cluster marked 1 merges externally.

In order for the information from the system of concepts to be legible to the linguistic system, it has to be formally coded. The feature clusters fall into three classes; (a) \([-\) clusters, namely \([-c-m], [-c], \) and \([-m]\), (b) \([+\) clusters, namely \([+c+m], [+c] \) and \([+m]\), and (c) ‘mixed clusters’, namely \([-c+m]\) and \([+c-m]\). These last ones are not assigned any index by (7), which means that these roles may have varying syntactic realizations. In such cases, (8a) determines that if nothing prevents this (e.g. if there is no co-argument marked 1 that has to be merged externally), such roles merge externally. Reinhart views (8a) as an economy requirement. An external argument is required to check the EPP, and if this requirement can be directly met by argument merger, it should be. It is less economical to first merge the argument internally and then move it to have the EPP checked.

That the ninth feature cluster, the empty list theta-role, is an external role follows from (7) and (8). Because the \([\) cluster is neither a \([+]\) nor a \([-\) cluster, it will not receive an index. Also, it is the only role assigned by HAVE. This means that the ‘when nothing rules this out’ of (8a) will always apply to it, so that it will be an external role.

The third assumption we make about constructions with HAVE relates to the predicate it combines with in the ‘possessive’ construction:

associated in the end with the Goal role which is apparently subject to this selectional restriction (see below and section 9.4).
The predicate that *have* theta-merges with in its ‘possessive’ use is a null LocP. LocP assigns two theta-roles, one externally and one internally.

Recall that a problem with Ackema’s analysis was that, while auxiliary *have* and possessive *have* were unified in the sense that they both were supposed to assign an external theta-role, the content of this role appeared to be different in both cases: a Goal-like role in the case of possessive *have* but a semantically vacuous/contentless role in the case of auxiliary *have*. We assume instead, as stated in (6), that *have* always assigns the empty theta-role. The question, then, is where the Goal role of the subject in possessive *have* sentences comes from. We assume that, like the role for the apparent object of possessive *have*, it also ultimately comes from the abstract secondary LocP predicate. The subject ends up being associated with this role as the result of theta-merger (see section 9.4 for the complete analysis). In assuming that *have* is accompanied by a predicative category headed by a ‘locative’ head that assigns an internal Goal role, our analysis falls into the tradition of the type of analyses that assume *have* is similar to *be* with an accompanying ‘to’-like preposition (though without assuming *have* is literally derived from *be* by actual incorporation of a preposition, with accompanying inversion of the possessor/possessed arguments, see section 9.5); see e.g. Freeze 1992; Hoekstra 1994; Belvin and den Dikken 1997. We will further assume that ‘possessive’ *have* is always merged with LocP, even when an overt secondary predicate is present as well, as in sentences of the kind in (4); this is necessary under the assumption that the subjects’ Goal role ultimately originates in the head of LocP; the full analysis is provided in section 9.4.

Finally, we need to adopt something like the Theta Criterion, although this need not be seen as a separate condition. Rather, that referential NPs must be linked to some semantic argument role is just a subcase of the general principle of Full Interpretation. Given the possibility of theta-merger, an NP need not actually be directly assigned a contentful theta-role; it is enough if at LF it is associated with such a role. Hence, we formulate this requirement as follows:

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10 Levinson (2011) argues that analyses that involve an empty locational P accompanying *have* are problematic, because possession can in some languages be expressed by *be* plus a non-locational P, in particular ‘with’. As noted, we do not assume here that *have* is literally *be* plus an incorporated P, and the exact semantic content of the roles assigned by the secondary predicate are not that material to us, as long as this predicate has the general thematic structure we ascribe to it. However, since our aim is to provide a unified analysis of *have*, not to provide a unified analysis of all cross-linguistic expressions of possession, we find it plausible to assume the secondary predicate accompanying ‘possessive’ *have* is in fact LocP, as this results in a semantics that can be paraphrased in a way by which many languages do in fact express possession. The fact that languages can also make use of other means to express possession does not affect this point, provided one accepts that a unified analysis of all such means is neither necessary nor desirable (which is actually a point Levinson appears to make as well).

11 The clause in (10i) contains the conditional ‘if a theta-role is projected to syntax’ because we assume that not all theta-roles need do so. In particular, we assume that roles with Arb(bitrary) content need not, e.g. in the case of the external theta role of middle verbs; see Ackema and Schoorlemmer (1994) and Marelj (2004).
(10) (i) If a theta-role is projected to syntax, it must be either associated with a syntactic argument or be ‘absorbed’, where absorption consists of assignment to participial morphology.

(ii) Referential NP arguments need to be associated with a contentful theta-role at LF.

Note again that in (10i) as well as (10ii) the crucial thing is that the theta-role is associated with a syntactic argument. It need not be assigned to the argument directly, since a role can be associated with an argument indirectly by being theta-merged with a role that is assigned to the argument, as in a HAVE perfect tense (see section 9.2). Recall that we follow several earlier authors in assuming that in all instances where a verb occurs in its participial form, this verb assigns its external theta-role (if it has one) to the participial morphology, and that the semantics associated with this ‘absorption’ of the role is one of existential quantification over the role (as in Reinhart’s model).

9.4 Analyses

Given the assumptions outlined in the previous sections, perfect tenses with auxiliary HAVE can still be analysed as in Ackema (1995). The main verb, occurring as a past participle, assigns any internal role to its object as usual, but assigns its external role to the participial morphology. This external role is theta-merged with the empty theta-role that HAVE assigns to the syntactic subject. Thus, a sentence like (11) is analysed as in (12).  

(11) John has read a book.

(12)\[ \begin{array}{c}
\text{VP} \\
\text{NP}_k^{j} \quad V' \\
\text{NP}_j^{i} \quad V \\
\text{V-PM}_i^{i} \quad \text{have} \\
\end{array} \]

θ^i = θ^k

\[ \text{Theta-merger: } \]

12 In (12) (and the other sample analyses below) we simplify the presentation by indicating theta-roles by their traditional names, e.g. [+c+m] is represented by ‘Agent’, [−c−m] is ‘Theme’, [−c] is ‘Goal’, etc. Also, in (12) we give the main verb an Agent external role and a Theme internal role, but the exact content of these roles is immaterial for the analysis; it carries over to verbs with different roles as external or internal role, and to unergative intransitive verbs (without an internal role); see below on unaccusatives.
Given the existential quantificational semantics associated with theta-role absorption (assignment to PM), and given the theta-merger that takes place, the resultant interpretation is ‘There is someone who read a book and this someone is John’.

Consider next a sentence with just possessive have and no overt secondary predicate, such as (13).

(13) Carla has a house.

As before, the subject gets the external empty theta-role role of have. The abstract LocP predicate that accompanies possessive have assigns its external role via predication to the object in the clause, while the internal Goal role of the head of this predicate is not assigned at all. However, it is merged with the external role of have, and is thereby associated with the subject (so that the condition in (10) is satisfied). The analysis is illustrated in (14).

(14) \[
\begin{array}{c}
\text{VP} \\
\text{Np}^k \\
\text{V'} \\
\text{Np}^l \\
\text{V} \\
\text{LocP} \\
\text{have}
\end{array}
\]

\[\text{(Locatum}^i, \text{Goal}^j) \quad [\quad |^k \quad] \quad \text{Theta-merger: } \theta^i = \theta^k\]

The resultant interpretation is ‘a house is at someone and this someone is Carla’, which appears to be correct (cf. section 9.2 above).

In a sentence with possessive have and an overt secondary predicate, such as (4), repeated here as (15), there is double secondary predication, i.e. it is a structure in which the secondary predicate that have is merged with (LocP) assigns its external role to a constituent which itself consists of a subject–predicate combination (a small clause).

(15) John has the window open.

The overt secondary predicate in (15), the AP open, assigns its external role via predication to the window. Together, the small clause the window open receives the external role of the covert LocP that accompanies ‘possessive’ have. And as before have assigns its external empty role to the subject John, and this role is theta-merged with the internal Goal role of LocP. All this is schematically illustrated in (16).
The resultant interpretation of the sentence is 'the situation) that the window is open is at someone and this someone is John'.

In its spirit, though not in execution, our analysis of **have** is similar to that of Ritter and Rosen (1993; 1997). These authors also propose a uniform analysis of all uses of **have**, where **have** is taken to be a functional item which lacks the lexical semantic content necessary to provide an interpretation for its subject argument and where this subject must be related to some other constituent in order to get an interpretation. A problem with their account is that the unification does not seem to extend to auxiliary **have**, as this is supposed not to add an external argument, whereas ‘main’ verb **have** does. For instance, as pointed out by Ritter and Rosen (1997), auxiliary **have** can take an unaccusative predicate (in languages that do not have a **have** v **be** split in the perfect of intransitives) and no additional argument is added to the derived subject (the unaccusative’s internal argument):

(17) The ice has melted.

The unaccusative syntax of (17) can be dealt with under our account of **have** as a verb with a null theta-role. As discussed in section 9.3, in active perfects this role usually theta-merges with the main verb’s external role. However, as discussed by Ackema (1999), there are no conditions on theta-merger that prevent theta-merger with an internal role of the main verb. In the active perfect of a transitive verb this is nevertheless impossible, as it leads to problems with other principles of grammar. In particular, theta-merger of **have**’s role with a transitive verb’s internal role would lead to two distinct arguments (the subject and the object) receiving a non-distinct role. This is ruled out by the Theta Criterion or an equivalent principle of interpretation. But in (17), theta-merger with the unaccusative verb’s internal role does not

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13 In a passive perfect, such as **beautiful music has been played**, there is theta-merger with the main verb’s internal role, just as in the unaccusative case discussed in the text, see Ackema (1999: 141-5) for discussion.
have this consequence. Unaccusatives have only a single theta-role. Application of Decausativization (e.g. Reinhart 2002) reduces the Cause role of the basic transitive entry of *melt*, but it does not affect the index assigned to the theta-role that remains after this valency reduction. This being the case, the [*c–m*] complex retains index 2, and so the instruction to merge internally. The empty complex [ ] remains an external role, just as with all other instances of HAVE. Thus, the internal argument in (17) picks up a second theta-role after having been moved to subject position, but precisely because this role is merged with the role that the argument was already assigned in internal position by *melt* (so that these roles count as one non-distinct role semantically), this is allowed.14

9.5 On the unergativity of HAVE

The assumption that structures with HAVE are essentially unergative in the sense that the subject is an underived one deviates from some other analyses that seek a unified account for the different uses of this verb. Analyses such as Kayne (1993) and den Dikken (1995), for instance, assume that HAVE is unaccusative in nature. These analyses take the observation that the semantics of ‘possessive’ HAVE is, in some languages, expressed by (unaccusative) BE plus a prepositional phrase, with the possessor being the argument of P and the possessed occurring as subject, to mean that HAVE is actually BE with an empty ‘to’-like preposition incorporated into it. The idea is that if this P is null rather than overt and incorporates into the verb, the internal argument of the PP predicate inverts with the subject argument of this predicate and becomes the derived subject of the entire clause instead of this.

While the analyses mentioned provide an account of why such ‘argument inversion’ is allowed only when there is P-incorporation, it remains unclear to us why it is an obligatory consequence of such incorporation. More importantly, it remains unclear why BE plus incorporated null element is never simply spelled out as BE; for some reason, this amalgam must have a suppletive form (namely the language’s form for HAVE) in every single language in which it occurs. As far as we know, there are no languages in which ‘John has a book’ is expressed as ‘John is a book’, which is really the expected realization under this account (suppletion, after all, being quite a marked option for spell-out). Also, as far we know, such P-incorporation and inversion of the arguments never seems to take place in those languages where P is overt, so where possession is expressed by BE plus a PP containing the possessor (cf. section 9.2). For these reasons, we find such analyses implausible a priori. But ultimately, whether or not HAVE is unergative or unaccusative is an empirical issue. In this section we will consider relevant data, taking Dutch as our main example.

14 See Ackema (1999: 127ff.) for an account of why in languages with an auxiliary split in the perfect, such use of HAVE with unaccusatives is banned in favour of use of BE.
language. On the whole, the data seem to indicate that this verb is unergative at least in this language. There is a striking phenomenon that may at first sight point towards an unaccusative status for *have*, namely the fact that it universally seems to resists passivization. We will argue, however, that this in fact follows from the analysis we provided above.

One indication that *have* is unergative is that, in languages with a *have/be* auxiliary split in the perfect tense, this verb takes *have* itself as auxiliary:

(18) Marie heeft/*is een huis gehad.
Mary has/is a house had

'Mary has had a house.'

There is quite some discussion about how reliable a test this is for unergativity v. unaccusativity, but Ackema (1999) provides an explanation for why the auxiliary split is the way it is that is crucially based on the idea that at least in Dutch it is a reliable diagnostic.\(^{15}\)

In addition to the auxiliary selection, other evidence from Dutch also points towards the unergative status of *hebben*. The availability of prenominal past participles has widely been used to establish whether a verb is unaccusative or unergative. This is because, considering transitive verbs, we see that prenominal past participles can modify an internal but not an external argument of the participial verb:

(19) a. de gedirigeerde muziek
the conducted music

‘The conducted music’

b. *de gedirigeerde dirigent
the conducted conductor

As expected, then, unergative intransitives cannot appear as a prenominal past participle whereas unaccusatives can:

\(^{15}\) In cases where there is a complex predicate, it is the unergativity/unaccusativity of the complete predicate that is relevant, so cases in which an otherwise unergative verb behaves in unaccusative fashion (taking *zijn* ‘be’ as perfect auxiliary) when accompanied by e.g. a directional PP fit into the account (see Ackema 1999: 111–15). A reviewer mentions Dutch positional verbs like *hangen* ‘hang’, which always take *hebben* ‘have’ as perfect auxiliary but for which Hoekstra and Mulder (1990) have argued that they have both an unergative and an unaccusative incarnation. The latter occurs when the verb is accompanied by a locational PP. Hoekstra and Mulder assume such structures are unaccusative so as to be able to maintain a generalization that instances of locative inversion involve unaccusative verbs only (which is a necessary feature of such constructions under their analysis of them). See Levin and Rappaport Hovav (1995: 260–74) for a critique of this position. Empirically speaking, we see no evidence that verbs like *hangen* ever behave as unaccusatives in Dutch. Besides the auxiliary selection itself, other evidence also points towards their unergative nature even when accompanied by a locational PP. For instance, they cannot appear as prenominal past participle in their intransitive use (see the main text for this diagnostic): *de dagenlang aan de lijn gehangen kleren* lit. ‘the for-days on the line hung clothes’.
Under our analysis of *hebben*, it is predicted to pattern with unergatives like (20a), and indeed it does:

(21) a. *de gehadde huizen*
    the  had  houses

b. *de gehadde verhoudingen*
    the  had  relationships

c. *de gehadde redenen*
    the  had  reasons

Note that *hebben* can appear as a prenominal *present* participle, as in (23), in line with what other unergatives can do, see (22) (although this does not discriminate unergatives from unaccusatives, the latter being able to occur as prenominal present participle as well).

(22) de lopende eendjes
    the walking ducks

‘the walking ducks’

(23) a. de op deze zaak betrekking hebbende onderwerpen
    the on this issue relation having subjects

‘the subjects related to this issue’

b. de in de commissie zitting hebbende pensioenuitvoerders
    the in the commission seat having pension.executors

‘the executors of pension funds that are members of the committee’

Also note that, in contrast to the past participle of *hebben*, the past participle of *bezitten* ‘own’ can be used as an attributive modifier of a noun expressing the thing possessed, showing this verb contrasts with *hebben* in apparently being an ordinary transitive verb:

(24) de bezeten aandelen
    the  possessed  shares

‘the shares owned’

Nevertheless, there is also a piece of empirical evidence that seems to point in the opposite direction. This is the property of *have* that it resists passivization, something
that as far as we know holds cross-linguistically. In English, which for some reason lacks impersonal passives, no intransitive verb passivizes. But even in languages that do allow impersonal passives, unaccusatives typically appear to resist undergoing the process (cf. Perlmutter and Postal 1984). **have**’s inability to passivise has therefore been taken as an indication that it is unaccusative (see e.g. Broekhuis and Cornips 2010).

Interestingly, it seems that this verb’s resistance to passive is even greater than that of most ‘ordinary’ unaccusatives. It has been observed (e.g. by Zaenen 1993 and Ackema and Schoorlemmer 1994) that passives from unaccusatives do in fact occur, albeit only in contexts that are jocular or in which the verb receives a rather forced agentive reading, as in examples like (25). (Note that in Dutch the auxiliary in a non-perfect passive is a form of *worden* ('become') rather than *zijn* ('be'), which is immaterial to the point at hand.)

from Schiphol becomes there the whole day landed and taken off

‘Planes are taking off and landing at Schiphol airport the whole day long.’

b. ?Er werd weer spectaculair gevallen door alle circusartiesten.  
There became again spectacularly fallen by all circus artists

‘All the circus artists performed spectacular falls again.’

In contrast, passivizing *hebben* always leads to strong ungrammaticality, as illustrated in (26):

(26) a. *95% van de aandelen word gehad door een enkele investeerder.  
95% of the shares become had by a single investor

b. *Alle auteursrechten op deze pagina worden gehad door de uitgever.  
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In it is instructive again to compare this with the behaviour of proper possessive verbs like *bezitten* ‘own, possess’, which ‘possessive’ *hebben* supposedly resembles in meaning. The verb *bezitten* can perfectly well undergo passivization, again showing its apparently ‘ordinary’ transitive nature. Some ‘real life’ examples plucked from the Web include the ones in (27).16

16 Our impression from a (entirely non-systematic) Web search is that legal contexts are an especially rich source for passives of *bezitten*, but this does not detract from the fact that the relevant sentences are perfectly grammatical. (Another, somewhat idiosyncratic, reading in which passive *bezeten* ‘possessed’ occurs especially often is the ‘one possessed by the devils/spirits/demons’; in fact, it seems this reading for *bezitten* almost exclusively occurs in the passive, rather than the active.)
(27) a. Die zaken worden voor 95\% gezamenlijk bezeten door de beherende vennoten.

Those businesses became jointly possessed by the managing partners.

b. De televisierechten op Laatste Starfighter worden bezeten door Warner.

The television rights to Last Starfighter are owned by Warner.

The non-passivizability of HAVE extends to that of other true light verbs. Kearns (1988/2002) notes that a nominal complement of true light verbs cannot be the surface subject of a passive (28), whereas the nominal complement of verbs that are not fully devoid of semantic content can be (29).

(28) a. The man on the right gave a groan.
   b. *A groan was given by the man on the right.
   c. John gave the floor a sweep.
   d. *A sweep was given to the kitchen floor this morning.

(29) a. John gave a demonstration of the equipment on Monday.
   b. A demonstration of the new equipment was given on Monday.
   c. He made an inspection some time last week.
   d. An inspection was made some time last week.

Recall that under our analysis, HAVE is a true light verb in the sense that it does not contribute independent semantic content, quite like give in (28) and unlike give in (29). Though on the surface they might look alike, the syntactic structure of true light verbs is different from that of transitive verbs. The true light verb does not theta-mark its action nominal complement, and the head of the true light verb’s NP complement is categorially ambiguous—it is not a full noun; see Kearns (1988/2002) for elaboration and details. This can be straightforwardly translated to the following have-instances in (30), where the complement of have is a categorially ambiguous action nominal complement parallel to the ones in (28).

(30) a. Luka and Sam had a walk/read.
   b. *A walk/read was had by Luka and Sam.
Considering that have under our analysis is uniformly a light verb, not just in cases like (30), its unavailability to undergo passivization should extend to other have-uses, which indeed it does in English as well:\footnote{We will put aside exceptions like (i) and (ii), just noting that these uses are considered 'really marginal or semi-idiomatic' (anonymous reviewer) or 'jocular' (see Santorini and Heycock 1988).

(i) She was had (by the con artist/too many sailors).

(ii) A good time was had by all.}

(31)  
\begin{itemize}
  \item a. John has a house.
  \item b. *A house was had by John.
\end{itemize}

(32)  
\begin{itemize}
  \item a. John has blue eyes.
  \item b. *Blue eyes are had by John.
\end{itemize}

We will show now that the impossibility of passivizing have (and other light verbs) does not indicate its unaccusative nature, but in fact follows from the analysis of it as unergative verb that assigns the null theta role as external role, as provided in sections 9.3 and 9.4 above.

First, recall what is left of the theta-criterion, namely the condition in (10). The relevant part of that here is that a theta-role (which is projected to syntax in the first place) must be either (i) associated with an argument, or (ii) 'absorbed', where absorption consists of assignment to the participial morphology. The problem with a passive of have is that the Goal role of the secondary LocP predicate is neither absorbed nor associated with an argument. It is not absorbed because it is not this predicate that occurs as the past participle, but have. Hence, it is the empty theta-role of have that gets absorbed by the participial morphology, not a theta-role of LocP. But neither is this Goal role associated with an argument in this case because the role with which it Theta-merges, namely the empty theta-role of have is, as just noted, not assigned to an argument in this case but absorbed by PM.\footnote{Unless this absorbed role is 'resurrected' again by further theta-merging with the external [ ] role of yet another, non-participial form of have. This is what happens in active perfect possessive examples such as We have had problems like this before, pointed out by a reviewer. Note that, while theta-roles can be (seemingly) 'resurrected' as a result of theta-merger, they can never be absorbed by proxy by this or any other process. Given usual assumptions about the locality of theta-assignment, a verb can only assign its external role to its own participial morphology, not to that of another participle (see Ackema 1999 for more details on how theta-assignment within morphologically complex words can take place). As a result, one predicate cannot absorb the theta-role of another.} This makes a structure like this, as given in (33), violate Full Interpretation, in particular the part of that represented by the condition in (10). (Note that we ignore the presence of the passive auxiliary in (33); this does not influence matters as this auxiliary (be in English, worden in Dutch) does not have any thematic structure. Also, we ignore the fact that the object in (33) raises to subject position in this passive, as this, too, is of course immaterial to the thematic properties of the structure.)
The account can be extended to the non-passivizability of other light verbs, such as those in (28), given that in these cases, too, the participial morphology is attached to a verb that is not the source of the contentful theta-role that is to be absorbed.

Broekhuis and Cornips (2010) mention some further properties, besides its non-passivizability, that may make HAVE look like an unaccusative verb. We think that these, too, fit into our analysis of HAVE as an unergative verb whose external theta-role is semantically vacuous. In particular, they mention the following two properties.

First, in contrast to most ‘ordinary’ unergatives, HAVE fails to undergo derivation with the nominalizing suffix –er:

(34)  werk-er ren-er *heb-er
     work-er run-er have-er

In this respect it seems to behave on a par with unaccusatives:

(35)  *sterf-er *aankom-er *val-er
     die-er arrive-er fall-er

Although the reliability of this criterion is not undisputed (examples where apparent unaccusatives do take -er have been pointed out e.g. by Booij 1986), let us suppose that it is the case that –er requires its base verb to have an external theta-role. Perhaps this is because this suffix has the specification that its own external role, a Referential role in the sense of Williams (1981), needs to theta-merge with such a role (cf. also Di Sciullo and Williams 1987). Hence, a werker ‘worker’ refers to the person who works,
a *renner* ‘runner’ refers to the person who runs, etc. If so, then given our earlier analysis the problem with *hebber* is, again, one of uninterpretability. The verb *HAVE* does have an external role available to be merged with -er’s R-role, but this role is without content. Hence, *hebber* would mean ‘person who <vacuous>’, which obviously is uninterpretable. 20

Second, Broekhuis and Cornips note that the subject of *hebben* can be used as an inalienable possessor of the nominal part of a locative PP:

\[
\text{(36) Peter heeft een euro in de hand.}
\]

‘Peter has a euro in the hand.’

Broekhuis and Cornips argue that a generalization about such inalienable possessors is that they must be Goal arguments, and from this they conclude that the subject in (36) is an internal Goal argument of *hebben* that is moved to subject position. Note, however, that nothing in this generalization about inalienable possessors as such hinges on the subject being a derived subject rather than an underlying one. Indeed, in our analysis, the subject of *hebben* is associated ultimately with an internal Goal role as well, only as the result of theta-merger with LocP’s Goal role rather than being assigned this role directly. Hence, we can stick to Broekhuis and Cornips’s generalization without giving up our contention that *hebben* assigns its subject an empty external role.

To sum, the inability of *HAVE* to passivize follows under our analysis of *HAVE* as functional, light verb, which has no independent semantic content, but which provides an additional external theta-role, licensing the presence of an underived subject. Such an analysis is superior to any account that bases itself on a supposed unaccusative syntax of *HAVE*, since one would—to provide a unified account under such an analysis—also have to argue that all other true light verbs are unaccusative. It is not obvious how such an analysis can be motivated for cases like *give a floor a sweep* or *give a groan*, for example.

### 9.6 A note on experiencer *have* and causative *have*

In this section we will consider how other uses of *HAVE* may fit into our account of this verb, concentrating on two main ones: what may be called ‘causative *HAVE*’ illustrated by (37), and what may be called ‘experiencer *HAVE*’, illustrated by (38).

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20 We therefore expect that if the derived noun morphologically combines with a predicative element that does have a contentful external role, things should improve. It does not seem possible to incorporate the full LocP we assume accompanies ‘possessive’ *HAVE* into a nominal derived from this verb, since examples like *huizenhebber* or *gelukhebber* do not seem to occur, as pointed out by a reviewer. But the option may provide an account for cases like *gezaghebber* ‘main officer’ (lit. ‘command haver’) and *liefhebber* ‘lover’ (lit. ‘love haver’), pointed out by the same reviewer.
These uses differ from the ones discussed so far in that have does not combine with just a predicative element, but with a complete subject–predicate combination (a clause). We will consider how likely it is to maintain that have assigns an empty theta-role in these cases as well, in line with the aim of a unified account of this verb’s behaviour, but a full analysis of the constructions in question will have to wait future research.

(37) The director had the actors do a retake.

(38) The unfortunate couple had their home repossessed by the bank.

In (37) and (38) it is clear whether have is meant to have a causative or an experiencer reading. This is simply because we know that actors doing retakes is something that directors can cause, rather than something that happens to them, while the connection between unfortunate couples and banks repossessing homes is the other way round. However, it is important to note that, on encountering a sentence like (39), the first thing that strikes one is that it is ambiguous between the causative and experiencer reading.

(39) John had his students walk out of class. (Ritter and Rosen 1993)

Bearing in mind lex parsimoniae when analysing have, this ambiguity can be explained under the assumption that the thematic role associated with John is the fully underspecified role [ ]. Consider why.

In terms of what constitutes a necessary and a sufficient condition for a participant to be interpreted as a Causer or an Experiencer, these two theta-roles show no overlap. This is very clear particularly in Reinhart’s Theta System. The necessary and sufficient condition to be a Causer is to be causally involved, which is expressed by stating that its role must be one of the [/+c] clusters. Experiencers must be mentally involved, which means their role must be a [/+m] cluster. This lack of overlap is true under other accounts of thematic roles as well. For instance, though both ‘sentience (and/or perception)’ and ‘causing an event or change of state in another participant’ are entailments that characterize the Agent Proto-Role in Dowty’s system (Dowty 1991), what we find with experiencer verbs (e.g. the propositional attitude verbs/statative perception verbs and stative psych predicates like know, believe, love) is the obligatory absence of causation and the presence of sentience/perception entailment, whereas with generic causative verbs (e.g. cause), we find causation and the absence of sentence. Moreover, under what is referred to as the experiencer reading in (39), the experiencer seems adversely affected by another participant and not merely sentient/perceiving. If a participant is causally affected by another participant, this would amount to saying that, in the present system, John in (39) is interpreted as [+m–c]. If the role needs to be explicitly specified as /–c, a causative reading for it would of course be impossible to derive. This means the two
uses of *have* can only really be unified if one assumes that the thematic role in question is fully underspecified—the empty list cluster [ ]. Being fully underspecified for either of the features/values, the [ ] is in principle compatible with either the causer or the experiencer (or any other) interpretation.

The question that arises next, of course, is how then to derive these two readings? One could propose that under the causative reading there is additional functional structure projected above *have*, say, an Event Phrase, which introduces some sort of Event Instigator/Causer role (in the spirit of Grimshaw 1990), which—via theta-merger—ensures the Causer interpretation of the [ ]-role of *have*. Alternatively, the Event Phrase could be projected below *have* (see Harley 1995) or simply be one of the two underspecified functional projections of *have*, where the higher functional projection (i.e. FP1) always introduces the Instigator/Causer of the event (see Ritter and Rosen 1997). In the case of Experiencer, one could postulate a Stative Phrase,21 which again introduces some sort of Experiencer (bearing in mind that stative verbs typically have an Experiencer/Perceiver type of role on their grid, rather than Causers or Agents). Alternatively, one could propose that an Experiencer *have* lacks the Event Phrase altogether and the interpretation of its argument is provided by other elements in the clause (as in Harley 1995 and Ritter and Rosen 1997).

One could, however, argue that, specifically with respect to the Causative and Experiencer uses of *have*, there are no conceptual reasons to prefer a uniform analysis to what we will refer to as a ‘homonymy solution’. Consider (40).

\[
\text{(40) a. Sam broke the window.} \\
\text{b. The window broke.}
\]

Whereas in the case of (40), one could argue that postulating a single *break*—as opposed to *break*1 and *break*2—allows one to capture the entailment relation that exists between (40a) and (40b) straightforwardly (see Marelj 2004), there is no entailment relation between the Causative and the Experiencer *have* to start with. Hence, positing the lexical verbs *have*1 and *have*2, assigning the roles Causer and Experiencer respectively, seems conceptually unproblematic, if not in line with the ideal of a uniform account of all uses of the verb.

However, there are actually strong empirical reasons to reject such an approach. In order to show that the ‘homonymy solution’ is not adequate, we will compare *have* to *cause* and *make* in English, with the intent to show that it cannot be the case that causative *have* has an actual Causer role on its grid.

Consider (41). In each of the sentences here, the subject argument can be interpreted as an entity that brings about the event described by the verb in the embedded clause.

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21 Borer (2005), for instance, assumes that statives have a special functional Stative Event Structure—SP, projected below EP and which stands in ‘complementary distribution’ with Aspect Phrase (a functional projection which is responsible for telic interpretation).
He made her bake the cake. The smell of the burning cake caused him to run away. Once he returned, he had her bake another one.

What is further typical of periphrastic causative constructions (not just in English, but cross-linguistically) is that they express ‘indirect and directive causation’, rather than ‘direct and manipulative causation’ (see e.g. Shibatani 1976; Dowty 1979; Dixon 2005) Typically, it is lexical causatives that express direct and manipulative causation. But this is where the parallelism between periphrastic causatives with cause and make on the one hand, and with have on the other hand, seems to stop. There are instances in which have cannot give rise to causative readings, whereas both cause and make, each assigning an actual Causer role to their subject, do. Ritter and Rosen (1993), for instance, show that unaccusative verbs like die, fall (down), and grow cannot felicitously be embedded under causative have.

Ralph had Sheila/his gold fish die.
Ralph had Sheila fall down.
Ralph had the plants grow.

But it is not the case that unaccusative verbs cannot be embedded under causative predicates as a general rule. When embedded under make or cause, Theme-unaccusatives like die, fall and, grow are possible.

Ralph caused Sheila to die.
Ralph made Sheila/the books fall.

Moreover, whereas the causative reading with embedded unaccusative verbs under have is out, the experiencer reading actually is fine:

Ralph had Sheila/his gold fish die on him.
Ralph had his daughter fall and break her leg.
Ralph had the ivy grow all the way up the side of the house.

To account for these very peculiar properties of have, we suggest that whereas cause and make predicate causal necessity and causal sufficiency, respectively (see Lauer 2010 for arguments), have by itself does not predicate causality at all, in line with it not assigning a Causer role but a fully underspecified (empty) one. If causality is, in

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22 See also Rappaport Hovav and Levin (Ch. 6 above), Neleeman and van de Koot (Ch. 2 above), and Rákosi (Ch. 7 above) for in-depth discussions of ‘causation’.

23 As pointed out by Ritter and Rosen (1993), examples like (42) are possible if the embedded Theme is interpreted as in control of the embedded event, as volitional. The fact that the causative reading becomes available only under a certain, rather forced interpretation of the embedded predicate makes have different from cause and make.
fact, not a part of the lexical semantics of have, then it does not seem surprising that the availability of a causal reading with have—unlike a causal reading with make/cause—is somehow dependent on the different facets of its complements.²⁴

In corpus studies, it is often noted that (unlike other causative verbs) have lacks clear collocations. ‘Have tends to present things as a mere fact…what is shared by many instances of causative have is the idea of a human doer who is told or commissioned by the CAUSER to do the job, usually on payment’ (Gilquin 2003: 140–42). Indeed, the lack of clear collocations is very often accounted for in terms of ‘progressive delexicalization, or reduction of the distinctive contribution made by that word to the meaning’ (Sinclair 1991: 113). These observations appear to be fully compatible with the idea that have is a verb with a fully underspecified thematic structure.

Although, as noted, a proper analysis is beyond the scope of this chapter, we would like to stress the relevance of pragmatic factors in ‘filling out’ the relevant information, left by the underspecification of HAVE. Consider examples like (45). Though, typically, when a predicate like steal is embedded under have, one expects an affected—Experiencer—reading to arise, this is not necessary. In (45), it is clearly just the context that disambiguates between the two readings.

(45) a. Luka had a masterpiece stolen (for him/for himself/for his private collection).
    b. Luka had a masterpiece stolen (from him/himself/from his private collection).

The same seems true in (46).

²⁴ It might look as if the embedded predicate is somehow ‘augmented’ by the addition of a (semi)-argument, not dependent on have at all. But there are reasons weighing against such an analysis. The ‘extra’ participant is genuinely an argument of have; it is not simply added to an otherwise saturated (embedded) predicate. If this were not the case, then the contrast between (ia) and (ib) would be quite surprising.

(i) a. He, baked a cake for him\textsubscript{ij}/*i
    b. He had a cake baked for him\textsubscript{ij}

Moreover, data like (iib) show that have and the embedded predicate do not form a complex predicate, at least, not in a canonical sense, as is sometimes suggested in the literature. Note that the different structures that have been argued to illustrate complex predicates allow the subject to bind only an anaphor, not a pronoun, in contrast to the causative have construction:

(ii) a. The librarian looked (up) the information (up) for him\textsubscript{ij}
    a’. The librarian had the information looked up for him\textsubscript{ij}
    b. The queen, painted the roses red for her\textsubscript{ij}
    b’. The queen had the roses painted red for her\textsubscript{ij}
(46)  
  a. Poor Mr Biswas had his house burned down just after his wife died.  
  b. Poor Mr Biswas had his house burned down to claim insurance money.  

The disambiguation between the two readings again seems, at least partially, dependent on the discourse information. We consider it plausible that the full underspecification of have’s theta-role makes it particularly susceptible to such factors. No disambiguation by world knowledge or context is needed for, or can change the causative reading of, ‘true’ causative periphrastic verbs like cause and make. Regardless of the lexical-semantic differences between the embedded predicates or world knowledge, Sherry is uniformly and unambiguously interpreted as a Causer in (47).  

(47)  
  a. Sherry made/caused George (to) water the plants.  
  b. Sherry made/caused George (to) overwater the plants.  
  c. Sherry caused the masterpiece to be stolen for her private collection.  
  d. Sherry caused the masterpiece to be stolen from her private collection.  

9.7 Conclusion  
We have argued that the empty theta-role is not just a conceptual artefact of Reinhart’s Theta System, but that it actually exists: it is the theta-role assigned by the verb have. The assumption that there is only one, fully underspecified have, formalized in terms of the presence of the [ ] on its grid, allows us to account for the whole array of constructions have gives rise to. We have first shown that the assumption that have assigns the empty list cluster [ ] role is instrumental in maintaining an internally consistent unified analysis of all past participles (‘perfect’ participles with have and ‘passive’ participles with be) on the one hand and the ‘auxiliary’ have and ‘possessive’ have on the other hand. In the last part of the chapter, we have shown how this uniform approach to have is consistent with the most quirky uses of this light verb, the Causative and Experiencer uses. The only thing that the empirical data seem to necessitate is that have must be fully underspecified. This being the case, we propose that a single have, with a [ ] on its grid, underlies all the uses of have.  

The formalization of the light verb’s thematic structure by utilizing the null cluster can account for the intuitions that light verbs ‘do not predicate like main verbs’ and ‘depend on the predicative power of the main verb/predicate’ (Butt 2003).25 Positing a null cluster is a way of explaining why some sort of ‘Predicate Composition’/‘Argument Fusion’ is obligatory in all instances that involve light verbs (see e.g. Rosen 1990 on Romance, Mohanan 1994 on Hindi, and Butt 1995 on Urdu).  

25 We do not, however, agree with Butt’s claim (see Butt 1995 and subsequent work) that auxiliaries and light verbs should be kept apart.
10

Emission Verbs

JOSEPH POTASHNIK

10.1 Introduction

The set of emission verbs, which have hitherto received little attention in the literature (Perlmutter 1978; Levin & Rappaport Hovav 1995; Van Valin & Wilkins 1996; Reinhart 2002; forthcoming, a), poses a challenge to argument realization theories. Descriptively, emission verbs are non-agentive unergatives which express ‘non-voluntary emission of stimuli that impinge on the senses’ (Perlmutter 1978: 163). A typical division into subcategories (Levin and Rappaport Hovav 1995: 91) is:

(1) Sound: burble, buzz, crackle, ring, whistle …
    Light: flash, flicker, gleam, glitter, shine …
    Smell: reek, smell, stink …
    Substance: bubble, gush, ooze, spew, squirt …

Two central research questions are associated with emission verbs. The first question regards their mapping: what dictates their unergativity? Reinhart (2002; forthcoming, a) claims that emission verbs are thematically indistinguishable from unaccusative change-of-state verbs: both sets involve a theme role. Such an analysis necessitates an additional mechanism for disambiguating the arising mapping indeterminacy. I assert that the analysis of emission verbs as involving a theme role is not supported by linguistic evidence. Rather, I provide empirical evidence that emission verbs have a causal implication (lacking in unaccusatives) and hence that their argument merges externally by an independently attested mapping rule. The second question addresses a transitivity alternation: only a subset of emission verbs shows transitive alternates, as in The doorbell rang/The postman rang the doorbell. I claim that the relationship between the alternates is a productive, non-derivational pattern which

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involves an animate (agentive) cause role and an inanimate cause role in the verbal concept; the latter is interpretable as an instrument.

As a starting point, evidence from unaccusativity diagnostics overwhelmingly suggests that these verbs are unergative. In English, -er nominals typically formed from unergatives are found with emission verbs:

(2) beeper, buzzer, clicker, blinker, flasher . . . (Levin and Rappaport Hovav 1995: 139)

The Italian counterparts of these verbs invariably select the auxiliary avere 'have', rather the unaccusative essere 'be', thus patterning with unergatives with respect to auxiliary selection:

(3) ha scintillato 'sparkled', ha puzzato 'stank', ha brillato 'shone' (Rosen 1984: 64)

Similar examples are found in Dutch, where emission verbs take the auxiliary hebben 'have':

   the sun has shone
   ‘The sun shone.’

   b. De sleepboot heeft eenmaal getoeterd.
      the tugboat has once hooted
      ‘The tugboat hooted once.’

   c. De kerkklokken hebben geluid.
      the church bells have rung
      ‘The church bells rang.’

Hebrew provides us with two internal-argument diagnostics. The first is untriggered inversion: if VS order in a verb-initial (matrix) clause is grammatical, the post-verbal argument is internal (Shlonsky 1997). The second is the possessive dative: a dative constituent can serve as a possessor for the subject only if the subject is an internal argument (Borer and Grodzinski 1986).

Applying internal-argument tests to the Hebrew verbs nišbar 'break' and nafal 'fall' yields grammatical results:

(5) a. nišberu śnei xalonot.  (untriggered inversion)
   broke two windows
   ‘Two windows broke.’

   b. ha-ca’acu’a nišbar le-dina. (possessive dative)
      the-toy broke to-Dina
      ‘Dina’s toy broke.’

   c. naflu harbe kadurim.
      fell many balls
      ‘Many balls fell.’
d.  *ha-kadur nafal le-yonatan.
   the-ball fell to-Yonatan
   ‘Yonatan’s ball fell.’

The grammaticality of sentences (5a–d) corroborates the classification of nišbar and nafal as unaccusatives. By contrast, if emission verbs are unergatives in Hebrew, they are expected to fail the same tests, as shown in (6):

(6)  a. *cilcelu šnei telefonim/pa’amonim.  (untriggered inversion)
   rang two phones/bells

b. *ha-telefono/ha-pa’amon cilcel le-dina.¹  (possessive dative)
   the-phone/the-bell rang to-Dina

c. *he’iru harbe panasim.
   shone many flashlights

d. *ha-panas he’ir le-yonatan.
   the-torch shone to-Yonatan

e. *šarku mispar mašrokiyot.
   whistled number whistles

f. *ha-mašrokit šarka la-šoter.
   the-whistle whistled to.the-cop

g. *šikšeku kama trisim.
   jingled some blinds

h. *ha-trisim šikšeku la-šaxen.
   the-blinds jingled to.the-neighbour

The failure of the untriggered inversion (6a, c, e, g) and possessive dative (6b, d, f, h) tests indicate that in Hebrew as well there is evidence that these verbs are unergatives.

In this chapter, I reassess the status of emission verbs and propose an analysis that directly solves the relevant research questions. The rest of the chapter is structured as follows. Section 10.2 tackles the mapping of emission verbs and explains why their subjects merge externally. Section 10.3 addresses the transitivity alternation problem and motivates a non-derivational analysis. Section 10.4 takes stock of the overall picture which has emerged and delineates topics for future research.

¹ In Hebrew, the preposition le- can indicate either possessive (‘to’) or benefactive (‘for’). Examples (6b,d) are grammatical with a benefactive interpretation, but not with the possessive reading that is relevant here.
10.2 The mapping problem

10.2.1 Emission verbs in the Theta System

Assuming a meaning-driven approach to argument realization, the main task regarding emission verbs is the identification of the component of their meaning responsible for the external merging of their arguments. Crucially, the answer depends on their thematic analysis. In order to appreciate the problem, consider the following data:

(7) Unaccusatives
    break, open, fall, melt, develop...

(8) Agent unergatives
    walk, run, march, hurry, dance...

(9) Emission verbs
    glow, shine, beam, glimmer, babble...

On what basis does the computational system merge the arguments of set (7) internally but the arguments of sets (8) and (9) externally? Clearly, set (7) is thematically distinguishable from set (8), in that the former corresponds to a theme/patient role whereas the latter corresponds to an agent role. Also clear is that the thematic role of the arguments of emission verbs, as in (9), is non-agentic. Since Reinhart’s analysis treats the arguments of emission verbs (referred to as ‘theme’ unergatives) and the arguments of unaccusative change-of-state verbs as corresponding to the same thematic role, it follows that the merging results of sets (7) and (9), under Reinhart’s account, cannot be attributed to a purely thematic classification: some other mechanism must be added.

I call into question the assumption that the values of the components of meaning involved in change-of-state verbs and in emission verbs are identical. Ostensibly, it is plausible to assume that emission verbs involve a theme role, because one tends to find the same typical inanimate NPs in subject position with verbs in set (7) as with those in set (9), NPs which are likewise commonly found in direct object position with transitives. However, the same NP may receive two distinct thematic roles from two different verbs. Reinhart’s analysis might have been influenced by a common misconception mentioned in Levin and Rappaport Hovav (2005: 183): ‘Properties of the NPs that typically fill certain semantic roles are often confused with properties of the semantic roles themselves.’

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2 The meaning-driven approach adopted here follows Reinhart in assuming a loosely coupled architecture: the CS receives merging instructions that are blind to the underlying meanings; these meanings are previously computed in a separate component. Technically, the Theta System performs the decoupling of meaning from merging by marking indices (see section 10.2.2 and Reinhart forthcoming, a).
In order to understand the shortcomings of Reinhart’s analysis of emission verbs as ‘theme-unergatives’, let us observe how the system predicts the external merging of emission verbs.

10.2.2 Emission verbs are base-generated as intransitives

Reinhart (2002; forthcoming, a) proposes that emission verbs and change-of-state verbs correspond to a V([-c–m]) entry, involving a theme role. Hence a constraint is introduced to account for the different merging results of the two sets. To show how this works, repeated below are the marking and merging procedures of the Theta System (Reinhart 2002; forthcoming, a):

(10) Lexicon marking
   Given an n-place verb-entry, n > 1:
   a. Mark a [-] cluster with index 2.
   b. Mark a [+ ] cluster with index 1.
   c. If the entry includes both a [+ ] cluster and a fully specified cluster [/a,–c], mark the verb with the ACC (accusative) feature.

(11) CS merging instructions
   a. When nothing rules this out, merge externally.
   b. An argument realizing a cluster marked 2 merges internally; an argument with a cluster marked 1 merges externally.

Reinhart suggests that emission verbs are underived and are base-generated as intransitives, and hence fail to undergo the marking procedure in (10). As a result, their [-c–m] cluster merges externally by the default merge rule (11a):

(12) The diamond glowed

(13) a. Base entry for (12): e.g. glow([-c–m])
    b. Marking: inapplicable (one place entry, by (10))
    c. Merge: external (by (11a))

Unaccusatives, by contrast, are derived according to Reinhart (2002; forthcoming, a; see also Horvath and Siloni 2011) from their transitive alternates by a decausativization operation, which reduces the external role. Therefore their theme role, a [-] cluster, is marked for internal merge before reduction occurs:

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3 Under the Theta System, the feature –c(ause) means that the argument does not bring about the relevant event; the feature –m(ental state relevant) means that the argument’s mental state is not relevant to the described event. For more discussion, see Ch. 1 above and Reinhart (forthcoming, a).
The examples above demonstrate that the scope of marking rules is constrained by the entry’s arity: it is postulated that marking does not apply to one-place entries (as stated in (10)). According to Reinhart (forthcoming, a), this constraint is derived from theory-internal principles governing economy of derivation. However, although it may account for the facts, this extra constraint has several disadvantages. First, the constraint is the only non-semantic part of a system which is otherwise based on semantic abstractions. That is, it is alien to the nature of a meaning-driven approach: explicit counting of arguments does not play a part in any other phenomenon. Second, the constraint is an implement whose functionality is to block the arguments of emission verbs from internal merge: it only affects the merging of intransitives whose cluster is marked with index 2 (e.g. theme roles). Intransitives that have clusters marked with index 1 or unmarked clusters merge externally systematically. It emerges, then, that the constraint is tailored for emission verbs. Third, the constraint is an exception to the scope of the marking procedures, and compromises the generality of the system.

In light of the above, the analysis of emission verbs as involving a theme role is questionable. In what follows, I show that a different, independently motivated analysis of emission verbs directly accounts for the merging results, obviates additional stipulations, and corroborates the semantic abstractions offered by the system.

10.2.3 Main hypothesis: the subject of emission verbs corresponds to a [+c–m] cluster

10.2.3.1 Emission verbs involve a causal implication  As previously discussed (section 10.2.1), while the sole role of emission verbs is non-agentive, there is no direct evidence that it is a [–c–m] (theme). No empirical support for a theme-oriented analysis is offered. It is therefore important to examine whether emission verbs involve a [–c–m] role or a different θ-cluster, which will make them thematically distinguishable from unaccusatives. I suggest the following hypothesis:

4 Commonly, one-place intransitives are not analysed as involving [–c] or [–m] rules (both clusters are marked with an index 2). However, see Haiden (2005) for monadic [–c] and [–m] verbs.

5 A [+c–m] cluster is compatible with both the instrument and the cause roles (Reinhart 2002; forthcoming, a). For more discussion, see also section 10.3.3.
Emission verbs Involve Cause (EIC) hypothesis

The subject of an emission verb corresponds to a \([+c-m]\) cluster.\(^6\)

The hypothesis asserts that the subject of an emission verb has a causal implication.\(^7\)

Before assessing its consequences, we look for relevant evidence. Namely, we look for diagnostics that identify \(/+c\) or alternatively \(/-c\) in a verb. In what follows, I present several tests that presumably detect cause but turn out to be unsuitable for our purposes. Then I proceed to suggest a test of my own.

A test allegedly detecting a cause role is the addition of the phrase \(by\ itself\) (Levin and Rappaport Hovav 1995). Based on examples such as (17), Levin and Rappaport Hovav argue that if \(by\ itself\) is acceptable, then the concept contains an external (but not internal) cause, which can be excluded. If \(by\ itself\) is unacceptable, then there is no external cause in the concept, as seen below:

(17) a. The door broke by itself. (unaccusative)
   b. *The diamond glowed by itself. (emission verb)

However, the addition of a \(by\ itself\) phrase is not always compatible with an external cause:

(18) a. *The food was eaten by itself.
   b. *The knife peeled the apple by itself.

The failure of the test in (18) is attributed to the fact that an external cause is present in the concept but cannot be semantically excluded. It seems, then, that this diagnostic can detect only \(/+c\) which is not present in the syntax/semantics; i.e. it can only be used for roles present exclusively in the verbal concept (in the lexicon). Therefore, the \(by\ itself\) diagnostic is inapplicable for our purposes, since if emission verbs have the cluster \([+c-m]\), the cause role is not present exclusively in the lexical concept. Rather, it is realized syntactically by the external argument. If, alternatively, emission verbs have the cluster \([-c-m]\), then \(by\ itself\) would fail as well, since in such a case there would be no cause present.

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\(^{6}\) A detailed investigation of the semantics of the feature \(M\) in the Theta System is beyond the scope of this chapter; I adhere to the assumption that intransitive uses of emission verbs (which are strictly inanimate, hence incompatible with a \([+c+m]\) cluster) have a \([-m]\) cluster as a working postulate.

\(^{7}\) The hypothesis resembles Levin and Rappaport Hovav’s (1995) account of emission verbs. They argue that emission verbs are ‘internally caused’. My proposal differs in two theory-internal but crucial ways. First, determining external or internal causation of arguments is at times motivated by the observed argument-structural facts (lack of transitive alternate), and is therefore circular; internal causation is not formalized in the Theta System (see Reinhart 2002 for arguments against internal causation). I use here the feature \(/+c\) without stipulating internal or external causation. Second, the components of meaning in Levin and Rappaport Hovav’s theory are determined by world knowledge, whereas in the Theta System they are directly encoded linguistic components of lexical entries.
Another test aimed at detecting a /+c role is the *did it* test (Frazee 2005). The addition of the phrase *X did it* is allegedly acceptable for a /+c role which is present in the verbal concept but not in the syntax:

(19) a. The glass broke. Bill did it.
   b. The door opened. Mary did it.

*Break* and *open* are unaccusatives. The grammaticality of (19), according to Frazee, means that there is a cause role present in the concept which caused the breaking/opening. However, rigorous inspection reveals that the test fails to predict the ungrammaticality of the examples in (20), which employ unaccusatives taken to involve a /+c role in the verbal concept:

(20) a. *John fell. Mary did it.*
   b. ??The ice melted. John did it.
   c. *The flower blossomed. John did it.*

Moreover, this diagnostic suffers from the same weaknesses as the *by itself* test, as it is not always compatible with an external cause:

(21) a. *The knife peeled the apple. John did it.*
   b. *John was worked hard. Mary did it.*

In the examples in (21) an agent role, compatible with a /+c interpretation, is present in the verbal concept but not in the syntax (as shown by: *John peeled the apple with the knife* and *Mary worked John hard*). The resulting ungrammaticality shows the *did it* test to be untenable.

10.2.3.2 The ‘caused-NP’ experiment So far, there are no reliable diagnostics to identify the Theta System value of /C. I propose a test that may reveal that value for intransitive verbs: for each sentence, I have constructed a second sentence, rephrasing the original one so that causation is expressed periphrastically using a nominalization of the verb. If the result is acceptable, the subject is compatible with a /+c interpretation, otherwise, it is incompatible with a /+c interpretation and has a /–c value. (This test was originally outlined in Potashnik 2009. I was at that time unaware that a similar test had been proposed in Marelj 2004: 11.) Differently put, the diagnostic tests whether speakers are prepared to accept a causal implication as expressed in an explicit causative construction, as shown in (22):

(22) a. The window broke.
   *The window caused the breakage.*
   b. The ball fell.
   *The ball caused the fall.*

8 Reinhart (2002) argues that verbs such as *blossom* contain a ‘frozen’ [+c] role in the verbal concept that is not accessible to the syntax interface but feeds lexical operations.
c. The ice melted.
   *The ice caused the melting.
d. The glasses disappeared.
   *The glasses caused the disappearance.
e. The door closed.
   *The door caused the closing.

(23) a. The rubbish smelled.
   The rubbish caused the smell.
b. The bell rang.
   The bell caused the ringing.
c. The torch shone.
   The torch caused the shine.
d. The stream gushed.
   The stream caused the gush.
e. The firewood crackled.
   The firewood caused the crackle.

The examples in (22) show that the unaccusatives break, fall, melt, disappear, and close fail the test: the corresponding paraphrase with an explicit causative construction is ungrammatical. By contrast, the unergatives smell, ring, shine, gush, and crackle in (23) pass the test. Thus, the θ-role of unaccusatives must include a /–c value, while that of emission verbs is compatible with a /+c interpretation.

One may wonder whether the diagnostic identifies only Theta System /c values, and does not also indicate causal implications which may not be linguistically encoded. For instance, it appears that when animate subjects of unaccusatives are involved, some explicit causal paraphrases of unaccusatives are marginally acceptable:

(24) a. The man escaped.
   ?The man caused the escape.
b. The girl fell.
   ?The girl caused the fall.
c. John disappeared.
   ?John caused the disappearance.

Compare (22d) with (24c): John and the glasses have the same thematic role, yet we are more inclined to accept the ‘caused-NP’ test for John. Animacy triggers implications which may influence judgements about causality. While example (24) above shows that further investigation of causality, and of /c values, is called for, the test is suited for our purposes because emission verbs all select inanimate subjects, so we are able to control for effects of animacy. I have conducted an experiment to test the above intuitions.
Method and procedures  The participants in the experiment were fifty first-year students, all naïve adult native speakers of Hebrew (volunteers). Each participant received an identical questionnaire containing forty pairs of sentences in Hebrew prepared using the formula demonstrated in (22) and (23): the second sentence in each pair was an explicit periphrastic causative rephrase of the first one. The participants received printed instructions to mark ‘Yes’ or ‘No’ respectively if they accepted or rejected the felicity of the second sentence in each pair. The duration of the test was twenty minutes.

Of the verbs appearing in the first sentence of each pair, 85% (34 out of 40) were intransitive, and the other 15% were transitive. To control for effects of animacy, only judgements about sentence pairs with non-agentive intransitive subjects (24 out of 40) were analysed. The rest were regarded as fillers. Of the intransitive verbs, 62% (15 out of 24) were unaccusatives and 38% were emission verbs (unergatives). The sentences appeared in random order.

Results  The intransitive verbs with inanimate subjects (24 out of 34) were divided into two classes: a class of unaccusatives (such as ne’elam ‘disappear’, nišbar ‘break’, hitkalkel ‘break down’, hitmale ‘fill’, livlev ‘blossom’, hirik ‘rot’), and a class of emission verbs (such as šarak ‘whistle’, hicxin ‘stink’, hivzik ‘flash’, tirter ‘rumble’, cilcel ‘ring’, karan ‘radiate’, ša’ag ‘roar’).

Each verb was assigned a ‘Causativity Level’ value. This value is the percentage of examinees who accepted the causal implication of the rephrased sentence. The experiment, then, tested the effects of the independent variable Verb Class on the dependant variable Causativity Level. The results are given in Fig. 10.1.

A one-way Between-Items ANOVA test revealed a Main effect for Verb Class F(1,22) = 116 p < 0.00001. The mean value for inanimate unaccusatives was 14%, significantly lower than the mean value for the emission verbs, which was 86%. Furthermore, every emission verb received a higher Causativity Level value than any inanimate unaccusative verb.

Discussion  The results show that there is a strong correlation between the acceptability of causal implication and the distinction between unaccusatives and emission verbs. The subject of an emission verb may be perceived as a cause, while that of an unaccusative may not. Evidently emission verbs, unlike unaccusatives, carry a causal implication and hence should be assigned a different /c value. I henceforth take it as a working postulate that the subjects of emission verbs involve a /+c feature. The hypothesis in (16), that the external role of emission verbs is [+c−m] rather than [−c−m], is borne out by the data.
Some emission verbs also have transitive alternates which will be discussed in a greater detail in section 10.3 (e.g. *The doorbell rang/The postman rang the doorbell*). The questionnaire included such emission verbs (e.g. *cilcel* ‘ring’, *śarak* ‘whistle’, *hir’iš* ‘make noise’; see section 10.3). The results show that speakers were willing to perceive the subject of emission verbs as having a /+c role uniformly, regardless of the availability of a transitive alternate.

A subsequent experiment by Idan (2009) extended the *caused-NP* test to a wider range of verbs in Hebrew, confirming the results obtained here. Moreover, the subjects of agentive transitives, causative transitives, and agentive unergatives were all found to be compatible with a /+c interpretation, whereas the subjects of unaccusatives and the direct objects of transitives were found to have a /–c value, in accordance to the Theta System’s abstractions.9

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9 A priori, these results are consistent also with a cluster underspecified for the feature /c, since when the cluster is unspecified it may be interpreted as positively valued. My choice of a direct /+c value rather than the underspecified value hinges on two theory-internal motivations. First, the Theta System imposes the [+c–m] analysis because such choice would obviate the need for a tailored marking constraint (see section 10.2.3): an [–m] cluster, unlike a [+c–m] cluster, is predicted to merge internally independently. Second, and more importantly, as will be clear shortly, the assumption that the relevant cluster is [+c–m] allows us to straightforwardly account for the transitive–intransitive alternation emission verbs show (see section 10.3).
Recapitulating, the results of the experiment corroborate the hypothesis that emission verbs have a causal implication, and therefore involve the $\theta$-cluster $[+c–m]$, in stark contrast to unaccusatives.

10.2.4 Accounting for the mapping problem

In light of the reanalysis above, one observes a clear-cut formal split between unaccusatives and unergatives (see Table 10.1).

The unaccusative hypothesis (Perlmutter 1978) proposes that there are two types of intransitives. To distinguish between the two types, one minimally needs a single binary value/feature. If emission verbs turn out to have the cluster $[+c–m]$, then this single value is readily available for intransitives: $[-]$ clusters are merged internally. Anything that is not a $[-]$ cluster is not merged internally. Taking the $\theta$-features to be linguistically coded, we come to a simple and learnable rule:

(25) The intransitive verb classification rule

An unaccusative verb has only $[-]$ cluster(s). An unergative verb has only a non-$[-]$ cluster.\(^{11}\)

Simply put, the distinct mapping can thus be done on a purely thematic basis.

Another important result is a simplification of the Theta System. As mentioned in section 10.2.2, a constraint on the entry’s arity (see (10) above) was tailored to block the subjects of emission verbs, analysed as involving a theme role, from merging internally. However, if there is no such thing as a ‘theme unergative’, the rule is no longer required. Themes always merge internally. Emission verbs have a $[+c–m]$ role, and are therefore not marked with an index in the lexicon; accordingly, their subjects merge externally.

\(^{10}\) For evidence showing subject-experiencer verbs to be unergatives, see Reinhart (2002) and Reinhart and Siloni (2005).

\(^{11}\) A $[-]$ cluster is cluster is a cluster all of whose features have the value $–$ (see Ch. 1 above).
I argue that this is a welcome result for two central reasons. First, the indeterminacy of the system regarding one-place predicates is remedied; the system is simpler and more general. Second, the need for a non-semantic constraint excluding the operation of marking procedures is obviated.

10.3 The transitive alternant problem

10.3.1 Illustration of the problem

We proceed to address the second question raised by emission verbs. Levin and Rappaport Hovav (1995) suggest that emission predicates generally do not license transitive alternants (p. 92):

(26) a. The jewels glittered/sparkled.
   *The queen glittered/sparkled the jewels.
b. The stream burbled/roared.
   *The rocks burbled/roared the stream.
c. The stew bubbled.
   *The cook bubbled the stew.
d. The truck rumbled.
   *Peter rumbled the truck.

However, a transitive alternant does appear for some of the usages (Frazee 2005; Potashnik 2009; Levin, Song, and Atkins 1997; Levin and Rappaport Hovav 1995: 115; 2005: 11):

(27) a. The tea-cups clattered.
   I clattered the tea-cups (as I loaded the dishwasher).
b. The windows rattled.
   The storm rattled the windows.
c. The doorbell buzzed/rang.
   The postman buzzed/rang the doorbell.
d. The flashlight beamed/shone.
   We beamed/shone the flashlight.

The problem is then: what is the relationship between the transitive and intransitive alternants? How is the alternation formed? In what follows, I show that my analysis of emission verbs as involving a \ [+c\text{-}m\] role directly accounts for the data. In preparation, let us first look at the solution suggested by Reinhart.
10.3.2 The transitive alternant is formed by causativization

Reinhart (2005: 4) maintains that, in pairs such as those in (27), the transitive alternant is derived from the intransitive alternant by lexical causativization: the verb’s grid is expanded by 1, and a new agent is added to the entry. Importantly, causativization in Hebrew forms a verb that assigns accusative case. The examples in (29) below show the transitives (accusative case assigners) resulting from lexical causativization of the agentive unergatives appearing in (28):

(28) a. *eli rakad.*  
  Eli danced  
  ‘Eli danced.’

b. *ha-xayalim ca’adu.*  
  the-soldiers marched  
  ‘The soldiers marched.’

(29) a. *mira hirkida et eli.*  
  Mira dance. CAUS ACC Eli  
  ‘Mira made Eli dance.’

b. *ha-mefaked hic’id et ha-xayalim.*  
  the-commander march. CAUS ACC the-soldiers  
  ‘The commander made the soldiers march.’

Thus, if the transitive alternate of emission verbs is a causative, it is expected to bear the ACC feature. In fact, according to Reinhart, the external θ-role of emission verbs involves a theme role [–c–m], and is predicted to be realized as the direct object of the derived causative verb, as the verb is marked with the ACC feature.12 ‘If the entry includes both a [+] cluster and a fully specified cluster [/a,–c], mark the verb with the ACC feature’ (see (10c) above).

However, there is counter-evidence to Reinhart’s prediction, which suggests that the relevant transitives are not derived by causativization. Hebrew provides us with a different pattern:

(30) a. *danny cilcel be-pa’amoni ha-delet.*  
  Danny rang in-bell the-door  
  ‘Danny rang the doorbell.’

12 More generally, lexical causativization has been argued to exhibit feature adjustment, an operation targeting the /c feature of the input’s cluster candidate for an external merge. The /+c value of the relevant role is adjusted to a /–c value (see Horvath and Siloni 2011). Under this analysis, Reinhart’s system also predicts that agentive verbs bear accusative case after causativization as well emission verbs (be their role [–c–m] or [+C–m], as argued here).
A causativization process is therefore unlikely to be involved in the derivation, since the original intransitive subject is realized with a preposition in each of the examples in (30), and not with accusative case, as in other instances of causativization in Hebrew.

A second fact that undermines a causativization analysis is that there is no morphological marking on the transitive verb. Causativization is generally marked morphologically in Hebrew, as is shown in examples (28) and (29): rakad ‘dance’ and ca’ad ‘march’ v. hirkid ‘dance.CAUS’ and hic’id ‘march.CAUS’, respectively. The examples in (30) and (31) show that for emission verbs, the transitive and intransitive
verbs are morphologically identical and unmarked, hence they contrast with the
morphological pattern of Hebrew causatives shown in (28) and (29).

I therefore conclude that it is unlikely that causativization is responsible for the
alternation. What process may account for the data? Another pattern of argument
realization, that of Agent–Instrument, may shed light on the problem.

10.3.3 The solution to the transitive alternate problem: the Agent–Instrument pattern

According to Reinhart (2002; forthcoming, a) and Siloni (2002), an instrument
role ([+c−m]) is generally licensed by an agent role, and need not be listed
specifically in each verb’s grid. This means that the instrument role can always
be realized (when licensed) optionally, but is not directly selected by the verb.
Furthermore, it seems that the instrument role has certain constraints on its
syntactic distribution:

(32) Instrument Generalization (Siloni 2002)

In order to be realized syntactically, an instrument requires the presence of
either an explicit agent or an implicit argument interpretable as an agent.

The generalization in (32) is often used to detect an agent at the level of interpreta-
tion. Therefore, the addition of an instrument is licensed in passives (33a), but not in
unaccusatives (33b) (Siloni 2002):

(33) a. Le crime a été commis avec un couteau. (French)
   'The crime has been committed with a knife.'
   b. *La branche s’est cassé avec une hache.
   'The branch SE is broken with an axe.'

However, there is a subset of agentive verbs, such as drill, whose behaviour with
regard to the instrument argument is different. What defines this set is that the verbs
in it include reference to a specific instrument. Specifically, the event denoted by the
verb cannot take place without that instrument (e.g. it is impossible to drill without a
drill). Differently put, the verb is associated with two distinct causal contributions to
the event: the agent and the instrument. It selects two [/+c−] roles. However, only one
of these roles is obligatorily realized:

(34) a. John drilled the tunnel (with a drill).
   b. The drill drilled the tunnel.
   drill ([+c+m], [−c−m], [+c −m])

How do the mapping procedures predict the merging of the tunnel in (34b)?

13 Originally the verbs exhibiting this pattern were called ‘manner-verbs’ (Reinhart 2002), partly over-
lapping with ‘verbs of cutting’ (Levin 1993).
(35)  a. Basic entry: drill ([+c+m], [-c–m], [+c–m])
    b. Marking: drill_{acc} ([+c+m], [-c–m], [+c–m])
    c. Agent not realized: drill_{acc}([+c–m], [-c–m], [-c–m])
    d. Merge of the instrument argument: external (by default rule)

Let us observe the following facts regarding this pattern:

(i) The pattern has two hallmarks: (a) Both alternants are morphologically unmarked, since a derivational process was not involved (see (ii) below). (b) The instrument argument, when not in the subject position, is marked with a canonical instrumental preposition or an instrumental case.

(ii) The Agent–Instrument pattern is a source of non-derivational alternation in the Theta System, in contrast to arity operations such as decausativization, saturation, and lexical causativization.14

(iii) Nothing in the Theta System and in general precludes the possibility of having a two-place variant of the Agent–Instrument pattern. Lexical entries with a V([+c+m], [+c–m]) grid are predicted to exist and are expected to have unergative alternates whose subjects realize the [+c–m] cluster. Furthermore, nothing prevents such an unergative alternate from serving as an input to lexical causativization, resulting in two transitive alternates for a single unergative. As I will show in section 10.3.5, Hebrew data bears out these predictions.

(iv) The label ‘instrument’ given to a [+c–m] cluster reflects only one of its possible thematic interpretations (see also Rákosi, Chapter 7 above). The Theta System abstracts components of meanings; thematic roles are only conventionalized labels. Specifically, instruments and (inanimate) causes share the same cluster composition:

The cluster [+c–m] is consistent with both the instrument and the cause role. In both cases, the bearer of the role causes a change, and no mental state is involved. The difference is that an instrument never does it alone, but in association with an agent. There is, however, no reason to assume additional features for capturing this difference. (Reinhart 2002; forthcoming, a).

Therefore, the generalization formulated in the Agent–Instrument pattern is not necessarily expected to be exhibited only by verbs with a conventionalized instrument interpretation, but also by verbs with (inanimate) cause arguments. Reformulating, one observes in Reinhart’s account two orthogonal conditions which are required of a verb to participate in the Agent–Instrument pattern:

14 Stipulating a new derivational operation which reduces agents only in a specific set of verbs is implausible, because that new operation fails to leave morphological traces in Hebrew which regularly mark verbs when derivational operations occur. Such a stipulation creates a new class of derivational operations behaving strikingly differently from known ones. It is more economical to assume that the Agent–Instrument pattern is a different phenomenon.
Conditions required for the Agent–Instrument pattern:

a. An agent is available in the concept.

b. There is an (inanimate) argument with a /+c value.\(^{15}\)

Each of the conditions by itself is necessary but not sufficient. Condition (a) is responsible for the alternation with an externally merged agent argument. Condition (b) is responsible for the interpretation of an inanimate argument as having a cause/instrument role and not as a theme role. Although a theme and an instrument are similar in the sense that they are both objects which may be operated on by agents, the latter role involves a causal implication absent in the former.

The conditions are also independent of each other: the fact that some argument has a causal implication does not necessarily have any bearing on whether it may or may not be used as an instrument. Additionally, a theme role is not mentioned or required by the pattern; it is merely easier to identify the argument of an instrument/cause role if a separate argument realizing the distinct theme role is present.

In light of the above, and given my claim that the subject of emission verbs involves a \([+c-m]\) cluster—the cause/instrument role—it is fully to be expected that the Agent–Instrument pattern will be attested by the subset of emission verbs which include an agent in the verbal concept, as indicated by evidence from Hebrew (see also Haiden 2005 for evidence from German). Let us summarize this evidence in comparison to the Agent–Instrument pattern.

First, consider an example of the following Agent–Instrument pattern in Hebrew:

(37) a. Danny peeled ACC the-apple in-knife
   ‘Danny peeled the apple with a knife.’

   b. The-knife peeled ACC the-apple
   ‘The knife peeled the apple.’

The same pattern can also be witnessed with transitive alternates of emission verbs. The relationship between the transitive and intransitive alternates of emission verbs conforms to the Agent–Instrument pattern and displays its two hallmarks. First, the original intransitive subject is realized with the locative/instrumental preposition (be-) that is used also to license canonical/uncontroversial instruments. Second, the alternation is not due to a derivational operation, as evidenced by the absence in all the alternations of the kind of morphological marking which indicates other

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\(^{15}\) Condition (36b) refers only to cause arguments that are selected by the verb, not to any instrument licensed by the instrument generalization in (32). This is shown by the contrast between the following: The boy ate the soup with a spoon, but not *The spoon ate the soup.
derivational operations in Hebrew. The pattern is given below (repeated from (30) and (31) above):

\[(38)\]

\[\begin{align*}
\text{a.} & \quad \text{Danny } \text{cilcel } \text{be-pa’amon ha-delet}.^{16} \\
& \quad \text{Danny rang in-bell the-door} \\
& \quad \text{‘Danny rang the doorbell.’}
\end{align*}\]

\[\begin{align*}
\text{a’.} & \quad \text{pa’amon ha-delet cilcel.} \\
& \quad \text{bell the-door rang} \\
& \quad \text{‘The doorbell rang.’}
\end{align*}\]

\[\begin{align*}
\text{b.} & \quad \text{galit he’ira ba-panas.} \\
& \quad \text{Galit shone in.the-torch} \\
& \quad \text{‘Galit shone the torch.’}
\end{align*}\]

\[\begin{align*}
\text{b’.} & \quad \text{ha-panas he’ir}.^{17} \\
& \quad \text{the-torch shone} \\
& \quad \text{‘The torch shone.’}
\end{align*}\]

\[\begin{align*}
\text{c.} & \quad \text{ha-šoter šarak ba-mašrokit.} \\
& \quad \text{the-policeman whistled in.the-whistle} \\
& \quad \text{‘The policeman blew the whistle.’}
\end{align*}\]

\[\begin{align*}
\text{c’.} & \quad \text{ha-mašrokit šarka.} \\
& \quad \text{the-whistle whistled} \\
& \quad \text{‘The whistle blew.’}
\end{align*}\]

\[\begin{align*}
\text{d.} & \quad \text{ha-tinok hir’iš ba-ra’ašan.} \\
& \quad \text{the-baby made.noise in.the-rattle} \\
& \quad \text{‘The baby rattled the rattle.’}
\end{align*}\]

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\[^{16}\] Hebrew realizes instrument arguments with either the preposition be- or the preposition im: Dan kilef et ha-tap’u’ax im sakin ‘Dan peeled the apple with a knife’. An anonymous reviewer observed that the preposition im cannot be used in the examples of (38): ‘Danny cilcel im pa’amon ha-delet ‘Danny rang with the doorbell’. The difference between the prepositions may be that im is used for the productive adjunction of instruments, which is not the case in (38). While this observation may suggest that the PP arguments in the examples in (38) are not canonically construed as instruments, it does not undermine my proposal that the source of the Agent–Instrument alternation and the one exhibited by emission verbs is the same. As noted earlier, the Theta System captures generalizations about alternations without committing to conventionalized interpretations of thematic roles.

\[^{17}\] There is further evidence that the alternation is involved here is of the Agent–Instrument type:

\[\begin{align*}
\text{(i)} & \quad \text{ha-panas he’ir et ha-rexov} \\
& \quad \text{‘The torch illuminated the street.’}
\end{align*}\]

\[\begin{align*}
\text{(ii)} & \quad \text{Galit he’ira et ha-rexov ba-panas} \\
& \quad \text{‘Galit illuminated the street with the torch.’}
\end{align*}\]

In these examples, a theme argument is realized (ha-rexov ‘the street’, see also (34), (37)), which reinforces the claim that ha-panas ‘the torch’ is not the theme.
d'. ha-ra’as̱an hir’iš.
the-rattle made.noise
‘The rattle rattled.’

e. ha-yeled šikšek ba-trisim.
the-child jingled in.the-blinds
‘The child jingled the blinds.’

e'. ha-trisim šikšeku.
the-blinds jingled
‘The blinds jingled.’

Recapitulating, the hypothesis that the θ-role of emission verbs involves a [+c–m] cluster not only solves the mapping problem but also motivates the observed alternation in (38), given the independently attested Agent–Instrument Pattern. Note that the discussion above does not exclude the independent ability of emission verbs to feed an operation of lexical causativization; this possibility will be discussed in greater detail in section 10.3.5.

10.3.4 Emission verbs in English

The question now arises as to why in English, the transitive alternate of emission verbs realizes the original intransitive subject with what appears to be ACC case, while in Hebrew the original intransitive subject is realized with an instrumental preposition. Consider the following (repeated from (27d) above):

(39) a. The torch beamed/shone.
    b. We beamed/shone the torch.

Recall that the realization of the original subject as a PP in the transitive alternate in Hebrew was taken as evidence that this verb is not derived from the intransitive one via causativization. Does the fact that *torch* is realized as a direct object in English

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18 I do not at present discuss why some emission verbs do not contain an agent role in the verbal concept and do not exhibit the Agent–Instrument alternation. The inclusion of an agent role in the verbal concept seems to be an empirical matter, and depends on the event the verb depicts (see also Levin and Rappaport Hovav 1995: 118), but it is irrelevant to the identification of a [+c–m] cluster per se. In contradistinction, for views which distinguish the semantics of eventive instruments from ‘pure’ instruments and discussion of why certain ‘pure’ instruments also function agentively, see Kamp and Ross-deutscher (1994) and Alexiadou and Schäfer (2006).

19 Several studies investigate the behaviour of PP arguments in English. Two principal approaches exist which analyse an oblique argument as surfacing as a direct object. Under the first analysis, the relevant Case is licensed through a phonetically null head (Emonds 1985; Kayne 1994; den Dikken 1995), which parallels be- in Hebrew. A second analysis, which I adopt here, is that the relevant DP-Case is morphologically indistinct from ACC case (Botwinik-Rotem 2004; 2006).
indicate that causativization has occurred, as suggested in Reinhart (2005)? Not necessarily. English exhibits a variety of oblique NPs that are morphophonologically non-distinct from arguments bearing ACC case, most notably those associated with double-object constructions (e.g. Oehrle 1976; Larson 1988; Baker 1997) and with two-place unaccusatives such as appeal (Belletti and Rizzi 1988). Put differently, English and Hebrew differ with respect to the relation between the abstract accusative case and its morphological manifestation. Consider the following sentences, which restrict the external argument to being agentive:

(40) a. John/*The wind/*The war shot the bullet.
    b. John shot the victim.
    c. John shot the gun.

(41) John shot the bullet at the victim with a 9 mm handgun.

The arguments realized in the direct object position in (40) correspond to different roles: in (40a) the accusative-marked argument is a theme; in (40b), a goal; and in (40c), an instrument (as shown by (41)). That these are the relevant thematic roles is also reinforced by the following examples:

(42) a. John shot the bullet with a 9 mm handgun.
    b. John shot the bullet at the target.
    c. *John shot the gun with a bullet.
       (Intended meaning: John shot a bullet out of the gun.)
    d. John shot the victim with a bullet (*with the gun).
    e. John shot the gun at the victim.
    f. John shot the victim with a 9 mm handgun.

One observes that when multiple objects are realized, if the true theme argument surfaces it receives the accusative case, while other internal arguments are realized with prepositions (as in (42a) and (42b)). If the bullet is realized as a PP, it is obligatory interpreted as an instrument on a par with the gun (not as a theme). In such a case, the presence of a true instrument argument (e.g. the gun) in either the direct or indirect object position renders the sentence ungrammatical (as in (42c) and (42d)).²⁰ Note that both arguments can co-appear in (42a). Finally, if the theme argument is left unexpressed, either the goal or the instrument may be realized as the direct object (as in (42e) and (42f)).

Furthermore, in Hebrew, which does not allow the flexibility of the English Case system, only the direct object in example (40a) gets the ACC marker (as shown in (43a)), while the other objects are obligatorily realized with prepositions:

²⁰ Multiple uses of with are possible: John filled the pool with water with a hosepipe.
Dan shot ACC the-bullet
‘Dan shot the bullet.’

Dan shot in.the-gun
‘Dan shot the gun.’

Dan shot in.the-victim
‘Dan shot the victim.’

Now let us consider the following paradigm:

a. *The arrow shot.
b. *The victim shot.
c. The gun shot.

(40a) demonstrated that shot allows agents ([+c+m]) only. Therefore, reduction of the external role (decausativization) is inapplicable, since reduction applies to [+c] clusters only (Reinhart 2002; forthcoming, a; Reinhart and Siloni 2005); (44a) and (44b) demonstrate the ungrammatical results. However, (44c) is acceptable. Why is this so? The Agent–Instrument pattern provides an account: its conditions (see (36)) are met. First, an agent is available in each of the concepts. Second, shoot obligatorily takes the shooting instrument as a part of the concept (see also Neeleman and Van de Koot, Chapter 2 above). Examples (40c) and (44c) are therefore instances of the Agent–Instrument alternation. Note that the theme argument is not required to enable the alternation. The same observations apply also to other weapon-related verbs such as stab or fire.

In spite of the superficial similarity, it is unlikely that the verb in (40c) John shot the gun is a lexical causativization of the verb in (44c) The gun shot, because (44a) and (44b), *The bullet/*The victim shot, are ungrammatical and cannot serve as an input to (40a) and (40b) respectively. However, this is precisely the account Reinhart provides for the alternation exhibited by emission verbs (e.g. The torch shone/We shone the torch). Alternations that superficially resemble lexical causativization are actually driven by an entirely different mechanism, and manifest different meaning relationships.

However, this is not to say that any transitive alternate of an emission verb is necessarily a manifestation of the Agent–Instrument pattern. In the following section (section 10.3.5), I demonstrate the independent availability of causativization, and explore the differences between Agent–Instrument alternations and causativization.

Based on the above, it is clear that in English the ACC case cannot be taken as evidence in favour of identifying a theme role, and cannot be taken as evidence of a
causative alternation. Therefore, the alternation in English can be analysed on a par
with the one in Hebrew, as an instantiation of the Agent–Instrument pattern.

Furthermore, the alternations such as *The doorbell rang/The postman rang the
doorbell* in English (27a–d) are described by Levin and Rappaport Hovav (1995: 115) as
follows: ‘These pairs are what we call spurious causative pairs: by spurious we mean
that what appears to be a causative pair involves two distinct verb meanings—one of
them causative—that are not derivationally related.’ Levin and Rappaport Hovav
then suggest that some emission verbs have dual classification, with both ‘internal’
and ‘external’ eventualities, the latter licensed when the relevant emission ‘must be
emitted by manipulable entities’. Without formalizing the Agent–Instrument pat-
tern, Levin and Rappaport Hovav identify the distinguishable causal contributions of
the agent and the instrument. However, they claim that emission verbs involve two
distinct lexical semantic representations that happen to share the same constant but
are not related by any productive rule (1995: 118–19). The evidence brought so far
points to the contrary: the pattern is pervasive and productive. An exhaustive list of
verbs conforming to the pattern is provided in section 10.3.6.

10.3.5 Causativization v. Agent–Instrument alternations

I demonstrated that transitive alternative to emission verbs in Hebrew are due to the
Agent–Instrument pattern, and follow naturally from the identification of emission
verbs as involving a [+c–m] cluster. However, nothing of what was said excludes the
independent possibility of causativization of the intransitive alternant. Hebrew
vehicle transport verbs, *tas ‘fly’, nas’a ‘ride’, and šat ‘sail’ manifest both options. I
show that these verbs belong in the syntactic class of emission verbs: their intransitive
use is non-agentive unergative, corresponds to the same cause/instrument role, and
manifests the same alternations. Importantly, they also allow a causativized entry
whose morphological form, syntactic behaviour, and semantic behaviour are distinct.
Consider the following data:

(45)  a. *ha-matos tas.*
     the-plane flew
     ‘The plane flew.’

     b. *ha-mexonit nas’a.*
     the-car rode
     ‘The car rode (on).’

     c. *ha-sira šata.*
     the-boat sailed
     ‘The boat sailed.’
The examples above show that these verbs manifest the Agent–Instrument pattern: the transitive alternate is morphologically unmarked and employs a canonical locative/instrumental preposition. The conditions for the Agent–Instrument pattern are met: vehicle transport verbs (i) may be utilized by agents and (ii) encode a specific argument with causal implication, an instrument, without which the eventuality cannot occur. The evidence further reinforces the predictive power of the conditions for the Agent–Instrument pattern in (36).22

The familiar tests for detecting internal arguments will establish that these verbs are unergative in Hebrew: untriggered inversion and possessive dative.

21 The preposition be- in the examples in (46) does not simply denote a location. It has clear instrumental use, as can be seen from the failure of the wh-question that tests for a locative interpretation of the vehicle: ‘Eyfo Dan tas le-amerika? ’Where does Dan fly to America?’

22 Another possibility is to analyse the alternations exhibited in (45) and (46) as dual instances of the same verb, whose external Θ-role is [+c] rather than [+c–m]. This role is realized as [+c–m] in ha-mexonit nas’a ‘The car rode on’, and as [+c+m] in Sara nas’a ba-mexonit ‘Sara rode in the car’. This analysis is infeasible because the activity the agent performs is different from the activity the instrument performs: their causal contributions to the event are distinct, a trait which does not characterize ‘true’ [+c] roles, as in Maxi/The wind opened the door, where different subjects perform the same activity.
The failure of the untriggered inversion test (47a, c, e) and the possessive dative test (47b, d, f) shows that the subjects of the intransitive verbs in (45) are genuinely external.

Notably, the verbs in (45) are also candidates for lexical causativization, which yields different transitives from those produced by the Agent–Instrument pattern. Recall that causativization in Hebrew (i) is generally marked with causative morphology, (ii) forms an output-bearing accusative Case. Indeed, the verbs in (45) have in addition to the transitive alternants in (46), transitive alternants that are morphologically marked and bear the ACC feature, in contrast to those in (46) above:

(48) a. dani hetis et ha-matos.
   Dani flew.CAUS ACC the.plane
   ‘Danny flew the plane.’

b. sara hesi’a et ha-mexonit (la-musax).
   Sara rode.CAUS ACC the-car (to.the-garage)
   ‘Sara drove the car (to the garage).’

c. yoni hešit et ha-sira.
   Yoni sailed.CAUS ACC the boat
   ‘Yoni sailed the boat.’

Moreover, recall that lexical causativization always adds a [+c+m] agent role. Hence, the ungrammaticality of the non-agentive subjects in (49) reinforces the conclusion that causativization is involved:

(49) a. *ha-ru’ax hetisa et ha-matos.
   The-wind flew.CAUS ACC the-plane

b. *ha-te’una hesi’a et ha-mexonit (la-musax).
   The-accident rode.CAUS ACC the-car (to.the-garage)

c. *ha-yam hešit et ha-sira.
   The sea sailed.CAUS ACC the-boat

Recapitulating, vehicle transport verbs display both the Agent–Instrument pattern (see (46)) and lexical causativization (see (48)).

The syntactic differences between the transitive alternants formed with the Agent–Instrument pattern (46) and the transitive alternants formed by causativization (48) are clear: morphological marking on the verb and the ACC Case of the object characterize causativization in Hebrew, while neither of these occurs in transitive alternants produced by the Agent–Instrument pattern.

The semantics of the two alternants is not the same, either. In both of the transitive variants the agent uses the vehicle, but it is used in a different way in each. The Agent–Instrument pattern puts the emphasis on the object’s being an instrument, not a theme: the object is used to advance the agent from one location to another.
Crucially, the person using the vehicle need not be the one who drives it. On the other hand, the meaning of the causative alternant is not one of usage, but rather of effecting a deliberate operation on the vehicle (i.e. moving the vehicle).

Fig. 10.2 summarizes the relationships between the three verbal alternates.23

It still remains to be established when each of these paths can be taken and what other conceptual or language-specific factors constrain them further. Why does Hebrew not allow emission verbs to undergo causativization as vehicle transport verbs can? I leave this as an open question for research regarding the range of lexical causativization options in Hebrew and cross-linguistically.

I conclude, then, that a transitive alternate of a non-agentive unergative need not necessarily be the product of lexical causativization, though it may be. 24 Two different alternates are present side by side; one is derived by causativization and the other instantiates the Agent–Instrument pattern. 25 This corroborates the claim that the morphologically non-distinct transitive alternant is not derived by

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23 If feature adjustment, the operation targeting a cluster candidate for external merge (see fn. 12 and Horvath and Siloni 2011), occurs in lexical causativization of unergatives in general and not only agentive unergatives, then tas ‘fly’ V([+c–m]) would result in hetis ‘fly.CAUSE’ V([+c+m], [+c–m]). The marking and mapping procedures of the Theta System (10) and (11) then predict that the original intransitive subject is realized with ACC case in its causative alternant, as indeed is the case.

24 A set of verbs such as hisria’x ‘stank’ and hivrik ‘polish/shine’ appear to demonstrate causativization for some emission verbs, as the internal argument of their transitive alternates is realized with ACC case and not with an instrumental preposition. Their behaviour requires rigorous exploration which is beyond the scope of this chapter (see Borer 1991).

25 It is possible for the transitive alternate with the Agent–Instrument pattern to serve as input for additional causativization, which transforms the agent role into a theme role by feature adjustment, this
causativization, as it is not possible that both transitive alternants are derived by the same operation given their different properties.

10.3.6 Sets of (non-)alternating emission verbs in Hebrew

Recapitulating, I have argued that, since emission verbs involve a [+c–m] role, a morphologically unmarked transitive alternate for them is licensed by the conditions of the Agent–Instrument pattern when an agent is available in the concept (as shown in (36)). Hence, emission verbs in Hebrew may be partitioned into two sets:

(50) Emission verbs which do not have a transitive alternate:

(51) Emission verbs allowing a transitive alternate (formed with Agent–Instrument pattern):

(52) Transitive alternates (formed with Agent–Instrument pattern) for the verbs in (52):
   cilcel ba-pa’amon ‘rang the bell’, dinden ba-pa’amon ‘rang the bell’, he’ir ba-panas ‘shine the torch’, šarak ba-mašrokit ‘whistle the whistle’, hir’iš ba-ra’ašan ‘made noise with the rattler’, hivzik ba-maclema ‘flashed the camera’, šikšek ba-trisim ‘jingled the blinds’, zimzem ba-interkom ‘buzzed the intercom’, hivhev be-orot ha-rexev ‘flickered the vehicle’s lights’, cifcef ba-mašrokit ‘beeped the whistle’, kirkeš ba-maftexot ‘clanged the keys’, nakaš ba-kafl ‘clattered the spoon’

Verbs from both lists in (50) and (51) appeared in the questionnaire which tested causal implication, described in section 10.2.3.2. The results show that speakers were willing to judge these verbs as having a /+c role, regardless of whether they allow a transitive alternative. These findings corroborate the hypothesis that emission verbs uniformly have the thematic representation V([+c–m]), independently of whether they may participate in lexical alternations, derivational or otherwise.

time leaving the instrument intact: Dani tas ba-matos ‘Danny flew in the plane’ → Ruti hetisa et Dani ba-matos ‘Ruti flew Danny in the plane’ i.e. V([+c+m], [+c–m]) → V([+c+m], [−c+m], [+c–m]).
10.4 Summary

The chapter has explored two central research questions involving emission verbs. First, the mapping problem: what dictates their unergativity? Second, the transitive alternant problem: how are the transitive and intransitive alternants related? I have shown that the answers to both questions are derivable from my analysis and are intimately linked.

Reinhart (2002; forthcoming, a) asserts that emission verbs and change-of-state verbs are thematically indistinguishable. Hence a constraint stipulating dependency on the arity of the verb must be added to the Theta System with the sole purpose of blocking emission verbs from merging their arguments internally. Though this is a possible solution, the issues of its necessity and its relevance in a meaning-driven approach naturally arise. Furthermore, Reinhart’s analysis of the transitive alternants of emission verbs as being derived via causativization (2005) cannot account for the data found in Hebrew.

Based on an experiment designed to test speakers’ intuitions regarding the external \( \theta \)-role of these verbs, I have suggested the following hypothesis ((16) repeated):

(53) **Emission verbs Involve Cause (EIC) hypothesis**

The subject of an emission verb corresponds to a \([+c-m]\) cluster.

This hypothesis directly solves both problems. The external mapping of the subjects of emission verbs is now straightforwardly predicted by independently manifested Theta System rules, leading to a considerable simplification of the system.

The transitive alternant problem is also accounted for: for the subset of emission verbs which also include an agent in the verbal concept, a transitive alternant is expected under the conditions of the Agent–Instrument pattern. This transitive is characterized by a lack of morphological marking and a canonical instrumental preposition or instrumental Case-marking on the internal argument. Such data is found in Hebrew. Additionally, there exists the possibility of a separate causative transitive alternate formed via causativization. Vehicle transport verbs demonstrate this variable behaviour in Hebrew.

The main research question remaining with respect to emission verbs is whether the division between the set of emission verbs that exhibits the Agent–Instrument pattern and the set which does not is stable across languages. Specifically, is the availability of an agent in the concept purely idiosyncratic? If the sets are not consistent cross-linguistically, must they be acquired from language data by the child? If they are, are additional semantic phenomena or world knowledge at work?
Verbal Passives in English and Hebrew: a Comparative Study

AYA MELTZER-ASSCHER

11.1 Introduction

This chapter focuses on verbal passives in English and Hebrew, as in (1):

(1) a. The ship was sunk.
    b. ha-sfina hutbe’a.
        the-ship was+sunk
        ‘The ship was sunk.’

Passive sentences in the two languages seem to be very similar: both are morphologically marked, in both the verb does not check accusative case, and in both the theme argument appears in subject position. In addition, in both languages verbal passives entail an ‘implicit’ external argument. The contrast between (1) above and (2) makes this intuition more conspicuous. Example (1), which contains a passive verb, entails that someone sank the ship, namely, that it did not sink on its own. Example (2), with an unaccusative verb, lacks this entailment.

(2) a. The ship sank.
    b. ha-sfina tav’a.
        the-ship sank
        ‘The ship sank.’

I argue that despite these similarities, the mechanism that underlies the passive in English and Hebrew is different. The difference between the two languages resides in the representation of the implicit argument: in the English passive this argument is
syntactically represented, while in Hebrew it is represented only in the semantics. This analysis accounts for several syntactic differences between the passive in the two languages, and, coupled with Reinhart’s (2002; forthcoming, a) Theta System, can explain also two interesting thematic differences between them.

The chapter proceeds as follows: in section 11.2 I describe the syntactic and thematic properties of the implicit argument in English and Hebrew passives, revealing numerous differences between the two languages. In section 11.3 I present and justify my analysis, namely, that English passives include a syntactically realized external argument, whereas in Hebrew the implicit argument exists in the semantic representation only. Section 11.4 elaborates on verbal passivization in Hebrew and its implications. Section 11.5 uses the proposed analysis in conjunction with Reinhart’s (2002; forthcoming, a) Theta System to account for the thematic differences between passives in English and Hebrew.

11.2 Properties of the ‘implicit argument’ in English and Hebrew passives

Given that there is an understood, yet unpronounced argument in passive sentences, as evidenced by the contrast between (1) and (2) above, it is interesting to investigate what the properties of this argument are. In section 11.2.1 I examine what types of elements are licensed by this argument. In section 11.2.2 I look into its thematic properties. It turns out that in both respects, English and Hebrew passives behave differently in important ways. This provides us with clues as to the nature of the implicit argument in passive sentences in the two languages, as will be explained in section 11.3.

11.2.1 Elements licensed in English and Hebrew passive sentences

It is often noted (e.g. Grimshaw 1990; Dubinsky and Simango 1996; Reinhart and Siloni 2005) that passive verbs license by-phrases, agent-oriented adverbs, and instrument phrases. This is true for both English (3) and Hebrew (4):

(3) a. The ship was sunk by Bill.
   b. The ship was sunk deliberately.
   c. The ship was sunk with a torpedo.

(4) a. ha-sfina hutbe’a al.yedey bil.
    the-ship was.sunk by Bill
    ‘The ship was sunk by Bill.’

   b. ha-sfina hutbe’a be-xavana.
      the-ship was.sunk in-purpose
      ‘The ship was sunk deliberately.’

   c. ha-sfina hutbe’a be.emca’ut torpedo.
      the-ship was.sunk by.means.of torpedo
      ‘The ship was sunk with a torpedo.’
Additionally, passive verbs in both English and Hebrew license several types of embedded clauses with a PRO subject (rationale clauses, without-clauses, and complement clauses), as shown in (5) and (6) (Manzini 1983):

(5)  

a. The ship was sunk [PRO to impress the king].  
b. The president was elected without [PRO considering his competence].  
c. It was decided [PRO to leave].

(6)  

a. ha-sfina hutbe’a kedey [PRO le-haršim et ha-melex].  
the-ship was.sunk in.order to-impress ACC the-king  
‘The ship was sunk to impress the king.’

b. ha-nasi nivxar bli [PRO le-hitxašev ba-yexolot šelo].  
the-president was.elected without to-consider in.the-abilities his  
‘The president was elected without considering his abilities.’

c. huxlat [PRO la’azov].  
was.decided to.leave  
‘It was decided to leave.’

Thus, in (3)–(6) we observe elements that are licensed by both English and Hebrew passive verbs. But, the languages differ with regard to other elements.

As seen in (7), passive sentences in English can include an arbitrary reflexive anaphor co-referential with the implicit argument. The arbitrary pronoun can either be oneself or yourself. In contrast, passive sentences in Hebrew cannot include an arbitrary reflexive anaphor, as seen in (8).

(7)  

a. Such privileges should be kept to yourself. (Baker, Johnson and Roberts 1989: 228)  
b. This kind of messages can be sent to oneself.

(8)  

a. *sodot ka-ele crixim le-hišamer le-acmexa.  
secrets like-these should be-kept to-yourself  

b. *ha-hoda’a yexola le-hišalax le-acmexa ke-tizkoret.  
the-message can be-sent to-yourself as-reminder

An additional difference between English and Hebrew passives lies in their ability to license secondary predication. English passives license depictive secondary predicates, predicated of the implicit argument (9). Hebrew passive sentences, on the other hand, completely reject such predication (10).

(9)  

a. The book was written drunk.  
b. At the commune, breakfast is usually eaten nude. (Collins 2005)  
c. Traditionally, the koto was played seated on the floor.  
d. The hula is danced barefoot.
(10)  a. *ha-sefer nixtav šikor (šikora / šikorim / šikorot).
      the-book was+written drunk.MSG drunk.FSG drunk.MPL drunk.FPL

b. *ba-komuna, aruxat ha-boker ne’exelet arum (aruma / arumim /
in+the- commune breakfast is+eaten nude.MSG nude.FSG nude.MPL
      arumot)
      nude.FPL

c. *rikud ha-hula mevuca yaxef (yexefa / yexefim /
dance the-hula executed barefoot.MSG barefoot.FSG barefoot.MPL
      yexefot)
      barefoot.FPL

It is worth mentioning that the general availability of secondary predicates with
passives is debatable. Williams (1985), for example, notes the contrast between the
grammatical (11a), and the impossible (11b):

(11)  a. The game was played nude.

      b. ??The game was played mad at Bill.

To account for these facts, he suggests that in sentences such as (11a), *nude is in fact
predicated not of the implicit argument, but of the game itself, since ‘one may call a
game nude if it is played by nude people’. In contrast, according to Williams, the
property of being mad at Bill cannot be predicated of a game.

However, as noted by Bhatt and Pancheva (2006), Williams’s explanation cannot
extend to all cases of secondary predication in the passive sentences. For example, in
(9a) it would be a far greater stretch to refer to a book that was written drunk as a
drunk book. Examples like (9a) show that the secondary predicate must be predicated of
the implicit argument. Given this, it seems very plausible that the violation in (11b)
is not syntactic at all (since the sentence includes an implicit argument) but rather
semantic or pragmatic. As noted in Aarts (1995), a secondary predicate has to have
some relevant relation to the primary predicate in the sentence. Aarts claims that it is
this requirement that renders e.g. (12) non-felicitous in most contexts; the waiter’s
being naked has nothing to do with his smiling.

(12) ??The waiter smiled naked.

I believe that the status of (11b) is similar to that of (12). Whether the players are
mad at Bill has, in most contexts, no relevance to their playing the game. This shows
also in the active counterparts of the sentences in (10), as evidenced by the contrast
between (13a) and (13b). If a supporting context is supplied, (13b) is improved, and
so is (11b).
I therefore take the licensing of secondary predicates to be a general syntactic property of passives in English, which is subject to the same semantic/pragmatic requirements imposed on secondary predication in active sentences. In Hebrew passive sentences, by contrast secondary predication is not allowed.

In addition to these syntactic differences between English and Hebrew, the passive in the two languages, and specifically, the implicit argument, also displays different thematic properties. This is discussed in 11.2.2.

11.2.2 The thematic properties of the passive in English and Hebrew

11.2.2.1 Interpretation of the passive  As mentioned in the introduction, passive sentences in both English and Hebrew include an implicit argument. As noted in Doron (2003), however, there is a certain aspect in the interpretation of Hebrew passive verbs which is different from that of their English counterparts. Consider (14) and (15) ((15) taken from Doron 2003):

(14)  a. ha-oyev / ha-picuc hitbia et ha-sira.
    the-enemy the-explosion sank ACC the-boat
    ‘The enemy/the explosion sank the boat.’
   
   b. ha-sira hutbe’a (al.yedey ha-oyev).
    the-boat was.sunk by the-enemy
    ‘The boat was sunk (by the enemy).’
   
   c. *ha-sira hutbe’a al.yedey ha-picuc.
    the-boat was.sunk by the-explosion

(15)  a. ha-rof’a / ha-tzuna ha-nexona kicra
    the-doctor / the-nutrition the-right shortened
    et ha-šehiya be-vet ha.xolim.
    ACC the-stay in-hospital
    ‘The doctor/the good nutrition shortened the stay in the hospital.’
   
   b. ha-šehiya be-vet ha.xolim kucra (al.yedey ha-rof’a).
    the-stay in-hospital was.shortened by the-doctor
    ‘The stay in the hospital was shortened (by the doctor).’
   
   c. *ha-šehiya be-vet ha.xolim kucra al.yedey
    the-stay in-the hospital was.shortened by
    ha-tzuna ha-nexona.
    the-nutrition the-right
As can be seen in (14a) and (15a), the verbs hitbia ‘sink’ and kicer ‘shorten’ can take as an external argument either an agent or an inanimate, non-volitional cause. However, the Hebrew passive sentence ((14b) and (15b)) can only be understood to mean that someone caused the event, not something. That is, the implicit argument in the Hebrew passive must be interpreted as an agent. These sentences also show that the obligatory agentive interpretation of the passive does not result from the by-phrase, namely, it cannot be argued simply that al-yedey ‘by’ assigns an agent θ-role, because the agentive interpretation exists also in the short versions of (14b) and (15b), without the by-phrase. When a by-phrase is added, it must introduce an agent. If a non-agentive cause is introduced ((14c), (15c)), the sentence becomes, for most speakers, ungrammatical or marginal (see Doron 2003).

It can be noted here that some speakers find sentences such as (14c), (15c) acceptable, even if not perfect. Importantly, however, when these speakers were presented with the sentence in (16) (the short version of (14b)) and asked about its interpretation, they agreed that it is only possible that someone sank the boat, not something.

(16) ha-sira huthbe’a.
     the-boat was.sunk
     ‘The boat was sunk.’

Even if sentences such as (14c) and (15c) are marginally accepted by some speakers they do not undermine the generalization that the θ-role assigned in the passive is agent. In these sentences, the by-phrase introduces an inanimate object as a cause of the event. Importantly, however, the by-phrase is an (optional) adjunct, and does not receive a θ-role from the verb; the external θ-role is assigned to the implicit argument, regardless of the existence of the by-phrase. When confronted with sentences such as (14c), speakers need to resolve the mismatch between the agent role assigned to the implicit argument and the cause adjunct, and some sort of accommodation needs to take place, but this need not necessarily lead to ungrammaticality.

The sentences in (17) further illustrate the constraint on the interpretation of Hebrew passives. He’edif ‘prefer’ presents a subtle ambiguity. One reading of (17a) simply discusses Max’s mental state, his preferences. In this reading, Max receives the experiencer role. The other, agentive reading of (17a) has to do with Max’s behaviour—it asserts that Max behaved better to Lucy than he did to Matilda. However, according to speakers’ intuitions, the passive alternate in (17b) has only

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1 A reviewer suggests that (15c) is ungrammatical because ‘good nutrition’ does not seem to be the type of cause that we typically need for the event denoted in the sentence. The reviewer also notes that the English counterpart of (15c) is not completely acceptable. Note, however, that if one accepts (15a) as grammatical, this means that ‘good nutrition’ can be an external argument in this event; therefore, the contrast between (15a) and (15c) is interesting, and has to do with a thematic restriction unique to the passive in Hebrew.
the latter reading—it necessarily reports some actions that took place in the world, rather than only Max’s feelings.

(17)  

a. \( \text{maks he’edif et lucy al pney matilda}. \)
    
    Max preferred \( \text{ACC Lucy over Matilda} \).
    
    ‘Max preferred Lucy over Matilda.’

b. \( \text{lucy hu’adfa (al-yedey max)}. \)
    
    Lucy was preferred by Max
    
    ‘Lucy was preferred (by Max).’

The phenomenon exemplified in (14), (15), and (17) is general. Hebrew verbs which have a wide interpretation in the active—i.e can take as an external argument a cause or an agent (like shorten), or an experiencer and an agent (like prefer)—have a narrower interpretation in the passive: only the agentive interpretation is retained.²

In English no such constraint exists, and the passive sentence exhibits the entire range of interpretations possible for the active sentence. A non-agentive cause is perfectly grammatical in the English passive, as shown in (18a, b), as is an experiencer argument (18c).

(18)  

a. The boat was sunk by an explosion.
    
    b. The hospitalization period was shortened by optimal nutrition.
    
    c. The new coaching style was preferred by the basketball players.

It is interesting to note here that according to Alexiadou et al. (2006), Greek is like Hebrew in allowing only agents, not causes, to be introduced via by-phrases in the passive, as exemplified in (19). In contrast, German is like English, where non-agentive arguments can be introduced by the by-phrase (20).³ I will return to these languages when presenting my account for the facts of (14)–(17), in section 11.5.1.

(19)  

a. \( \text{Ta mallia mu stegnothikan apo tin komotria}. \)
    
    the hair my dried\_NACT by the hairdresser
    
    ‘My hair was dried by the hairdresser.’

b. *? \( \text{Ta ruxa stegnothikan apo ton ilio}. \)
    
    the clothes dried\_NACT by the sun

(20) \( \text{Die Vase wurde von Peter / durch den Erdstoss zerbrochen} \)
    
    the vase was by Peter through the earth.tremor broken
    
    ‘The vase was broken by Peter by the earth tremor.’

² Similar facts have been observed in the domain of nominalization in English. For example, Grimshaw (1990) observes that only the agentive reading of object-Experiencer verbs can give rise to nominalizations, and Jaeggl (1986) notes that by-phrases in nominalizations have to be agentive. Further research is needed in order to clarify whether these facts can be subsumed under the analysis presented in this paper.

³ German uses von to introduce agents, and durch to introduce causes.
11.2.2.2 The input for passivization Another thematic difference between the passive in English and Hebrew lies in the group of transitive verbs giving rise to a passive alternative. In general, in both English and Hebrew, passivization applies roughly only to transitive verbs checking accusative case. Some further constraints on passive formation were discussed in the literature. For example, Jackendoff (1972) notes that sentences such as John reached the door cannot be passivized (*The door was reached by John), and attributes this to a constraint making use of thematic hierarchies. Postal (2003) discusses further exceptions for passive formation (e.g. this costs a lot of money—*A lot of money is cost by this, John had an accident—*An accident was had by John).4 These exceptions, or constraints on passive formation, exist also in Hebrew. However, Hebrew exhibits a further constraint; some verbs have a passive form in English, but not in Hebrew. These verbs fall mostly in one of two groups:5

(i) Object-Experiencer verbs. As noted in Landau (2002), many object-Experiencer verbs do not have a verbal passive alternate in Hebrew, as shown in (21), and other object-Experiencer verbs have extremely marginal passive alternates, as exemplified in (22).


(22) icben/*ucban ‘irritate’, h’e’cıv/*hu’acav ‘sadden’, hıx’ıs/hux’as ‘anger’, hı-rıɡı’/hurgaz ‘annoy’, hıɾı’ı’/hurga ‘calm down’…

(ii) Subject-Experiencer verbs. As noted in Doron (2003), many subject-Experiencer verbs in Hebrew lack a verbal passive alternate (23).6 Other subject-Experiencer verbs (24) have a verbal passive alternate whose use is very limited or marginal.

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4 It seems that at least some of the noted exceptions can be reduced to the basic constraint that only verbs with an accusative case feature can be passivized. Thus, in reach the door, it may be that the door is a dative, rather than an accusative marked complement (this is overtly marked in Hebrew). Regarding the impossibility of passivation of measure verbs (e.g. cost, weigh), see Adger (1994).

5 Another class of verbs which have passive alternates in English and not in Hebrew is stative verbs. Example (i) contains a passive of the stative verb surround. The fact that the passive is post-modified by an adverb shows that it is indeed a verbal, rather than an adjectival passive (as explained in the discussion of examples (29) and (30) in the text). The Hebrew version of the sentence, in (ii), is completely ungrammatical.

(i) They were surrounded ceaselessly by beautiful things.

(ii) *hem hukfu le.lo ḥafsaka al.yedey dvarim yafim. they were+surrounded without stopping by things beautiful

As with the cases mentioned in the text, this constraint on verbal passive formation in Hebrew is obviously related to the agentive nature of the passive in this language.

6 Among these, Doron lists kıva ‘hope’, cıpa ‘expect, await’, and yıxel ‘hope for’. Note however that these Hebrew verbs do not check accusative case (their complements are clauses or PPs), and therefore are not expected to undergo passivization to begin with.
In contrast, it seems that the verbs in (21)–(24) do have completely natural verbal passive alternates in English. Determining whether a transitive verb has a verbal passive alternate in English is not simple, since a related passive participle form may exist independently, functioning as an adjectival passive. It is important to note also that the fact that some form passes adjectivehood diagnostics does not tell us anything about its status as a verb, since participial forms can be ambiguous between adjectives and verbs (see Wasow 1977; Levin and Rappaport 1986).

Let us consider examples like (25), and show that they do have a verbal reading, using some diagnostics suggested in the literature.

(25) Mary was excited by the news.

The incompatibility of forms such as excited with the progressive is sometimes used to argue that they are not verbal, since verbs (except for stative ones) are expected to appear in the progressive. But in fact, a web search reveals many examples such as (26):

(26) a. The American public was being excited by the images of an anti-cancer drug.
   b. I was being impressed by these people.
   c. He was being annoyed by the media.

Therefore, there is no reason to think that that these forms are not verbal.

In addition, Tenny (1998) presents a construction in the Pittsburghese dialect of English that can serve as a diagnostics for verbhood. She presents several arguments that the complement of needs in the context shown in (27) can only be verbal:

(27) The car needs washed very carefully.

The grammaticality of (28) therefore means that the participles in it are verbal:

(28) Nobody needs angered/irritated/discouraged/saddened by the truth. (Tenny 1998)

Laskova (2007) suggests another test for verbhood in English: only verbs allow post-modification by adverbs. This is evidenced, for example, from the incompatibility of seem, which selects only APs, with a postmodified participle, as shown in (29):

\[\text{Ne’ehav} \text{ ‘loved’ exists in Hebrew as an adjective and possibly as a noun, but not as a verb. This becomes clear when one tries to inflect the form for tense: *ye’ahav (‘will be loved’,3P.M.SG) and *ne’ehava (‘was loved’,3P.F.SG), for example, are impossible.}\]
The silver seems polished carefully. (cf. The silver seems carefully polished.)

Object- as well as subject-Experiencer passive participles can be readily post-modified by adverbs (30), a fact which shows that they have a verbal reading.

(30) a. Lucy was frightened/annoyed badly by the situation.
   b. He was puzzled deeply by this problem.
   c. Max was loved passionately by Lucy.

Finally, in Meltzer-Asscher (2011) I show that while by-phrases can be compatible with adjectival passives, this is only so when the participant introduced in this phrase can be detected from the state denoted by the adjective. Thus (31a), for example, is grammatical, since by looking at an eaten leaf, one can tell that it has been eaten by caterpillars. In contrast, when looking at an eaten apple, it is impossible to know whether it was eaten by John or by someone else, which is why (31b) is ungrammatical. This restriction does not hold for verbal passives, where by-phrases are always licensed (32).

(31) a. The leaf seems eaten by caterpillars.

(32) The apple was eaten quickly by John.

Considering again sentence (25) above, observing the state of Mary’s excitement, it is impossible to tell that it was the news that excited her. The exciting participant is not detectable from a state of a person’s being excited, and so, if excited were an adjective, it could not have appeared with a by-phrase. Thus, the grammaticality of the by-phrase in this sentence reinforces the conclusion that it contains a verb.

We see then that there is a considerable group of verbs which undergo verbal passivization in English, but not in Hebrew. The generalization seems to be that in Hebrew only verbs whose external θ-role can be agent may undergo passivization (see also Doron 2003). It is exactly those verbs not having verbal passive alternates which also do not license agent-oriented adverbs (33), purpose clauses (34), and instruments (35) which are generally assumed to require the presence of an agent:

(33) Lucy ?hilhiva /?hiršima /?ci’ara /’hitmiha/ *hidhima/?hirgi’a

Lucy excited / impressed / saddened / puzzled / amazed / calmed down

/’simxa ?ye’asha / *inyena et maks be.xavana.

/ delighted despaired / interested Max on purpose

(34) *Maks ahav et lucy kedey še-titnaheg elav yafe.

Max loved ACC Lucy so that she.will.behave.to .him nice
In contrast, no such thematic restriction holds for the input of passivization in English. We observed, then, two thematic properties of the passive in Hebrew which are obviously related: only verbs which may assign an agent role (possibly along with other options) may passivize; and when passivized, these verbs have only an agentive interpretation. Additionally, we have seen that the passive in English licenses reflexive anaphors and secondary predicates, whereas in Hebrew, these elements are illicit. The following section presents an explanation for these differences.

11.3 The analysis

11.3.1 Previous analyses of the implicit argument in passives

Passive sentences in both English and Hebrew include an understood implicit argument, which is not overt. A priori there are two possibilities for analysing such arguments: either they are syntactically projected, but phonologically null, or they are not realized in the syntax at all, and exist only in the semantic representation.

Both these options exist in the literature with regard to the passive. The first type of analysis, arguing for a syntactically present external argument, appeared first in Jaeggli (1986), and was elaborated in Baker et al. (1989). This analysis suggests that the passive suffix -en is a syntactic clitic, and is itself the external argument. This element is generated under the Infl node, and receives the verb’s external θ-role, as well as its accusative case. Moreover, the clitic -en forms a chain with another NP, which is either overt (introduced by the by-phrase) or null. Recently, Collins (2005) developed a somewhat different analysis of the same type, proposing that in passives, the external θ-role (assigned by little-v) is assigned to PRO which appears in spec, vP. Thus, the external argument in passives is merged into the structure exactly as it is in active sentences. Collins suggests further that in passive sentences, unlike in active ones, v, although assigning an external θ-role, does not check accusative case. Rather, this case is checked by another head, the Voice head. Borer (1998) offers yet another analysis in which the external argument in passives is syntactically realized, as pro.

The second type of analyses, to which I will refer collectively as ‘suppression’ analyses, holds that in the passive, the external θ-role is not assigned syntactically at all, and exists only in the semantic representation of the sentence. This type of account can be further divided into two classes.

The first class of ‘suppression’ analyses holds that passivization is a lexical operation which affects the lexical information carried by the verb, making the external θ-role unavailable for purposes of syntactic θ-marking. For example, Bresnan (1982a) argues that in the lexical representation of a passive verb the agent θ-role is no longer
correlated with the subject position, and Grimshaw (1990) claims that the external argument in passives is 'lexically satisfied'. Chierchia (1989/2004) suggests that passive morphology absorbs or saturates the subject θ-role, i.e. passivization introduces a variable that receives the verb’s external θ-role, and closes it off existentially. Reinhart (2002) adopts this analysis, holding that verbal passives are derived by a lexical operation of saturation: the external θ-role is marked for semantic rather than syntactic assignment.

The second class of ‘suppression’ analyses appears in Horvath and Siloni (2008a). Horvath and Siloni argue that saturation of the external role in the verbal passive takes place post-lexically, at the semantic interface; it is not a lexical operation. This is especially clear when contrasting verbal passives with adjectival passives, whose properties point to a lexical derivation. Horvath and Siloni show, for example, that verbal passives, unlike adjectival ones, can never give rise to idioms not shared by their transitive alternates. For example, Hebrew has the idiom muван me-elav (‘self-evident’, literally: ‘understood(ADJ) from-to.it’), which is headed by an adjectival passive, and is not available with the transitive counterpart. This situation is impossible with verbal passives. Assuming that predicates have to exist in the lexicon in order to give rise to idioms specific to them, the fact that there are no idioms unique to verbal passives strongly suggests that verbal passives do not exist in the lexicon (Horvath and Siloni 2010b contains a quantitative study of Hebrew idioms, reinforcing this conclusion). The authors further show that only adjectival passives, not verbal ones, may exhibit drifted meanings, not shared by their transitive alternate. For example, the Hebrew adjectival passive muфnam, literally ‘internalized’ (derived from hifnim ‘internalize’), has an additional meaning, ‘introverted’; the corresponding verbal passive, in contrast, has only the expected meaning, ‘internalized’. This is easily explained under the hypothesis that adjectival passives are derived lexically while verbal passives are created syntactically. Stored lexical items can undergo semantic drifts and acquire additional meanings, but the result of a syntactic operation must have a compositional meaning, and cannot undergo a process of drift.

Horvath and Siloni (2008a) therefore conclude that, when merged, the θ-grid of a passive verb is identical to that of its active counterpart. However, in passive sentences, unlike in active ones, the external θ-role is not assigned during the syntactic derivation. Rather, it is assigned to an existentially bound variable once the derivation reaches the semantic component.

To conclude, previous accounts of the passive differ on whether or not the external θ-role is assigned to an argument in the syntax, and if not, whether or not suppression is lexical. In what follows I propose that both the syntactic and the suppression accounts may be right, but for different languages.
11.3.2 The implicit argument: syntactic in English, semantic in Hebrew

Let us return to the properties of the passive presented in section 11.2.1, and see what they can tell us about the nature of the implicit argument in English and Hebrew. We will consider English first.

It was noted in 11.2.1 that the passive in English licenses by-phrases, agent-oriented adverbs, and instrumental phrases. These elements are widely assumed to detect an implicit argument (see e.g. Grimshaw 1990 for by-phrases, Chomsky 1986, Dubinsky and Simango 1996 for adverbs, and Siloni 2002, Reinhart and Siloni 2005 for instruments). However, as noted in Bhatt and Pancheva (2006), the fact that passive verbs license these elements is not very telling with regard to the nature of the implicit argument, since there is no independent reason to believe that such elements require anything more than a semantic representation of the external argument, which is assumed to exist under both approaches to the passive.

A more complicated issue is raised by the control facts presented in (5) and (6) above. There is no consensus on whether PRO needs a syntactically realized controller (see Williams 1987; Dobrovie-Sorin 1998). Moreover, there appears to be a difference between control into complement clauses and control into adjunct clauses of different kinds (see the discussion of control and implicit arguments in Landau 2000). Given this debate, the control facts above cannot lead to a definite conclusion regarding the representation of the external argument. Discussion of control is resumed in section 11.4.2.1.

A clearer case is that of the binding facts presented in (7) above, repeated partially in (36).

(36) Such privileges should be kept to oneself / yourself. (Baker et al. 1989: 228)

Binding is independently known to depend on a specific syntactic configuration: an anaphor needs to be c-commanded by a syntactically realized antecedent. Therefore, the fact that English passive sentences can contain reflexive pronouns suggests that they include a syntactically realized external argument which binds this pronoun, as stressed by Baker et al. (1989) and Collins (2005). Note that, although it is well known that anaphoric pronouns also have a logophoric use, in which they need not have a local antecedent, the logophoric use is only available for anaphors appearing in adjunct positions, or as part of other arguments (Reinhart and Reuland 1993), whereas in (36) the anaphor is an argument, and therefore cannot be logophoric.

The fact that English passives allow secondary predication reinforces this conclusion. Predication is a syntactic phenomenon: an implied argument does not suffice in order to license a secondary predicate. For example, while (37a) contains an implied object (the thing John photographs), this object cannot be modified by secondary predication (37b) (Rizzi 1986b). I assume here, following Rothstein (1983) and others,
that secondary predicates are APs, predicated directly of their subject. If secondary predicates are small clauses with a PRO subject, then secondary predication is a case of control into adjunct clauses, in which, as (37) shows, a syntactically realized controller is necessary.

(37)  a. John photographs.
     b. *John photographs seated. (Adapted from Rizzi 1986b)

The facts of binding and predication lead to the conclusion that there is a syntactically realized external argument in English passives, namely, that the external \( \theta \)-role is assigned to a syntactic argument, as proposed by Baker et al. (1989) and by Collins (2005), rather than suppressed.

Next, let us look at Hebrew. We have seen in 11.2.1 that Hebrew passives allow by-phrases, agent-oriented adverbs, instruments, and control of PRO. But, as explained above, these facts cannot help us to determine whether the implicit argument in Hebrew passives is syntactically present or not. However, as shown in (8) and (10) above (repeated partially in (38) and (39)), Hebrew passive sentences, unlike English ones, do not license reflexive anaphors and secondary predicates.

(38)  *sodot ka-ele cryixim le-hišamer le-acmexa.
        secrets like-these should be-kept to-yourself

(39)  *ha-sefer nixtav šikor (šikora / šikorim / šikorot).
        the-book was+written drunk.MSG drunk.FSG drunk.MPL drunk.FPL

These facts automatically rule out for Hebrew an account such as Collins’s, in which the external \( \theta \)-role in the passive is assigned to PRO, since PRO can bind anaphors and license secondary predication in this language, as seen in (40) and (41).^{8}

(40)  PRO liknot le-acmexa matanot ze tamid nexmad.
        PRO to+buy to-yourself presents is always nice
        'Buying presents for yourself/oneself is always nice.'

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^{8} One might suggest that even if PRO occupies spec, \( vP \) in sentences (38) and (39), they may be ungrammatical since in Hebrew, arbitrary reflexives and secondary predicates are only licensed by surface subjects, namely, material in Spec, TP. While this may indeed be the case for anaphor binding, it is clear that secondary predicates in Hebrew can modify elements other than the surface subject, as exemplified in (i), in which kar ‘cold’ is predicated of an object.

(i)  dan šata et ha-te kar.
        Dan drank ACC the-tea cold
        'Dan drank the tea cold.'
PRO to.write drunk is hard
‘It’s hard to write when you’re drunk’.

An analysis in which the external $\theta$-role of the passive verb is assigned to arbitrary pro (such as Borer 1998) is also impossible in the case of Hebrew, since, although pro indeed cannot bind (42) (see Ritter 1995), it does license secondary predicates (43), which are impossible in Hebrew passive sentences.

(42) *tamid PRO konim le-acmam matanot be-tel aviv.
always buy to-themselves presents in-Tel Aviv

(43) tamid PRO soxim arumim ba-brexha ha-zo.
always swim naked in.the-pool this
‘People always swim naked in this pool.’

What about an analysis along the lines of Jaeggli (1986) or Baker et al. (1989), according to which the passive morpheme is itself the external argument? First, I believe that while -en can possibly be analysed as a pronominal clitic, it is extremely counter-intuitive to view the vocalic template of the passive in Hebrew as an argument, which can receive a $\theta$-role. But even ignoring this intuition, under Baker, Johnson, and Roberts’s analysis, the chain formed by the passive clitic/affix and the NP co-referenced with it should be able to bind an arbitrary reflexive pronoun and license secondary predication, as it does in English. Importantly, this is not the case in Hebrew, as shown in (38) and (39) above.

Hence, the fact that anaphors and secondary predicates are ruled out in passive sentences in Hebrew strongly suggests that in this language the external argument is not syntactically realized.9

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9 Another argument presented by Baker et al. (1989) in favour of assuming a syntactically realized external argument in passives is the incompatibility of verbal passive sentences with self-action. For example, (i) cannot mean that the child combed himself.

(i) The child was combed.
The authors derive this impossibility of self-action from the ungrammaticality of the configuration in (ii) (argued for in Rizzi 1986a). They suggest that if one takes -en to be a realization of the external argument, then verbal passives are represented as in (iii), which is an instance of (ii), hence ungrammatical.

(ii) *X, Y, t
Where X c-commands Y, Y c-commands t, and there is movement from t to X

(iii) The child, was comb-en, t
Interestingly, verbal passives in Hebrew are incompatible with self-action as well, so that (iv), like (i), does not have a reading in which the boy combed himself.

(iv) ha-yeled sorak.
the-child was.combed
‘The child was combed.’
My suggestion is therefore that the external argument in the passive is syntactically realized in English, but not in Hebrew. It is interesting to note that this claim is very similar in spirit to the claim made in Rizzi (1986b) with regard to objects: that null objects are syntactically realized in Italian but not in English. Therefore, the former, for instance, allow secondary predicates, but not the latter.

11.3.3 The source of the difference between English and Hebrew passives
What underlies the difference between English and Hebrew? Why is the external \( \theta \)-role assigned syntactically in the former, but not in the latter? I suggest that the difference stems from the different properties of the passive morpheme in the two languages.

As noted in Collins (2005), the English passive suffix -en is identical to the past participle suffix, and therefore should not differ from it in its ability to absorb the external \( \theta \)-role or the accusative case feature. In sentences with past participles (The boy has eaten an apple), accusative case is checked, and an external \( \theta \)-role is assigned, which means that -en neither reduces case nor absorbs the external \( \theta \)-role.\(^{10, 11}\)

In contrast, what constitutes passive morphology in Hebrew is a number of vocalic templates which are specific and unique to the passive. I follow Reinhart and Siloni (2005), who suggest that the function of this morphology is to indicate the reduction of the accusative case feature of the verb. In 11.4.1 below I elaborate on how this property of the morpheme leads to the semantic nature of the implicit argument in Hebrew passives. As mentioned in 11.2.2.1, the Greek passive behaves thematically like the Hebrew passive. It is thus interesting to note that passive morphology in Greek, as in Hebrew, is correlated with case reduction. The passive in Greek is marked by the ‘Non-active’ morpheme, used also in the formation of unaccusatives, but not in the formation of transitive verbs. This reinforces the hypothesis that the properties of the morphemes are responsible for the differences between passives in different languages.

However, this fact does not lead to the conclusion that an external argument is present in the structure. In fact, the lack of a self-action reading is completely predicted even without a structurally present external argument, given Reinhart and Reuland’s (1993) Reflexivity framework, and in particular their condition B, which states that a semantic reflexive predicate must be reflexive-marked. Let us look at the semantic representation of the relevant predicate, in (v).

(v) The child (\( \chi x \chi e \). \( \exists y \) (Combing(e) & Agent(e, y) & Theme (e, x)))

If \( x \) and \( y \) happen to refer to the same individual, then in (v) we have a semantic reflexive predicate,co-referential arguments, participating in the same event, which is not reflexive-marked. Thus, this reading is impossible.

\(^{10}\) One could object to this claim, arguing that the morpheme -en is involved also in the derivation of adjectival passives, where the external argument is presumably absorbed. However, in Meltzer-Asscher (2011) I argue that adjectival passives do have an implicit external argument.

\(^{11}\) Under Collins’ analysis, in passive sentences PRO checks the null case feature of the Voice head.
11.4. Verbal passivization in Hebrew and the nature of the implicit argument

11.4.1 Syntactic verbal passivization

I follow Horvath and Siloni (2008a) in assuming that verbal passivization is not a lexical operation, and therefore that there is no suppression of the external \( \theta \)-role of a passive verb in the lexicon. Rather, a passive verb enters the syntactic derivation with a \( \theta \)-grid identical to that of its active counterpart. As explained in 11.3.3, following Reinhart and Siloni (2005), I assume that verbal passive morphology in Hebrew reduces the accusative case feature of the verb. The passive verb thus has both an external and an internal \( \theta \)-role, but no case to check. I remain agnostic as to where morphological derivation takes place, i.e. whether the passive morpheme attaches to the verb pre-syntactically or syntactically.

When the internal argument is merged with the passive verb in the syntax, it receives the verb’s internal \( \theta \)-role. However, since no accusative case is available, this argument must move to subject position to check nominative case. Thus, the verb cannot assign its external \( \theta \)-role to an argument in subject position. This \( \theta \)-role is thus retained on the verb, and undergoes existential closure at the level of interpretation (see Reinhart and Siloni 2005: fn. 12). So, the external \( \theta \)-role undergoes saturation, as in Chierchia (1989/2004), but this saturation is not lexical, but purely semantic. A derivation is given in (44).

(44) a. Transitive entry
   bana ‘built’ \( (\theta_{\text{Agent}}, \theta_{\text{Theme}}), \text{ACC} \)
   Passive entry
   nivna ‘was built’ \( (\theta_{\text{Agent}}, \theta_{\text{Theme}}) \)

b. Syntactic merger with an object, bayit ‘house’

\[
\begin{array}{c}
\text{VP} \\
/ \quad \\
\text{nivna}(\theta_{\text{Agent}}) \\
\text{bayit-Theme}
\end{array}
\]

c. Interpretation after merge
   Build(\( e \)) & Theme(\( e \)) = house
d. Syntactic merger with T

```
T
  / \
/    \   
T'    VP
       /   \
      nivna (θAgent) bayit-Theme
```

e. Interpretation after merger with T (existential closure of the event variable)

\[∃e [\text{Build}(e) \& \text{Theme}(e) = \text{house}]\]

f. Object moves to subject position

```
TP
  / \
/    \   
bayit-Theme \\
/     \\
VP
       /   \
      nivna (θAgent) ti
```

g. Interpretation after saturation (assignment of the unassigned role to an existentially bound variable, i.e. existential closure of the agent role)

\[∃e∃x [\text{Build}(e) \& \text{Agent}(e) = x \& \text{Theme}(e) = \text{house} & \text{By}(e, \text{Dan})]\]

It will be interesting at this point to discuss the status of by-phrases in Hebrew briefly, and compare it to their status in English. In Collins’s (2005) analysis of the English passive, the by-phrase, when present, occupies spec, vP and receives the verb’s external θ-role. Baker et al. (1989) view the by-phrase in English passive sentences as co-indexed with the passive morpheme (which receives the verb’s external θ-role) forming a chain with it. Thus, the interpretation of the DP introduced in the by-phrase as the external argument of the verb is not direct, but rather mediated through the chain.

What about Hebrew? I suggest that the interpretation of a sentence like (45a) is the one given in (45b):

(45) a. ha-bayit nivna al.yeday dan.
    the-house was.built by Dan
    ‘The house was built by Dan.’

b. \[∃e∃x [\text{Build}(e) \& \text{Agent}(e) = x \& \text{Theme}(e) = \text{house} \& \text{By}(e, \text{Dan})]\]
I do not represent *by Dan* as Agent(*e, Dan*) but rather as By(*e, Dan*) in order to mark the fact that the *by*-phrase is an adjunct; the verb does not assign the agent role twice—the role is assigned once, in the semantic component. It is clear, however, that some mechanism of ‘θ-transmission’ is needed in order to link the agent introduced by the *by*-phrase to the agent introduced by the existential quantifier, to ensure that *x* is interpreted as Dan. I assume the existence of some such mechanism, without committing here to its exact nature (see discussion in Fox and Grodzinsky 1998). The *by*-phrase is thus a syntactic ‘double’ for the purely semantic external argument.

11.4.2 Implications of the semantic nature of the implicit argument in Hebrew passives

The semantic-only nature of the implicit argument in Hebrew passives has some implications with regard to control and binding, on which I now elaborate.

11.4.2.1 Control  English and Hebrew behave alike with regard to control into both complement and adjunct clauses in passive sentences, as shown in (5) and (6) above, repeated here as (46) and (47):

(46)  
a. The ship was sunk [PRO to impress the king].  

b. The president was elected without [PRO considering his competence].

c. It was decided [PRO to leave].

(47)  
a. ha-sfina hutbe’a kedey [PRO le-haršim et ha-melex].  

b. ha-nasi nivxar bli [PRO le-hitxašev ba-yexolot šelo].

c. huxlat [PRO la’azov].

Based on the analysis of English and Hebrew above, these facts suggest that control of PRO should be thought of as a semantic relation (a relation established in semantic representations), rather than a syntactic one. If this is true, than it naturally follows that semantic implicit arguments, as in Hebrew, can control. In English, the implicit external argument is syntactically realized, and
thus obviously semantically represented as well, and can participate in control
relations.  

11.4.2.2 Binding condition B Consider the contrast in (48). Example (48a) is ungrammatical. Example (48b) is grammatical but, crucially, the implicit agent in the sentence (the one who sends the message) must be different from him. If an identical indexing for the two arguments is forced, we get in (48b) a violation of binding condition B. This may seem odd, since I have argued that the syntactic representations of the sentences in (48) do not include a realization of the external argument, which could trigger the condition B effect. It is precisely the lack of an antecedent that makes (48a) ungrammatical.

(48) a. *ha-hoda’a yexola le-hišalax le-acmexa ke-tizkoret.
   the-message can be-sent to-yourself as-reminder
b. ha-hoda’a yexola le-hišalax elav ke-tizkoret.
   the-message can be-sent to-him as-reminder

   ‘The message can be sent to him as a reminder.’

This puzzle is solved, however, if we assume that like control, and unlike binding condition A, binding condition B applies to semantic representations, rather than

12 Facts of control into rationale clauses, as in (46a) and (47a), are often cited as arguments for or against a certain representation of the missing argument in passives. In fact, however, it may be that these data are irrelevant in deciding on the representation of the implicit argument in passives. Williams (1987) notices the contrast between (i) and (ii):

(i) The ship was sunk [PRO to impress the king].
(ii) ‘The ship was sunk [PRO to become a hero].

Based on such contrasts, he argues that the controller of the embedded PRO is the entire passive sentence (or event), rather than the external argument. His argumentation is as follows. While the predicate become a hero selects a human DP as its external argument (iiiia), impress can take as an external argument either an agent or an inanimate cause, and specifically, an event (iiib):

(iii) a. ‘The sinking of the ship became a hero.
   b. The sinking of the ship impressed the king.

If only event-control of PRO is possible, then the facts of (i) and (ii) follow: a rationale clause is licensed only when the verb in it can take an event as an external argument, as in (i), as opposed to (ii) (for more discussion, see Reinhart forthcoming, a). The syntactic/semantic status of the implicit external argument is immaterial (for a detailed discussion, see Landau 2000).

13 Landau (2007) assumes that implicit arguments can be either lexically related to the verb (as a result of lexical saturation) or syntactically realized. After showing that control cannot be a lexical relation, he concludes that control must be a syntactic relation, and hence, that all controllers must be syntactically realized. However, he notes that the implicit argument (in Hebrew) cannot be realized as PRO, as in Collins (2005), since PRO can bind. Landau therefore suggests the existence of an additional type of null element, which is a PRO without a D feature, proposing that this element can control, but not bind, and that this is the external argument in (Hebrew) passives. Note, however, that the fact that control is not a lexical phenomenon does not force the conclusion that it is a syntactic phenomenon. According to my analysis, control is semantic, in which case an argument which exists in the semantic representation can control, although it cannot bind.
syntactic ones. This conclusion was in fact reached based on independent considerations in Reinhart and Reuland (1993), Reuland (2001), and others, who formalize a basic split between the different binding conditions. While condition A is a structural, syntactic condition, condition B applies at later stages of the derivation, to semantic rather than syntactic predicates. Since the implicit argument is present in the semantic representations of the sentences in (48), the co-referential reading of (48b) is ruled out. Example (48a) is ruled out since at the relevant stage of the derivation, the syntax, the anaphor is not licensed.\footnote{Note that when a by-phrase appears in the sentence, it naturally introduces a DP (co-indexed with the implicit argument), which behaves like any other syntactically realized DP. So, for example, it can bind an anaphor, as in (i) (this requires the by-phrase to c-command the dative argument, but I do not propose a specific structure for the sentence here). See discussion of parallel English examples in Collins (2005).}

11.5 Deriving the thematic differences between English and Hebrew passives

Apart from accounting for the differences between English and Hebrew with regard to binding and predication, the analysis presented above can also explain the difference between the languages with regard to the input for passivization and the interpretation of passive verbs, shown in 11.2.2 above, adopting Reinhart’s (2002; forthcoming, a) Theta System.

11.5.1 Deriving the restriction on the interpretation of verbal passives in Hebrew

Reinhart (2002; forthcoming, a) proposes a system in which thematic roles are not atomic elements, but rather compositions of two valued features, c(ause change) and m(ental state), specifying logical entailments that hold for different types of participants:

- The positively valued feature +c entails that the participant caused the change involved in the event; if the participant did not cause change, the role includes the negatively valued feature −c.
- The positively valued feature +m entails that the participant’s mental state was relevant in the eventuality denoted by the predicate. Otherwise, the role includes the negatively valued feature −m.

For details of the feature system, see Reinhart (2002; forthcoming, a), and Chapter 1 above. Importantly for our discussion, in this system an agent is a [+c+m] participant, namely a participant who causes change and whose mental state is relevant for

(i) ha-sefer  nišlax  al-yedey  dina le-acma.
   the-book  was+sent  by    Dina  to-herself
   ‘The book was sent by Dina to herself.’
Thus, passivization applies only to verbs which have this feature. The morpheme does is reduce the accusative case feature of the verb to which it attaches. A system, the accusative feature is assigned lexically to entries whose external role is a [+] cluster, namely a cluster which contains only features with a + value—[+c+m], [+c], or [+m].

- [+c+m] is the feature composition of the agent θ-role.
- [+c] is the external θ-role of verbs such as sink, shorten, break, excite. It is underspecified with regard to M(ental state). This role thus can be interpreted either as an agent or as an inanimate cause. The former interpretation arises in sentences such as The doctor shortened the stay in the hospital, when volition is attributed to the doctor. In The good nutrition shortened the stay in the hospital, The good nutrition gets a [+c] role which is interpreted as an inanimate cause, given that the nutrition has no mental state that can be involved in the event.
- [+m] is the external role of the so-called subject-Experiencer verbs, such as prefer, love, hate.

If these verbs are the only ones to passivize, we can see that the semantics of a passive sentence in Hebrew does not alter the external role of a verb to an agent, but merely requires that this role, when underspecified, be interpreted as agent ([+c+m]).

Marelj (2004) claims that at the semantic/discourse level, all θ-roles must be fully interpreted, in order to make sure that no two identical roles are assigned. Thus, an underspecified role will eventually always be interpreted as fully specified. We can see, then, that the case discussed here is simply a case of full interpretation.

The remaining question is why, in the passive, the underspecified role ([+c] or [+m]) should invariably be fully interpreted as agent ([+c+m]) and not otherwise (i.e. [+c−m] for [+c], [−c+m] for [+m]). I would like to propose the following.

We know that when θ-roles are assigned syntactically to arguments, the content of the θ-role—its feature composition in Reinhart’s terms—is carried over by the argument, and is visible to the semantic component, which interprets the relation between the argument and the event in which is participates according to the content.

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15 In order for a verb to have an accusative case feature according to Reinhart’s system, it should also have a fully specified internal θ-role which includes the negatively valued feature −c (namely, [−C−m] or [−c+m]).
of this role. Suppose, however, that the content of a $\theta$-role which remains on the verb, rather than assigned to an argument, is invisible to the semantic component. The intuition behind this idea might be the following. The main role of the syntax is to establish a relation between predicates and their arguments, by $\theta$-role assignment under specific syntactic configurations. The semantic component then attributes an interpretation to the structure. But the semantics cannot replace the syntax and establish thematic relations between predicates and arguments. Otherwise, the syntactic component would be superfluous. Thus, if syntactic $\theta$-role assignment fails for whatever reason (lack of an accusative feature, in our case) the semantics cannot simply replace the syntax and assign the role.

So, the basic idea about the division of labour between the syntax and the semantics is that $\theta$-role assignment is, by definition, a syntactic process. I propose that, since it is the syntax which is responsible for $\theta$-role assignment, when a role is not assigned syntactically, its content is deleted. Semantic $\theta$-role assignment is possible, as in the case of Hebrew verbal passives, but it will be inevitably ‘flawed’; it cannot mimic syntactic assignment completely. It cannot establish predicate–argument relations with the same degree of information and detail.

Thus, in the Hebrew passive, when the derivation reaches the interpretation level, it contains a verb marked morphologically for passive, with one unspecified $\theta$-role retained on it. The passive morpheme signals that an accusative case feature was reduced, and hence that the verb had a $[+]$ role which was not assigned syntactically. Remember that the semantics must assign a fully specified role to the external argument, based on the information available to it, namely, that this role is a $[+]$ cluster. The only full interpretation which is compatible with all $[+]$ clusters is agent $[+c+m]$. The semantics, therefore, ‘can’t go wrong’ by assigning a $[+c+m]$ role, and this is the strategy chosen.

The difference in interpretation between English and Hebrew passives, then, arises from the fact that $\theta$-assignment in English passives is syntactic, and in Hebrew, semantic. In English, where the assignment of the external $\theta$-role is syntactic, any role can be assigned to the external argument. The derivation of a passive sentence is minimally different from that of an active one in that the argument receiving the external $\theta$-role of the verb is phonetically null (or an affix) in the passive. When an underspecified role is assigned to the external argument, all the interpretive options are open to it, just as in active sentences. In Hebrew, the $\theta$-role is not assigned syntactically, but the passive morpheme retains the information that the verb has an unassigned $[+]$ role, and the argument invariably gets assigned a fully interpreted agent role by the semantics.

It is interesting at this point to compare this suggestion to the explanation by Alexiadou, Anagnostopoulou, and Schäfer (2006) of the difference between English and German passives on the one hand and Greek passives on the other. As mentioned in 11.2.2.1 above, Alexiadou et al. note that the passive in Greek is strictly
agentive (as in Hebrew), whereas in English and German other external arguments are possible as well. Assuming a syntactic decomposition of change of state verbs (e.g. *break*) into a Voice component, a CAUS component, and a root, the authors suggest that the passive in Greek involves a Voice head carrying the feature [+AG], thus forcing an agentive interpretation, while in English and German, the passive involves a Voice head with the feature [−AG].

Such a solution cannot be adopted within the framework of the Theta System, which does not assume syntactic decomposition of change of state predicates (see Horvath and Siloni 2011). Beyond that, the analysis I suggested in this section has a clear advantage over Alexiadou et al.’s (2006) analysis, at least with regard to the Hebrew–English contrast, in that it ties the thematic difference between Hebrew and English passives to the component of grammar where they are derived, which is independently motivated by the syntactic differences between them (i.e. binding and secondary predication). It would be interesting to see whether the passive in Greek shares the syntactic properties of the Hebrew passive, and the passive in German those of the English one, as predicted if the thematic and syntactic properties are indeed linked as argued here, but this is left for future work.

### 11.5.2 Deriving the restriction on the input for passive formation in Hebrew

As mentioned above, passivization in both English and Hebrew applies to verbs with an accusative case feature. However, as shown in 11.2.2.2 above, many object- and subject-experiencer verbs in Hebrew (e.g. *hilhiv ‘excite’, sana ‘hate’) have an agentive case feature, yet do not passivize.

I suggest that this is so because these verbs are incompatible with an agentive reading. Hence, when the interpretive component assigns an agent role to a bound variable acting as their external argument, as described in the previous section, the result is a semantic clash. Note that in these cases, the derivation itself is fine: the automatic semantic component is, as explained above, ‘blind’ to the lexical properties of the verb, and simply assigns an agent role. But the overall grammatical knowledge of the speaker rules out these cases, since there is a mismatch between the role assigned by the semantics and the role associated with the verb in the lexicon. This can account for the fact that judgements in this area are not very clear and exhibit a lot of variation between speakers: speakers vary in their willingness to interpret different verbs as agentive. Consider for example the contrast in (50) and (51). The judgments on (50b) vary to some extent, but (51b) is beyond repair. This is predicted under the current analysis. *Pana ‘turn to’* lacks an accusative case feature, and therefore is not predicted to undergo passivization at all, whereas *rigeš ‘excite’* is predicted to undergo the operation, which results, nonetheless, in a semantic mismatch requiring accommodation on which speakers vary. The mismatch arises since *rigeš ‘excite’* does not have an agentive interpretation, as can be deduced from its
incompatibility with be-xavana ‘on purpose’, as in (52). But again, judgements vary, as certain speakers are more prone to allow an agentive reading for rigeš than others.

(50)  a.  dan rigeš et rina.
     Dan excited ACC Rina
     ‘Dan excited Rina.’

     b.  */rina rugša al.yedey dan.
     Rina was excited by Dan

(51)  a.  dan pana le-rina.
     Dan turned to-Rina
     ‘Dan turned to Rina.’

     b.  */rina nifneta al.yedey dan
     Rina was + turned by Dan

(52)  */dan rigeš et rina be-xavana
     Dan excited ACC Rina in-purpose

The question then remains: how can it be that verbs with an accusative feature, namely verbs with external [+c+m], [+m] or [+c] roles, are incompatible with an agentive ([+c+m]) interpretation? An underspecified role is exactly a role which should be compatible with both values of its unspecified feature. It turns out that there are cases in which thematic and other restrictions conspire to rule out a specific full interpretation, and I turn to these now.

11.5.2.1 [+m] roles which cannot be fully interpreted as [+c+m]  According to Mar- elj’s full interpretation, the [+m] role should in principle be realized in two different ways, either as [+c+m] or as [−c+m]. Such a variable behaviour indeed characterizes some verbs which have an external [+m] role, for example plan, prefer (as shown in example (17), section 11.2.2.1), respect and others. The external argument of these verbs can be interpreted either as merely experiencing some mental state without acting ([−c+m]), or as performing actions and causing change volitionally ([+c+m]).

This however is not the case for other subject-Experiencer verbs, e.g. love, hate, and others, whose subject is invariably interpreted only as experiencing something. These verbs are nonetheless assumed to have a [+m] external role, rather than a [−c +m] role. The reason for this seems mainly theory-internal: as mentioned above, Reinhart (2002; forthcoming, a) suggests that only verbs that have an external [+c] cluster have an accusative case feature. Since love, hate, etc. have an accusative feature, it must be assumed that their external role is [+m], rather than [−c+m].

16 Additionally, Reinhart’s system predicts that [+] clusters are realized as external arguments. And indeed, the sentient argument of love, hate, etc. is always mapped externally.
Why, then, is it not possible for the external [+m] role of verbs such as love to be interpreted as [+c+m]? I believe that this stems from the interaction between the aspectual and the thematic properties of these verbs. Following Grimshaw (1990), Dowty (1991), Reinhart (2002; forthcoming, a), and others, I do not believe that thematic information can be reduced to aspectual information, or vice versa. Both types of information must be listed independently on each lexical item. Certain combinations, however, are impossible, and these as far as I can see involve principally stative verbs. Specifically, I would like to suggest the generalization in (53).

(53) A stative verb cannot assign a role containing a /+c value.

(53) is completely natural, since stative verbs never denote a change of state, and so cannot have a participant who is causing change. Indeed, stative predicates are often viewed as lacking a semantic component of cause (see e.g. Hale and Keyser 1993; but see Neeleman and van de Koot, Chapter 2 above, for a different view). The generalization predicts that languages will not include stative verbs whose external (or any) role is [+c], [+c+m] or [+c–m]. Note, however, that the existence of stative verbs whose external role is [+m] is not ruled out by (53). What is ruled out is the option of interpreting this role as containing a +c. Experiencer verbs such as love and hate are stative: they denote some steady relation without entailing a change of state of any of their participants. Therefore, the only possible realization of the [+m] external role of these verbs is [–c+m].

Given this, when these verbs are passivized in Hebrew, and their external argument is semantically assigned a [+c+m] role, the resulting sentence is ungrammatical. In English, in contrast, the [+m] role is assigned to a null argument in the syntax, and is interpreted later as [–c+m], due to the aspectual constraint in (53).

11.5.2.2 [+c] roles which cannot be fully interpreted as [+c+m] As shown in 11.2.2.2 above, certain object-Experiencer verbs in Hebrew (among which are hilhiv ‘excite’ and riges ‘move, excite’) cannot have a [+c+m] interpretation, and cannot passivize. The incompatibility of these verbs with the adverb on purpose (as in (54)) shows that their external argument cannot be interpreted as acting volitionally.

17 Rákosí (2006) argues that certain stative predicates, e.g. unpleasant, assign to their subject a [–m] role, which can be interpreted as [+c–m], a cause. This seems to undermine the generalization in (53). However, in this relation it is important to note that different authors view the interpretation of the positively valued feature +c differently—some as requiring that the participant assigned the role is causing change (within the eventuality denoted by the predicate), and some as requiring that this participant is causing the eventuality itself. It seems to me that Rákosí (2006) adopts the latter interpretation of +c; thus, unpleasant has a [+/c] participant, causing the state of unpleasantness. I, however, adopt the former interpretation of +c; it thus follows that predicates that do not involve change of state cannot have [+/c] participants. For additional discussion of this issue, see Neeleman and van de Koot (Ch. 2 above). For a detailed overview of the relation between stativity and causation, see Rothmayer (2009).
Relying on data from French, English, and Hebrew, Friedemann (2000) argues that these verbs nonetheless have a [+c], rather than a [+c–m] external role, for case considerations (as described above). What, then, blocks the realization of the role in these cases as [+c+m]?

Pesetsky (1995) argues in detail that object-Experiencer verbs have three thematic roles, as shown in (55). In the Theta system, the thematic grid of these verbs includes, in addition to the experiencer role, a [+c] role, denoting the cause of the emotion, and a [–m] role, denoting its subject matter. The experiencer role in this case is represented as [–c+m], rather than [+m], in order to account for the fact that this role can be assigned either to an internal argument (as in The doctor worried John) or to an external argument (as in John worried); in Reinhart’s system, this is a property of mixed roles, having both positively and negatively valued features (for details see Reinhart 2002; forthcoming, a).

(55) worry θ cause [+c], θ experiencer [–c+m], θ subject matter [–m]

Friedemann (2000) exemplifies and discusses the split behaviour of object-Experiencer verbs with regard to an agentive interpretation, namely, the fact that certain object-Experiencer verbs block this interpretive option, as in (54). Friedemann suggests that when an object-Experiencer verb does not allow an agentive interpretation, it is because the syntactic realization of its [+c] role is barred. The [+c] role must be present in the thematic grid of these verbs (otherwise, they would not check accusative case), but it is ‘frozen’, in the sense of Horvath and Siloni (2008a), i.e. it is inaccessible outside the lexicon, and can never be inserted into syntactic derivations. A ‘frozen’ external θ-role is an idiosyncratic property of verbs, which can differ between languages: the same verb can have a frozen role in one language and an active role in another (for psycholinguistic evidence for the existence of frozen lexical items, see Fadlon, Chapter 8 above). The straightforward implication of this proposal is that the argument found in subject position with these non-agentive verbs in sentences such as (56) is a realization of the [–m] role, rather than the [+c] one. It can be interpreted as causing of the emotion ([+c–m]) or not causing it ([–c–m]), but it can never be interpreted as acting volitionally, since the value of the M feature of the role is negative.

(56) maks hilhiv et lusi.
    Max excited moved ACC Lucy in-purpose

‘Max excited Lucy.’

Adopting Friedemann’s idea, it becomes clear why verbs like hilhiv ‘excite’ do not have a verbal passive alternate in Hebrew. Since the verb’s [+c] role is frozen, it enters into the syntactic derivation with two thematic roles—[–c+m] and [–m]—and with no
accusative case, which was reduced by the passive morpheme. The internal argument is assigned the \([-c+m]\) role, and moves to check nominative case. The derivation then reaches the semantics, and the content of the \([-m]\) role which remained on the verb is deleted. As in the general case of passivization in Hebrew described in 11.4.1 above, the semantics detects the unassigned role, and, ignorant of its feature content, assigns it a \([+c+m]\) role. But, as explained in 11.5.2 above, this results in a mismatch between the interpretation given to the verb by the semantic component and its lexical properties, which ban a \([+c+m]\) interpretation (since the \([+c]\) role is frozen) and leads to unacceptability for many speakers. Apparently, though, not all speakers conceive of the external roles of the same verbs as frozen, and this is reflected in the varying degrees of acceptance of passive verbs such as hulhav ‘was excited’.

Let us consider English briefly. English too has some object-Experiencer verbs with frozen external \(\theta\)-roles (though these are not necessarily the same verbs as in Hebrew). One example is preoccupy, which, as can be seen in (57), is incompatible with an agentive interpretation:

\[(57)\]  *Max preoccupied Lucy on purpose.

However, in English, even these verbs can passivize, as in (58):

\[(58)\]  The woman was preoccupied by this thought.

A possible explanation for this is the following. Since the external role of preoccupy is frozen, the verb enters the syntactic derivation with two roles: \([-c+m]\) and \([-m]\). The experiencer role is assigned to the internal argument, and the subject matter role (\([-m]\)) is assigned to the implicit, null argument. This argument does not receive an agentive interpretation, and the passive sentence is grammatical. However, as noted by Tal Siloni (p.c.), adopting this suggestion would entail giving up the generalization that the null argument in English passives corresponds to the verb’s external argument. Exploring the implications of this is beyond the scope of this chapter.

To conclude, since passivization in Hebrew involves a semantic assignment of a \([+c+m]\) role, it can only apply to verbs whose external role is compatible with a \([+c+m]\) interpretation. When this is not the case, the lexical properties of the verb clash with the interpretation attributed to it by the semantic component and unacceptability results. In English, this constraint is not operative, since \(\theta\)-assignment in the passive is syntactic, just as in the active.

11.6 Conclusion

In this chapter I have suggested that the derivation of verbal passives in Hebrew is different from that in English. While in English the external \(\theta\)-role of the verb is assigned in the syntax, Hebrew passive morphology reduces the accusative case
feature of the verb, thus preventing this role from being assigned syntactically. The role is thus assigned only in the semantics.

This difference accounts for the fact that, while in both English and Hebrew the external argument of a passive verb participates in semantic processes (e.g. licensing of adverbs, binding condition B, etc.), only in English does it show when syntactic diagnostics (e.g. binding condition A) are used. In addition, it provides a means for explaining the thematic constraints on the passive in Hebrew, since semantic θ-role assignment is different from syntactic assignment, in that lexical properties of verbs are not available to it.

Since the analysis correlates the lack of syntactic θ-role assignment and the thematic restrictions on the interpretation of the passive and the input for passivization, it leads to a prediction that languages like Hebrew, in which the external argument in the passive is syntactically inactive, will also exhibit the thematic constraints operative in Hebrew. As mentioned in 11.5.1, Greek is one example of a language whose passive behaves thematically like the Hebrew passive, and it will be interesting to look into the syntactic properties of the passive in this language. However, verifying the prediction, with regard to Greek as well as other languages, is left for future research.
An Event Semantics for the Theta System

ALEXIS DIMITRIADIS

12.1 Introduction

The theory of the Theta System (Reinhart 2000; 2002; forthcoming, a) gives a compositional account of verbal argument structure and argument structure alternations. Although the Theta System makes concrete predictions with respect to argument projection and syntax, Reinhart did not provide a definition of the semantics, and semantic operations, associated with the system’s component parts. In this chapter I develop a semantic implementation of the system’s primitives, based on a straightforward embedding of the ‘event semantics’ of Davidson (1967) and Parsons (1990). While it had not been my intent to extend or ‘explain’ the Theta system, the design proposed in these pages turns out to have interesting empirical consequences; these are explored in a later part of the chapter.

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This work was inspired by Tanya Reinhart’s seminars on the Theta System in 2001 and 2002. Earlier versions of this text were circulated in 2002 and 2004 (Dimitriadis 2004), and portions have been presented at the 26th GLOW Colloquium in Lund, Sweden, at the Brown University Workshop on Direct Compositionality (both in 2003), and to audiences at the Utrecht Institute of Linguistics and elsewhere.

The Theta System was still evolving during this time period, and some of the insights developed below (in particular, the adoption of event semantics) have become part of the Theta System as presented in Reinhart and Siloni (2005). While I have revised this text for publication and reorganized the order of presentation, I have kept some of the focus of the original work, which addresses the Theta System as presented in Reinhart (2000, 2002). Some topics have been augmented with references to later literature, and the terminology has been adapted to reflect the latest presentations of the Theta System (e.g., ‘decausativization’ instead of ‘expletivization’). A new, substantial appendix proves the claim that certain arity (valence changing) operations cannot be performed on model-theoretic functions, and identifies the restricted conditions under which these manipulations become possible.
The Theta System does not consider the order of thematic arguments to be encoded in the lexical entry; it is determined after the operation of general marking and arity operations (which manipulate the argument inventory), according to dedicated rules of the computational system (CS), the ‘CS merging instructions.’ But syntactic constituency, as well as the lambda forms standardly used in formal semantics, involve argument positions that are arranged in a particular order. In order to end up with the right kind of semantic object, there must be a change of representation at some point between the lexical entry and the form of the sentence at the LF interface. Before the change-over, which I will refer to as ‘assembly’, argument structure information is represented as a complex structure which we are at liberty to define as it suits us; afterwards, we must deal exclusively with the entities standardly employed by current theories of grammar: functions in a model-theoretic logic for the semantics, and aggregates of syntactic features for the syntax. I will show that it is best to locate this change just before lexical items enter syntactic computation (e.g. at the point of insertion into the numeration).

In the model I propose, the thematic role inventory of a stored lexical entry is a set of theta clusters, with no explicit order. Word-building in the lexicon involves copying the contents of the stored entry into a ‘working structure’ (WS), which is then manipulated by arity operations and enriched with calculated properties such as the Accusative case feature and, eventually, the order of argument projection. Just before lexical items enter syntactic derivation, the assembly step takes place. It removes theta clusters one by one from the set of arguments of the WS, in the order dictated by the CS merging instructions, and conjoins them into a single model-theoretic function that expresses the denotation of the verb. The WS is converted into a simpler syntactic object, consisting of syntactic features and a single function of event semantics encoding verb meaning. After this point, thematic arity operations must operate on the assembled object; their effect on the verb’s meaning must be expressible as manipulations of the model-theoretic function representing the verb’s denotation.

This architecture, adopted as a natural solution to the practical problem of designing a semantics of the Theta System, accounts in a natural way for certain known distributional asymmetries of arity operations. In particular, the Theta System recognizes two domains of application for arity operations: the lexicon and the (morpho)syntax. While some arity operations, such as reflexivization, take place in the lexicon in some languages and in the syntax in others, Reinhart and Siloni (2005b) discovered that other arity operations are cross-linguistically restricted to the lexicon. Prior to the work reported here, there was no comprehensive explanation of why some arity operations can apply in either domain but others cannot, or of which ones are so restricted.1

1 Siloni (2002) and Reinhart and Siloni (2005) adopt a related account, discussed in section 12.5.1.
In formalizing both types of arity operations within the semantic framework I will propose below, it turns out that the arity operations that apply in the syntax are exactly those that can be expressed as basic manipulations of the corresponding semantic denotation: specifically, an operator on verb denotations expressed as type-logical functions can existentially close off a role or identify two roles; but it cannot entirely delete the first (or n-th) theta-role from the truth conditions of the verb’s denotation, nor replace it with another. On the empirical side, the arity operations which Reinhart and Siloni found to be restricted to the lexicon require outright deletion of a theta-role and/or substitution of one thematic role for another (reduction, causativization), while those permitted in either domain involve existential closure of an argument position, or identification of two theta-roles (saturation, arbitrarization, reflexivization). I will argue that this correlation explains the distribution of arity operations: an operation can take place in the syntax only if its effect can be expressed as a manipulation of the semantic object present in syntactic derivation. A different, more articulated linguistic object encodes verb semantics in the lexicon, which can undergo the full complement of arity operations.

While it could be objected that we are dealing with accidental consequences of a postulated system, our findings derive from limitations on what is possible during syntactic derivation; and the encoding I have assumed for the syntactic component is simply the usual view of word meaning as functions in a logical calculus. The complex linguistic object I adopt for the lexicon has no interesting properties: it is motivated by the Theta System’s model of arity operations and thematic role ordering (i.e. for reasons entirely independent of the distributional differences between the lexical and syntactic components), and it simply makes it possible for these operations to be carried out. The interesting finding is that this custom object is not needed beyond the point of lexical insertion: of the arity operations posited by the Theta System, those that cannot be expressed as manipulations of standard denotation functions are exactly the ones that are unattested in the syntactic component. The semantics of arity operations that do take place in the syntax, in the account of the Theta System, can all be expressed as simple operations on model-theoretic denotation functions. This pattern of distribution supports the Theta System’s division of arity manipulations into two components, and confirms the view that the expressive power of the standard semantic framework is approximately right for a semantics of natural language.

For reasons of space, I do not provide a detailed summary of the Theta System, nor (especially) of the evidence for its claims. I do discuss many aspects of the theory as they relate to the claims made below. While I have attempted to make the presentation self-sufficient, readers who are entirely unfamiliar with the Theta System may wish to consult chapter 1 above, or Reinhart (2002; forthcoming, a) and Reinhart and Siloni (2005), for the full details and motivation.
The chapter is organized as follows. In the next section, I review the general organization of the Theta System and some of its more relevant constituent parts. Section 12.3 discusses the embedding of event semantics in the framework of the Theta System, and defends the conclusion that there is a change of representation between the lexicon, where theta-roles have no intrinsic ordering, and the eventual semantic interpretation. While the initial impetus for this decision is the transition from unordered to ordered theta roles, section 12.3.4 discusses an immediate benefit (and additional motivation): several of the Theta System’s arity operations cannot be carried out on simple denotation functions. Section 12.4 presents an explicit derivational model for the operations of the Theta System. Finally, section 12.5 takes up the issue of the lexicon–syntax division, and the correspondence between the observed distribution of arity operations in the two components and the predictions of the formal model proposed here. The formal results claimed in section 12.3.4 are proved in a separate appendix.

12.2 The Theta System

The Theta System framework (Reinhart 2000; 2002; forthcoming, a; Reinhart and Siloni 2005) provides a compositional account of verbal argument structure and argument structure alternations. The Theta System is ‘the central system of the systems of concepts’, and is responsible for putting concepts into a form that is legible by the computational system (CS). It includes lexical entries (encoding concepts and theta-role specifications), a set of operations on argument structure and marking procedures, and other general rules for the interaction of the above. Reinhart focuses on accounting for general, cross-linguistic patterns in the argument structure of verbs: in particular, on argument ordering and co-occurrence restrictions, and on allowable structural alternations like the causative–unaccusative alternation, shown in (1).

(1)  
    a. John opened the door.  
    b. The door opened.

The Theta System derives a good deal of what is currently known about these phenomena from a system of primitive structures and operations, subject to general conditions, that derive verb entries from coded concepts in the mental lexicon. It is understood that stored concepts are basic and non-redundant; variant argument realizations are generated from the same underlying concept by application of various operations on argument structure, such as passivization and causativization. The stored verbal concepts do not specify the order or manner of projection (internal or external) of verbal arguments; these are determined by general principles, the CS merging instructions, which are sensitive to the application of argument structure operations.
I will make a terminological distinction, not clearly made in Reinhart’s writings, between argument structure operations and arity operations. The former are grammatical devices that may vary cross-linguistically in their details: the passive, the antipassive, and reflexive verb formation in various languages are examples. These operations employ a very restricted set of universal arity operations, each of which performs a particular manipulation of theta grids. Arity operations include decausativization (deletion, also known as reduction, of an external theta role expressing Cause), saturation (existential closure of a role), and causativization (which transforms a verb’s theta grid, adding an agent and suppressing the causal status of the original agent or cause).

For example, the passive is an argument structure operation realized slightly differently in different languages: intransitive verbs can be passivized in Dutch but not in English, and so on. But the passive of every language utilizes the arity operation of saturation (existential closure). I will assume that the properties of arity operations are invariant; cross-linguistic differences are associated with the language-particular passive constructions, not with saturation itself.

According to the Theta System, arity operations take place in two domains, the computational lexicon and the syntax. There is some redundancy in the system: Reinhart and Siloni (2005) found that several arity operations (e.g. reflexivization) apply either in the (computational) lexicon or in the syntax, depending on the language. Others, such as causativization, are restricted to the lexicon. As mentioned already, the present chapter proposes a partial explanation for this state of affairs.

12.2.1 Theta clusters

The Theta System represents thematic roles as combinations of the features \([\pm c]\), \([\pm m]\) (standing for cause change and mental state, respectively). For example, the Agent role corresponds to the cluster \([+c+m]\). The system is actually ternary, not binary, since a feature may take a plus value, a minus value, or be absent; there are thus nine possible feature clusters, including the empty cluster which cannot be realized directly.

As with any system of theta-roles, determining the feature clusters (theta clusters) in the lexical entry of particular verbs is not an exact science. The appropriate cluster must be deduced from a combination of the argument’s semantics and the verb’s

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2 Argument structure operations, as defined here, are also known as valence changing or valence adjusting operations. Baker (1988) calls them grammatical function changing processes (or GF-changing processes).

3 Note that some of these terms have different (and sometimes varying) meanings in the literature; in this document they are used with the meaning assigned to them in the Theta System.

4 The empty cluster was presumed to be non-occurring in earlier formulations of the Theta System. It is introduced by Marelj (2004) as the underlying theta-role that gives rise to middles.
combinatorial properties. The feature clusters corresponding to the major theta-roles (such as Agent) can generally be assigned on the basis of their semantics, while the presence of other roles like \([-m]\) (subject matter or ‘target of emotion’) must often be inferred from a verb’s argument structure alternations, in part relying on the predictions of the theory. (For a list of the theta clusters and their correspondences to traditional theta-roles, see Chapter 1 above.)

12.2.2 Argument projection and linearization

As already mentioned, the lexical entries of verbs do not specify argument order or internal v. external projection. These are computed on the basis of a verb’s inventory of theta clusters, according to the principles of the CS merging instructions. Arguments are not ordered according to a universal, explicit linear hierarchy as usually proposed (see e.g. Grimshaw 1990). Rather, the following marking and merging principles determine the manner and order of argument projection:

(2) **Lexicon marking**

Given an \(n\)-place verb entry, \(n > 1\),

a. Mark an all-plus cluster \([+c, +m]\) or \([+c+m]\) with index 1.
b. Mark an all-minus cluster \([-c, -m]\) with index 2.
c. If the entry includes both an all-plus cluster and a fully specified cluster \([a,-c]\) (i.e. \([+m-c]\) or \([-m-c]\)), mark the verb with the Acc feature. This indicates that the verb has Accusative case to assign.

(3) **CS merging instructions**

a. When nothing rules this out, merge externally.
b. An argument realizing a cluster marked 2 merges internally; an argument with a cluster marked 1 merges externally.
c. In accordance with instruction (a), an unmarked argument merges externally unless:
   (i) some other argument is already merging externally. Or,
   (ii) the verb has the Acc feature, and no other argument is available to receive Accusative case.

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5 The Theta System adopts a version of the Universal Alignment Hypothesis (UAH) (Perlmutter and Postal 1984: 97), maintaining that the ordering and internal v. external projection of the theta-roles of any given verb is subject to universal constraints. Unlike some stronger claims (cf. Baker’s 1988: 46–8 Uniformity of Theta Assignment Hypothesis), the UAH does not assume an invariant structural position for each theta-role. See Pesetsky (1995: 11ff.) for a discussion and comparison of the two claims.

6 Part (c) is not part of Reinhart’s summary of the CS merging instructions. It is added here for clarity.
Application of the marking rules in (2) is explicitly restricted to verb entries with more than one argument. Verbs that are underlyingly intransitive, and do not undergo any arity operations that add an argument (see below), are not marked with projection indices. The merging instructions cause all such verbs to project their argument externally (since ‘nothing rules this out’). But an arity operation can detransitivize a transitive verb after it has undergone marking, which will result in unaccusative argument structure if the remaining argument carries the index 2. This process is central in Reinhart’s analysis of unaccusatives. Following Chierchia (1989/2004), she derives the unaccusative variant of alternating verbs such as break and open from the transitive variant, rather than the other way around:

(4) **Underlying:** John opened the door.
**Derived:** The door opened.

This account explains why all intransitive unaccusatives have a transitive alternative, while non-alternating intransitives with just a theme argument (e.g. glow, tremble) are always unergative: the unaccusatives must be derived from a transitive base. Theme unergatives, on the other hand, may or may not have a (derived) transitive alternate (but see Potashnik, Chapter 10 above, for an alternative analysis). Readers unfamiliar with the issue, one of the centrepieces of the Theta System, are referred to Reinhart (2002; forthcoming, a) for details.

Note also that in the framework of the Theta System, the external argument is projected by the verb, not contributed extrinsically (e.g. by a syntactic head, as proposed e.g. by Kratzer 1996). By treating internal and external arguments alike, Reinhart is able to explain alternations in which the same theta-role may project either internally or externally, depending on which other arguments are present. In the following sentences, *John* has the same theta role (Experiencer, \([-c+m]\)) but projects differently: Pesetsky (1995: 11ff) shows that worry is not unaccusative in sentence (5a), hence *John* is projected as the external argument in (5a) but is internal in (b).

(5) a. John worried.
   b. The letter worried John.

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7 A very few unaccusatives lack a transitive base; they are considered to be derived from ‘frozen’ transitive lexical entries, which cannot be realized outside the lexicon. (Reinhart 2002; Chierchia 1989/2004). There are also two-argument unaccusatives like escape, with two arguments indexed with 2. These are not problematic: since they do undergo marking with projection indices, they can be unaccusative without being derived forms (Reinhart 2002: 17ff.).

8 For arguments against introducing the external argument extrinsically, see Horvath and Siloni (2003; forthcoming).
The above summary of argument projection glosses over the fact that not all clusters in a theta grid need be projected: Reinhart treats certain cases as simple optionality of projection; in other cases, various conditions rule out projection of a certain cluster (e.g. an Instrument cannot be projected unless an Agent is overtly or covertly present), or certain cluster combinations may not be realized together (‘indistinctness’). These conditions will not be discussed here.

12.2.3 Arity operations

In the Theta System, grammatical manipulations of argument structure are restricted to a small set of universal arity operations on theta clusters. The theory recognizes two domains in which word-building operations can take place: the active lexicon and the syntax. The assumption is that operations in the syntactic component have syntax-like characteristics, while lexicon operations do not. This view of grammar, which is defended in some detail by Siloni (2002), contrasts with non-lexicalist proposals such as Distributed Morphology (Halle and Marantz 1993; Marantz 1997), which locate all word-building operations in the syntax.

Some arity operations, such as causativization, can only apply in the lexicon. Others, such as reflexivization, can apply either in the lexicon or in the syntax, depending on the language. For example, reflexivization takes place in the syntax in French and Italian, but in the lexicon in Hebrew and English. These are empirical claims: causativization is defined as taking place only in the lexicon because all instances that Reinhart found are consistent with this domain of derivation. (See also Horvath and Siloni forthcoming).

Reinhart did not provide a motivating rationale for every aspect of the system: making empirically correct predictions, with a minimum of over- or under-generation, was sufficient motivation. Hence these restrictions are incorporated as defining properties of the Theta System. Should they be found to be empirically false, the relevant conditions would need to be modified.

For operations that can take place in either derivational domain, Reinhart considers their distribution to be controlled by a parameter of universal grammar:

(6) The Lex-Syn Parameter (Reinhart and Siloni 2005)

UG allows thematic arity operations to apply in the lexicon or in syntax.

The effect of this parameter is that only one domain of derivation (lexicon or syntax) will be utilized by any given language, and that the same domain will be

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9 Besides the arity operation we call causativization here, there is a syntactic ‘causativization’ construction that, as Reinhart (2002) argues, has quite different properties. The two must be viewed as unrelated constructions. While Reinhart was rather brief on this point, Horvath and Siloni (forthcoming) show that this second kind of causative formation, found e.g. in Japanese, is clearly a syntactic process: a multitude of tests demonstrate that it involves two predicates and two agents, while the causativization arity operation is uniclausal and demotes the original agent.
utilized by all arity operations that allow parametric variation. It is not expected that
some language could allow saturation to apply in one component, for example, but
reflexivization in the other.\textsuperscript{10}

Allowing arity operations to apply in two domains is less parsimonious than
restricting them to a single domain, but Reinhart and Siloni argue that the distinction
accounts for a large number of empirical correlations cross-linguistically. For exam-
ple, diagnostics for distinguishing syntactic from lexical reflexivization include pro-
ductivity (reflexivization in the syntax is productive) and reflexivization into ECM
complements (possible in the syntax only, since operations in the lexicon can only
target a single verb). French and Italian have reflexivization in the syntax, while in
English and Hebrew it takes place in the lexicon (Reinhart and Siloni 2005a). Thus
the grammatical French example (7a), illustrating coreference between the matrix
subject and the subject of an ECM complement, contrasts with its ungrammatical
Hebrew counterpart (b).

\begin{equation}
\begin{array}{ll}
\text{(7)} & \\
\text{a. Jean } \text{se considère intelligent.} & \text{(French)} \\
\text{John } \text{se considers intelligent} \\
\text{b. *dan mítaxeveryone } \text{'intillegenti.'} & \text{(Hebrew)} \\
\text{Dan self.considers intelligent} \\
\end{array}
\end{equation}

While the division into lexical and syntactic arity operations is one of the core
claims of the Theta System, I shall not attempt to defend this view of the grammar.
The question is sufficiently large that it must be deferred to Reinhart and Siloni’s
writings on the topic.

\subsection{12.3 Event semantics and the Theta System}

Having introduced the basics of the Theta System, we now return to the question of
its semantic realization. In the terminology of the Theta System, arity operations
derive new verb entries, with a different array of theta-roles. Our goal is to give an
account of the semantics of such derived forms, starting from the semantics of the
original forms and the arity operations they undergo.

Because the Theta System presents theta-roles as objects that can be manipulated
and added or deleted, its model of theta clusters and their relation to the verb finds
a natural counterpart in the ‘neo-Davidsonian’ event semantics developed by Parsons
(1990). In Parsons’ system, a simple sentence involves explicit reference to an
‘eventuality’ represented by a variable \( e \). Event types, which are predicates over
eventuality variables, correspond to the core meaning of verbs. For example, \( \text{run}(e) \)

\textsuperscript{10} This interpretation has turned out to be too strong; Siloni (2008) proposes that lexical reciprocals can
occur even in the lexicon of languages with the parameter set to Syntax.
is true if \( e \) is an event of running. Thematic roles are represented as relations between this event and the corresponding participant; for example, the relation \( \text{Agent}(e, \text{John'}) \) holds if John is the Agent of the event represented by \( e \). An ordinary transitive sentence is represented as the conjunction of several predicates over an eventuality variable. The meaning of sentence (8a) is given in (b).

(8)  

a. John kicked the ball.

b. \( \exists e \) kick(\( e \)) \( \land \) Agent(\( e \), John') \( \land \) Patient(\( e \), b)

This says that there is some event \( e \) of kicking, whose agent and patient were John and the ball \( b \), respectively. Manner adverbs and many other adjuncts can also be expressed as predicates over the eventuality variable.

Parsons’ presentation of event semantics is informal. The following formalization is based on Landman’s (2000) event semantics, incorporating its essential ingredients but with certain simplifications where this is sufficient for our purposes.\(^{11}\) We assume an extensional semantics throughout.

(9) **Outline of a model theory for events**

a. Our model contains two (disjoint) types of objects: the set of ordinary individuals \( D \) (including plural individuals, with the usual lattice structure), and a set \( E \) whose elements denote eventualities. The type of their elements will be denoted by \( e \) and \( s \), respectively.\(^{12}\)

b. There is a set \( V \) of unary *event type* predicates over the elements of \( E \).

c. There is a finite set \( R \) of roles (Agent, Patient, etc.), which are relations between the sets \( E \) and \( D \). Roles are predicates of type \(<e, st>\).

A thematic role \( r \) is *instantiated* for some event \( e \) if \( r(e, x) \) holds for some individual \( x \).

d. Unique role requirement: if a thematic role is instantiated for a particular event, then it is instantiated by exactly one (possibly plural) individual.

e. Role specification: lexical constraints (general and/or lexeme-specific) determine which roles occur, either optionally or obligatorily, with each verb.

\(^{11}\) I chose Landman’s system because it sets down the mechanism of syntactic composition in some detail, and because it keeps theta-role predicates with the verb instead of distributing them to its syntactic arguments. While Landman’s goal was to deal with the properties of plurals, these are not relevant for our purposes and are not discussed here. The reader is referred to Landman (2000: 41–55) for details. I deviate in several ways from Landman’s notation. In particular, various objects and types are given different names here. The term ‘event type’ is used differently (as a unary predicate only), sets of events are written in lambda notation (i.e. as characteristic functions) rather than with set brackets, and theta-roles are written as relations between eventualities and individuals (after Parsons), not as partial functions.

\(^{12}\) Landman defines the domains for types \( e \) and \( s \) as \( D \cup \{\bot\} \) and \( E \cup \{\bot\} \), respectively, allowing expressions of type \( e \) and \( s \) to be undefined.
f. The eventuality variable is eventually bound by existential closure. Landman leaves the details open, allowing existential closure to apply at the VP or the IP level, depending on one’s syntactic analysis.

The next question is how event types and roles enter the derivation. In line with the general approach of the Theta System and general considerations of compositionality, our account of lexical meaning is local: the semantic contribution of the verb must be inserted at only one place in the derivation, i.e. thematic role information and the core denotation of the verb should form a single constituent. In particular, theta-roles are associated with V0, not with the argument NP that satisfies them.

While Landman’s (2000) event semantics is purely local in the present sense, this is not the only way to approach the semantics of thematic relationships. Krifka (1989) does not include theta-role information in the semantics of the verb; instead, it is assigned to the argument NPs and associated with the verb by means of open variables. The verb does carry syntactic information that controls the projection of its arguments. In later work, Krifka (1992) uses theta-roles as selectional features on the verb, which must match corresponding features on its arguments; once again, the corresponding semantics are only associated with the verb. Krifka adopted this architecture in order to allow flexibility in the realization of arguments and adjuncts. The present proposal accomplishes this goal while maintaining locality of lexical meaning.

Examples of an event type and a theta-role predicate are given in (10a) and (b), respectively. Verb denotations are conjunctions of an event type and one or more theta-role predicates in the appropriate order, as in examples (11a, b).

(10) a. $\lambda e$ kick(e).
    b. $\lambda x, e, \lambda x$ Agent(e, x).

(11) a. kick $\rightarrow \lambda y, \lambda x, e$ (kick(e) $\wedge$ Agent(e, x) $\wedge$ Patient(e, y))
    b. run $\rightarrow \lambda x, e$ (run(e) $\wedge$ Agent(e, x))

This brief description should give the reader an idea of the formal properties we expect from our event semantics. While I use Landman’s semantics for events as a starting point, there exist numerous other formalizations along similar lines (e.g. Link 1998: chs. 10, 11). The proposal developed below should be compatible with any of them.

12.3.1 Theta clusters as event modifiers

To embed the feature clusters of the Theta System in event semantics, we can simply use feature clusters as theta role predicates, i.e., as predicates over eventualities and ordinary individuals; we can write $[+m+c](e, J)$ instead of Agent(e, J), etc., yielding formula (12) in place of (8b).
∃e \text{kick}(e) \land [+c+m](e, \text{John'}) \land [-c-m](e, b)

We can even continue to use Agent as an informal synonym for [+c+m], and write (8b) but read it as (12). This raises the question of the relationship between theta clusters and the traditional theta-roles: Are they one and the same thing, or are theta clusters just properties (features) of some richer object, the theta-roles? For example, consider the roles Goal and Benefactor, both of which correspond to the [−c] cluster. Do we just have two names for the same thing, or do we have two distinct theta-roles characterized by the same values for the C and M features? Note that the question is not specifically about event semantics: it arises as we relate the Theta System to any general account of theta roles.

Although Reinhart does not explicitly address the issue, she does stress that theta clusters have semantic content, and in her writings the theta clusters are the theta-roles. Nevertheless her system is designed to be an adequate account of argument structure alternations, not of regularities in meaning, so it is possible that the nine cluster types she postulates are too broad for a complete semantic account of thematic roles, making a two-layer architecture necessary: Traditional theta-roles are the real semantic objects, but in the computational system only the nine feature clusters of the Theta System need be distinguished. Thus, several distinct theta-roles can correspond to the same feature cluster. This sort of two-tiered arrangement is suggested as a possibility by Chomsky (1981: 139), who remarks that the theta criterion, as formulated there, need only apply to the ‘basic system of grammatical relations’. But ‘[i]f θ-roles are assigned in some different way outside this system, the principles we are considering can easily be modified to accommodate such cases while continuing to hold them as formulated here within the central subdomain that is our primary concern’. In other words, the rules that govern the basic system of grammatical relations may be a simplified version of the full system. A similar state of affairs may well hold with respect to theta-roles. Note that the question is not whether additional features should be added to the system, but whether the feature system appropriate for argument projection is less fine-grained than some other conception of theta-roles that is better suited to doing semantics. The question is difficult to decide, not least because it is not at all clear which entailments belong in a system of general-purpose theta-roles and which should follow from the meaning of the verb itself.

If necessary, it would be technically straightforward to endow the set of roles $R$ with a full inventory of semantic theta-roles, which are mapped to the feature clusters of the Theta System by a projection function. I do not follow this option here, since it would complicate the formalization of the Theta System’s operations. For simplicity and ease of exposition, I will assume that the theta clusters are the theta-
roles. In the context of our model, Agent and [+c+m] are equivalent ways of writing the same theta role (element of $R$).

12.3.2 Events and concepts

If lexically derived verbal entries are produced via the application of general rules, they should be expressible in terms of the base entry. The question we must address here is: when we derive a new verb form in the lexicon, does it also require a new event type? For example, consider an event type predicate $\text{pinch}(e)$, which is true of events of (transitive) pinching. We can use it to represent the meaning of the verb $\text{pinch}$. Now consider an event of self-pinching, $e_0$. Should the same event type predicate hold of it, or do we need a new predicate, $\text{self-pinch}(e)$, to characterize such events? From the point of view of our event semantics, the simplest solution is to use the same event type: events of self-pinching are events of pinching, distinguished by the fact that their Agent and Patient are the same individual. If we now imagine applying a lexical reflexivization operation on the verb $\text{pinch}$, the meaning of the resulting reflexive verb $\text{self-pinch}$ (or $\text{Refl(pinch)}$) can be expressed by the same event type predicate, $\text{pinch}(e)$, as follows:

\[(13)\quad \text{a. self-pinch} = \lambda x \lambda e \quad \text{pinch}(e) \land \text{Agent}(e, x) \land \text{Patient}(e, x)\]

I will adopt this strategy for our model: lexicon operations do not change the underlying event type predicate. Derived lexical entries can be viewed as compound expressions involving the base concept. In the simplest case, arity operations have no effect on the event type. But lexical derivations sometimes involve systematic meaning shifts that go beyond changing the inventory of theta-roles. Middle constructions, for example, can involve aspectual changes. To the extent that arity operations, or other operations on lexical items, have predictable effects on the core meaning, it should be possible to express the meaning of the derived forms as some complex expression involving the basic event type predicate. But such effects are beyond the scope of most of Reinhart’s work on the Theta System, which focuses on the effects of arity operations on arguments. (In fact Reinhart shows that aspectual factors are not involved in accounting for the causative–unaccusative alternation.) I have nothing to add to the topic, and will therefore treat arity operations as if they had trivial effect on the event type predicate.

However, lexically derived verbs frequently have idiosyncratic meanings; for example, the Greek verb $\text{tsakono}$ ‘to catch’ has a special meaning for its reciprocal

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This is almost certainly insufficient if we adopt Marelj’s (2002) system of disambiguating underspecified feature clusters into just four fully specified clusters (so that [+m] must be resolved into either [+c+m] or [−c+m]). The disambiguation process yields just four distinct types of theta cluster after lexical insertion, almost certainly too few to capture the diversity of theta-role semantics. I consider it an open question whether the full system of nine clusters is adequate as a complete system of semantic roles.
form, *tsakonome* ‘to quarrel’. We must therefore distinguish two cases. Derived forms with unpredictable meanings are listed in the mental lexicon; their meaning can in principle involve any event type, regardless of the meaning of the base verb. Derived forms with compositional meaning are not listed; the definition of the lexical operation must specify a way of computing the meaning of the derived verb as a function of the meaning of the base verb.

I assume here a notion of ‘listedness’ as proposed by Di Sciullo and Williams (1987). Not only roots but entities of arbitrary complexity, including phrases (idioms), may be listed in the lexicon. The listed objects are those whose meaning is not compositionally predictable, and a listed meaning overrides (‘blocks’) the would-be compositional meaning of the listed entity. A reciprocal verb with idiosyncratic meaning, then, is a relatively simple example of a non-root form that is listed in the mental lexicon.

12.3.3 *The order of projected arguments*

Having discussed the interpretation of theta clusters in an event semantics model, we now consider the complete verb. Our goal is to derive verb denotation functions like (11c, d) above, while allowing the machinery of the Theta System to control the ‘role specification’ functions that Landman assumes. It is not enough simply to include complete forms like (11c) or (d) in the stored lexical entry of each verb. First, alternating verbs need a different function for each mode of argument realization, and listing all of them in the lexicon would lead to undesirable redundancy; second, each such formula specifies the order in which the arguments of the verb in question are projected. This is in conflict with the lexical model of the Theta System, which derives alternations in the argument inventory of verbs from a single underlying lexical entry, and computes their order of projection on the basis of general principles. Our goal, then, is to come up with a suitable model of lexical entries in the mental lexicon, which the mechanisms of the Theta System can manipulate to produce the various desired denotation functions.

We begin with the question of whether the verb’s lexical entry includes information on the ordering of its thematic grid. As we have seen, the Theta System includes a general procedure, the CS merging instructions given in (3), that (partially) determines the syntactic projection of any verb’s arguments. This accounts for the well-known fact that thematic roles are not mapped idiosyncratically to verbal argument positions; their arrangement is subject to universal constraints.

If the order of arguments was stored in the lexical entry of the verb, there would be no need to calculate it. Still, global constraints on ordering are not incompatible with having lexical entries that specify the argument order of each verb: the general constraints could then take the form of well-formedness constraints on lexical entries, i.e. of a filter. In other words, lexical entries might hardwire the order of
their arguments, but only those orders consistent with the CS-merging instructions would be permitted. Such a ‘declarative’ account, however, would be at odds with the Theta System’s strongly procedural orientation. The CS merging instructions apply after lexicon marking and lexical arity operations, not directly to the stored lexical entries. They could not be easily recast as well-formedness constraints on the stored representations. To leave room for the Theta System’s processes to apply, we must start with a lexical entry whose arguments have no intrinsic order; the CS merging instructions eventually build an ordered representation, perhaps after the application of lexical operations that involve the addition, deletion, or modification of some clusters of the original lexical entry.

We arrive at the same conclusion from considerations of redundancy: following the common view of the mental dictionary as the repository of unpredictable information about lexemes (see e.g. Di Sciullo and Williams 1987: 3, 14), it may be argued that since the order of arguments is predictable, it does not need to be stored in the mental dictionary. Besides, a system that lists order in the lexical entry could allow exceptions to exist, such as verbs whose Agent and Patient occur in reverse order. But such verbs are unattested. We conclude:

(14) The order of thematic arguments of a verb is not specified in its stored lexical entry.

Recall that our objective is to provide an explicit account of the semantics of verbs as they undergo arity operations, from the stored lexical entry to the final interpretable form. The end result of this process will be a model-theoretic denotation, in the form of a truth-valued function over individuals and events. But in the standard formalisms of model-theoretic semantics, Montague grammar, etc., function arguments are inherently ordered: the denotation of kick (example (11d)) specifies that the first (internal) argument is its Patient, and the higher argument is its Agent. This is more specific than the lexical entry should encode, since we have decided to leave our lexical entries unspecified for argument order.

This predicament is not an accident of our choice of formal framework: fixed argument order is inherent in syntactic and semantic phenomena, and hence also in the theoretical frameworks employed in their analysis. In syntax, constituents combine in a particular order that is expressed in a hierarchical (structural) way. In a given syntactic tree, each constituent appears in just one structural position, which determines the order in which it forms a constituent with other parts of the tree. (A tree, of course, can be transformed into a different tree through movement.) In particular, clause structure determines the order in which verbal arguments combine with the verb and other arguments. The functions of our semantic framework similarly fix the order in which the arguments of the verb will be saturated. For example, the tree in (15) specifies the syntactic projection of the arguments of the verb kissed. Its constituent structure determines the order in which the semantic counterparts of its constituents will combine. Arguments are assigned to the appropriate thematic role because the semantic form at each tree node indicates the order in which its arguments should be
saturated; for example, the semantic form of the verb *kiss* specifies that the first argument it combines with is the Theme rather than the Agent.

\[
\begin{array}{c}
\text{S} \\
\text{NP} \quad \text{VP} \\
\text{John} \quad \text{V} \quad \text{NP} \\
\text{kissed} \quad \text{Mary}
\end{array}
\]

For our model of the Theta system, this means that listing a particular denotation function in the lexicon would undesirably encode a certain order of argument projection in the lexical entry. Granted, it is not a difficult technical task to transmute one order of argument projection into another. But listing one particular order in the lexicon, even an arbitrary one, goes against the principles of the Theta System—especially since there is no evidence for arity operations that rearrange the order of argument projection.

12.3.4 Manipulating theta-roles

The considerations of the previous section lead us to adopt a semantic object more articulated than simple denotation functions: the inventory of theta-roles must be kept in the form of a set, with no explicit order. This also turns out to be useful for another reason: some of the Theta System’s arity operations perform manipulations on theta-roles that are impossible to carry out, in a general way, on the arguments of model-theoretic functions. Two operations fall in this category: decausativization (called ‘expletivization’ in Reinhart 2002) and causativization.

Decausativization completely eliminates a [+c] (Cause) theta-role, and is responsible for creating unaccusatives under the causative–unaccusative alternation (see section 12.2.2). It also removes a verb’s Accusative case feature, as indicated by its disappearance in the schema below.

\[
\begin{array}{c}
\text{Decausativization: reduction of a [+c] role} \\
V_{+\text{Acc}} ([+c], \theta_j) \rightarrow V (\theta_j)
\end{array}
\]

To carry out decausativization, our system must not only delete a theta cluster but also recognize the presence of a particular cluster, [+c], sufficiently well to ensure that decausativization only applies to verbs that have it.
It should be stressed that complete elimination of a theta role (‘reduction’, in the Theta System’s terminology) is truth-conditionally distinct from existential closure (‘saturation’) of the same argument position, which as we will see is easy to define as a compositional operation on functions. If we apply decausativization (i.e. reduction) to the transitive from of break, the result is as shown in (17b). As we have seen, it represents the unaccusative variant of break. If we apply saturation we get (17c), which represents the passive form was broken:

(17)  
\[\text{break} = \lambda x \, \lambda y \, \lambda e \, \text{break}(e) \land \text{Cause}(e, y) \land \text{Patient}(e, x)\]
\[\text{break}_{\text{Red}} = \lambda x \, \lambda e \, \text{break}(e) \land \text{Patient}(e, x) \text{ (Reduction)}\]
\[\text{break}_{\text{Sat}} = \lambda x \, \lambda e \, \exists y \, \text{break}(e) \land \text{Cause}(e, y) \land \text{Patient}(e, x) \text{ (Saturation)}\]

Both (17b) and (17c) are of type \(<e, st>\): when combined with an individual (type \(e\)), they each give us a predicate over events. The difference is that unaccusative (17b) can be satisfied by any event of breaking, whether or not it has a causal participant; but (17c) can only be satisfied by events of breaking that do have a causal participant. This accounts for the well-known fact that unaccusatives and passives contrast syntactically, with only the latter allowing purpose clauses, by-phrases, etc.\(^{14}\)

Causativization, which despite the name is not the opposite of decausativization, adds a [+c+m] role and modifies any existing cluster carrying the +c feature, replacing it with its corresponding –c cluster. It is responsible for constructions like walk the dog.

(18)  
\[\text{Causativization (Reinhart 2002)}\]
\[\text{a. Feature adjustment:}^{15} \text{ change a } +c \text{ feature to a } -c \text{ feature.}\]
\[\text{e.g. } \text{walk}([+c+m]) \rightarrow \text{walk}([-c+m])\]
\[\text{b. Agentivize: add an agent role.}\]
\[\text{e.g. } \text{walk}([-c+m]) \rightarrow \text{walk}([+c+m],[-c+m])\]

The two arity operations require access to the inventory of theta-roles in several different ways. Decausativization can only apply to verb entries that have a [+c] cluster, so the machinery of the theta system must be sensitive to its presence: either it should be possible to directly detect the presence of the [+c] cluster, or decausativization must be so defined that it fails if applied to a verb lacking it. While causativization is in principle compatible with any theta grid, it too must be able to identify the

---

\(^{14}\) The contrast is often illustrated with the following minimal pair (Manzini 1983):

(i) *The boat sank PRO to collect the insurance.\(^{14}\)
(ii) The boat was sunk PRO to collect the insurance.

The matter is in fact more complex than we can discuss here, as a reviewer points out; a review of the empirical motivations for the Theta System’s arity operations lies beyond our present goals.

\(^{15}\) Reinhart (2002) actually refers to this step as ‘decausativize’. The name was changed to ‘feature adjustment’ somewhere around 2006, in order to avoid confusion with the arity operation decausativization. The updated formulation, which includes some other changes, can be found in Rákosi (2006: 38).
presence of particular theta roles sufficiently well to target them for feature adjustment. Finally, both arity operations must be able to remove or replace the targeted roles. We will now see that if we model our verb denotations as model-theoretic functions in an ordinary type of logic, there is no general way to carry out these operations. The reason is that functions, including verb denotations, are not hierarchically structured objects or strings of symbols. Formally, functions are defined simply as mappings from one set to another—in our case, from one set of functions to a set of functions of another type-logical type. As such, a function is harder to manipulate, as a formal object, than a collection of distinct theta clusters and other features.

Mathematically, a function is a set of ordered pairs, with each element in the domain of the function being paired with the function’s value for that element. At this level there is no reflection of how the value is calculated from the argument, or even a notion of calculation of any sort. The truth-valued function \( \lambda e \ run(e) \land \ Agent(e, x) \) is simply a ‘characteristic function’ that returns True for all events of running whose Agent is \( x \) (whoever that is). Listing the set of these events would convey exactly the same information. The denotation of \( run, \lambda x \ \lambda e \ run(e) \land \ Agent(e, x) \), is simply a function that maps any individual \( x \) to the corresponding characteristic function. This function could be written in other ways (e.g. as a very large truth table). The characteristic functions it gives us (after combining with particular individuals) might be defined in other ways, without mentioning Agent in their definition. Suppose that whenever John runs, he sweats; that events of running are the only occasions on which he sweats; and that our model represents such co-occurring events as a single eventuality. Sweat is an emission verb, with a single Patient argument (Reinhart 2002). The following expressions would then pick out the same set of events, i.e., they are the same function in this model:

\[
\begin{align*}
(19) & \quad a. \ \lambda e \ run(e) \land \ Agent(e, j) \\
& \quad b. \ \lambda e \ sweat(e) \land \ Patient(e, j)
\end{align*}
\]

Consequently it is not possible to have an operator guaranteed to recognize all and only the functions containing Agent as one of the conjuncts in their definition: if applied to function \((19)\), our hypothetical operator would have the impossible task of choosing between forms \((19a)\) and \((19b)\). Since the same function can be defined either with or without using Agent, the task (if it is meaningful at all) assumes knowledge of how a function was in fact defined; and this is not present in the function itself.

16 By definition, a function must supply exactly one value for each element in its domain.
The same is true of complete verb denotations. If in our model the events of running are exactly the events of sweating (and, reasonably, the person running is the one sweating), the following expressions describe the same function of type $<e, st>$:

\[(20)\]  
\[\lambda x \lambda e \text{run}(e) \land \text{Agent}(e, x)\]  
\[\lambda x \lambda e \text{sweat}(e) \land \text{Patient}(e, x)\]

Any equivalent formulation would be a valid way of expressing the same function. The presence or absence of an Agent argument can only be detected through the truth-conditional properties of a verb’s denotation, and this turns out to be impossible: such denotations simply do not contain enough information. Denotation functions can be written as lambda forms, as above, but the symbols constituting the lambda form are not actually part of the function.

It might seem that this problem can be avoided by switching to an intensional (possible-worlds) model. In the Appendix I show that this is not the case: intensional models are also liable to having the same model-theoretic function arise by more than one route.

We could sidestep the problem, of course, by adopting a richer view of functions. For example, we could define functions as strings of symbols constituting a lambda form like the ones in \((20)\). It would then be possible to define operations that cut and splice arbitrary parts of the function. But such a move would have far-reaching consequences, and is in any event much more drastic than our present proposal of an expanded structure for the limited purpose of lexical derivation. The point is that functions as standardly defined are restricted in the ways we have detailed.

Detecting the presence of a theta-role is only the first hurdle. Even if we could assume that a particular theta-role is present in a verb’s denotation, there is no systematic way to delete it. For example, we cannot map all agentive verb denotations to equivalent denotations that do not involve an Agent. The reason is essentially the same as for the problem of detecting the presence of a role: since a function does not explicitly contain the rules that created it, it is not possible to reconstruct, and omit, the truth-conditional contribution of the Agent predicate.

Proving that removal of a theta-role is impossible involves a fair amount of technical detail, so I defer this to the Appendix. Briefly, the reason is that there are simply too many possible answers. We can informally illustrate the problem with an analogy. Consider a function $d$ that gives us the straight-line distance of any geographical location from some fixed point (say, a particular location in Athens). Suppose now that I give you a distance, 42,195 metres, and I ask you to figure out the point whose distance I calculated to arrive at this number. The problem does not have an answer because there are a great many points (forming a circle around our reference point) for which this number is the answer. The task of going from an agentive denotation function to its Agent-less counterpart is impossible for the same reason: there are too many possible answers. If we think of the verb denotation as
being assembled by adding theta-roles to the event type one by one, the operation of adding a theta-role can be viewed as a function that maps our partially built functions to other functions with one more argument; \(\langle e, \text{st}\rangle\) to \(\langle e, \langle e, \text{st}\rangle\rangle\), in the case of adding a second theta-role. But this function is many-to-one, and therefore cannot be inverted. It is hoped that the correctness of these claims will be apparent to many readers. I provide more discussion along with the proofs in the Appendix.

The following are natural consequences of the standard treatment of denotation functions:

(21) **Limitations of operations on verb denotations**

a. A theta-role cannot be completely deleted from a verb denotation, nor replaced with another one.

b. No operation on denotations can be restricted to particular thematic types.

(22) **Operations that can be readily applied to the arguments of model-theoretic functions**

a. Existential closure
b. Reordering
c. Identification with another argument (as in reflexivization)
d. Insertion of additional arguments

The limitations in (21) are discussed above. To confirm that the operations in (22) are easy to define as operations on functions, we provide formulas that will perform them on the denotation of transitive verbs:

(23) a. \(\text{SAT}(V) = \lambda V . \lambda x \lambda e \exists y V(x)(y)(e)\)
b. \(\text{FLIP}(V) = \lambda V . \lambda y \lambda x \lambda e V(x)(y)(e)\)
c. \(\text{REFL}(V) = \lambda V . \lambda x \lambda e V(x)(x)(e)\)
d. \(\text{EXP}(V, R) = \lambda V \lambda R . \lambda x \lambda z \lambda y \lambda e [V(x)(y)(e) \land R(z)(e)]\)

In the above, \(V\) is a transitive verb denotation (type \(\langle e, \langle e, \text{st}\rangle\rangle\)) and \(R\) is a theta-role predicate (type \(\langle e, \text{st}\rangle\)). Each of the four formulas carries out the corresponding operation described in (22). SAT performs existential closure on the external argument, FLIP reverses the order of projection of the two arguments, REFL causes both theta-roles to be satisfied by a single projected argument, and EXP (for ‘expansion’) adds a third theta-role, which is projected just below the highest argument. Analogous formulas can be defined for other argument positions and for intransitive verbs, ditransitives, or functions of any other type.

12.4 **A model for word derivation from lexical entries**

We have seen that the Theta System’s model of lexical derivation requires free access to the inventory of theta roles, and assumes that argument order is initially
indeterminate. Neither of these is a property of the usual type-logical functions of model theory. But during syntactic derivation and semantic interpretation, we are dealing with objects in a form that does impose an explicit hierarchy (order) on the verb’s arguments. It follows that the verb’s stored lexical entry is not in that form. We are led to the conclusion that there is a change of representation, which I refer to as assembly, somewhere between the lexical entry and the LF interface. To make the proposal maximally conservative, we should try to locate assembly as early as possible. I will show that this point is at the transition between the lexical and the syntactic component.

In this section, I provide an explicit model that is capable of undergoing the operations specified by the Theta System, and a procedure for assembling it into a single denotation function of event semantics. In section 12.4.6 we look in more detail at when assembly takes place, and its consequences.

We have arrived at the following scenario. In the stored lexical entry, the theta grid of the verb is an unordered set of feature clusters. This set is manipulated by arity operations, which may add, remove, or replace the clusters in the set. At a certain point the order and manner of argument projection (internal or external) is determined, and the derived lexical object is converted into a different form, expressible as a single denotation function, which gives the proper event semantics and, necessarily, imposes a fixed argument order. Along with the inventory of theta-roles, each stage in the process must encode all sorts of other information that must be kept track of at that level: the lexical entry might include a phonological representation, morphological properties such as conjugation class and compatibility with various derivational morphemes, etc., while a syntactic representation must, among other things, include interpretable and uninterpretable features as required by the Minimalist architecture. But each form must also include information about the verb’s meaning and about its arguments. It is this information we focus on, with the understanding that it is just part of a larger system.

12.4.1 The lexical entry

We may model the stored lexical entry of the verb as including the following (along with other information which will not concern us).

(24) a. A one-place predicate over eventualities (type <s, t>), representing the core verb meaning.17

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17 For simplicity, I will assume that the core verb meanings correspond to event types, i.e., are elements of the set V defined in (9). It is possible, however, for the relationship to be non-trivial. If to smash means to break with great force, the lexical entry for smash might define it as a combination of the event types break and forceful (a manner predicate), eliminating the need for an event type smash in our semantics:

(i) smash = λx λy break(e) ∧ forceful(e) ∧ Patient(e, x) ∧ Cause(e, y)
b. A set $T$, whose elements represent the theta roles of the verb and are drawn from the set of theta clusters.

For example, the relevant part of the lexical entry for *kiss* is as follows:

(25) Lexical entry for *kiss*

Event type: $\lambda e \text{kiss}(e)$
Roles: $\{[+c+m], [-c-m]\}$

In combination with the general constraint that Agents must project higher than Themes, our lexical entry contains enough information to construct the denotation function of the verb *kiss*:

(26) $\lambda x \lambda y \lambda e \text{kiss}(e) \land \text{Agent}(e, y) \land \text{Theme}(e, x)$

During the course of lexical derivation, an object representing a copy of the stored lexical entry is modified in various ways. We will refer to this object, initially a copy of the stored lexical entry, as our working structure, WS.\(^{18}\) In addition to the information inherited from the lexical entry, the WS can store values for the feature ACC (assign accusative case), which is introduced by lexicon marking rule (2c). Arity operations can add, suppress or modify elements in our working copy of $T$, and may delete the Acc feature again. Therefore the WS can be modeled as a tuple $\langle P, T, \Phi \rangle$, where $P$ is an event type predicate, $T$ is a set of theta-roles, and $\Phi$ is a set of features.

What happens when we assemble (26) from the WS? After assembly, theta structure information might be present twice, in the original theta grid and in the generated denotation function. To ensure non-redundancy and consistency, I will assume that the same information is not represented in two places at the same time: the ordered form replaces the original, unordered information. The relevant content of the lexical entry is consumed (‘checked’) during assembly, and is no longer accessible directly. Any subsequent morphosyntactic or semantic operations must work by manipulating the new representation. In particular, any arity operations that apply after assembly can modify argument structure only by manipulating the

---

\(^{18}\) The WS differs from the stored lexical entry in that it can carry information created or computed in the course of the derivation. It is the lexicon equivalent of the (initially incomplete) syntactic structures that are manipulated by Merge during syntactic derivation, referred to as ‘structural descriptions’ (SD) by Chomsky (1995: 14ff.) or simply as ‘syntactic objects’ by Adger (2000) and Hornstein, Nunes, and Grohmann (2005). The WS, in short, is a sub-lexical SD.
assembled denotation function. Accordingly, their semantic effects should be expressible as operations on functions. To summarize,

(27) **Non-redundancy principle**

The set of theta-roles is assembled into a unified denotation by ‘checking’ each role, which consequently loses its independent existence and is no longer accessible except as part of the resulting denotation function.

Although a model-theoretic function incorporates ordering information, it does not contain any syntactic information about the projection of its arguments beyond their order. The semantic denotations for an unaccusative and an unergative verb are combinatorially indistinguishable (type <e, st>), and two-argument unaccusatives are similarly indistinguishable from transitive verbs with one internal and one external argument. I will assume that when the set of theta-roles is assembled into a denotation function, the necessary projection information is encoded in the form of syntactic features that are stored with the assembled lexical entry.

Word derivation in the Theta System proceeds in a sequential manner, with constraints on the sequence of operations doing much of the work of obtaining the right result. Saturation and decausativization (reduction) apply after introduction of Case features and internal–external indices (‘lexicon marking’). In addition to their effect on theta clusters, saturation and reduction can have effects on argument projection and licensing, which rely on the precise sequence of events. As detailed in section 12.2.2, non-derived intransitives do not undergo marking and are therefore always unergative; but a verb that becomes intransitive because of reduction (or saturation) already carries projection indices, and could therefore be unaccusative. Causativization, on the other hand, applies before marking and therefore affects (‘feeds’) marking and the introduction of Case features.

Our model for lexical derivation faithfully follows the prescriptions of Reinhart (2000; 2002) and Reinhart and Siloni (2005). The general outline proceeds as follows. Its components are described in more detail below.

(28) **The derivation process**

1. Copy the verb’s stored lexical entry into a *working structure*, WS.
2. Apply arity operations, the calculation of the Acc feature, and the lexical marking procedure as specified by Reinhart (2002).
3. Immediately before the assembly step, determine whether an external argument will be projected.
4. Perform the assembly step, expressing each cluster as a theta-role predicate and conjoining them with the event type in the appropriate order.
5. All further operations must apply to the assembled denotation function, plus any remaining information such as the Acc feature.
12.4.2 Arity operations

The following arity operations constitute the inventory of universal theta-role manipulations, employed by constructions that manipulate argument structure. Because of the change of representation involved in the assembly step, pre- and post-assembly arity operators will manipulate different objects, and must be defined differently.

(29) a. Saturation is the operation that applies (inter alia) in passive formation. It existentially closes a theta-role, which is consequently present for semantic interpretation, but is normally not realized syntactically. (It can be reintroduced as an oblique, or license instrument adjuncts or other constructions that require it.)

b. Arbitrarization is a variant of saturation that involves existential closure by a variable marked for ‘arbitrary human’ reference (Chierchia 1995). It is involved in the derivation of middle verbs. Arbitrarization is not in the original inventory of arity operations for the Theta System; see Marelj (2004), Reinhart and Siloni (2005).

c. Decausativization involves reduction (complete elimination) of the external theta-role. It can only apply in the lexicon. (By definition, based on its observed distribution.) It must apply to a multi-argument verb entry that has a [+c] theta cluster as one of its arguments; that argument is removed. Decausativization is responsible, inter alia, for deriving unaccusatives such as break, open from their transitive counterparts.

d. Reflexivization identifies two roles, creating a verb in which one argument fulfils two thematic roles. It can apply either in the lexicon or in the syntax.¹⁹

e. Causativization adds an Agent [+c+m] role. If the original lexical entry projected a cluster with a +c feature (an agent, cause or instrument), this is changed into the corresponding –c cluster. Like decausativization, causativization can only apply in the lexicon.²⁰

¹⁹ This description reflects the analysis in Reinhart and Siloni (2005) and later. Reinhart (2002) analyses reflexivization as internal reduction, the elimination of the internal theta-role.

²⁰ The Theta System limits its treatment of causation to the combinatorial properties of the +c clusters; in particular, it does not articulate a relationship between a causing and a caused event, or equivalent. I assume that an analysis along these lines can be made compatible with the Theta System, but in fact this might not be necessary: Neeleman and van de Koot (Ch. 2 above) argue that while causation is logically a relationship between events, a Cause argument is still the right way to represent the lexical semantics of causation (see their chapter for the precise statement of what this claim entails).
We now define these arity operations as manipulations of the WS. Since (as I will show) syntactic arity operations do not have access to the WS, we only provide the definitions appropriate for the lexical component.\(^{21}\)

(30) **Lexical arity operations on the WS**

a. **Saturation**
   
   (i) Replace a cluster \(\alpha\) with the result of applying existential closure on its individual argument; its meaning is defined as \(\lambda e \exists x \alpha(x)(e)\).
   
   (ii) Remove the \textit{Acc} feature if it is present.

b. **Arbitrarization**
   
   (i) Replace an element \(\alpha\) with the result of applying existential closure with a variable designated for arbitrary human reference, as defined by Chierchia (1995); its meaning is defined as \(\lambda e \exists x_{arb} \alpha(x)(e)\).
   
   (ii) Remove the \textit{Acc} feature from \(\Phi\), if it is present.

c. **Decausativization**
   
   This operation can only apply if \(T\) contains the cluster \([+c]\).
   
   (i) Remove the cluster \([+c]\) from \(T\).
   
   (ii) Remove the \textit{Acc} feature, if it is present.

d. **Reflexivization**
   
   (i) Replace two clusters \(\alpha, \beta\) with the bundled cluster \(\alpha\beta\), whose meaning is given by the formula \(\lambda x \lambda e \alpha(x)(e) \land \beta(x)(e)\).
   
   (ii) Remove the \textit{Acc} feature from \(\Phi\), if it is present.

e. **Causativization**
   
   (i) If there is a cluster containing the \(+c\) feature, replace it with the corresponding \(-c\) cluster: \([+c+m]\) becomes \([-c+m]\), etc.
   
   (ii) Add a \([+c+m]\) cluster to \(T\).
   
   (iii) Add an \textit{Acc} feature, if appropriate.\(^{22}\)

After the application of the arity operations, the possible elements of \(T\) in the WS are the following. (We assume that only elementary clusters occur in stored lexical entries.)

(31) a. The nine clusters of the theta system.

b. For each cluster \(\alpha\), counterparts \(Sat(\alpha)\) and \(Arb(\alpha)\) generated by saturation and arbitrarization, with semantic type \(<s, t>\) and meaning defined as above.

\(^{21}\) For those operations that can apply in either component (saturation, reflexivization), the main practical difference is that the syntax versions do not suppress the Accusative feature.

\(^{22}\) The conditions for adding the \textit{Acc} feature are spelled out by the Theta System’s lexicon marking rules (2).
c. For each (unordered) pair of clusters $\alpha$ and $\beta$, a 'bundled' element $\alpha \beta$ with semantic type $<e, st>$ and meaning defined as above.

For example, the bundled role $<\{c+m\} - \{c-m\}>$ is produced by reflexivization of a verb with the theta clusters $\{c+m\}$ and $\{c-m\}$. Rule (d) above gives its interpretation as $\lambda x \lambda e \left(\{c+m\} (x)(e) \land \{c-m\}(x)(e)\right)$, i.e., $\lambda x \lambda e$ Agent$(x)(e) \land$ Patient$(x)(e)$.

12.4.3 Internal and external projection

Recall that the semantic framework does not distinguish between internal and external arguments. A function incorporates ordering information, but does not determine the syntactic position of its arguments: unaccusatives and unergatives are both just predicates of type $<e, st>$, and two-argument unaccusatives are similarly indistinguishable from ordinary transitives. In the framework of the Theta System, the CS merging instructions determine the type of projection, based on lexicon marking of the theta clusters and other considerations (see (2) and (3)). I will assume that whether or not to project an external argument is a syntactic property. The lexical component is responsible only for deciding whether the verb should do so, and for passing on this information to the syntax in the form of a feature. This feature, which I will call $\text{Ext}$, is not part of the Theta System as formulated by Reinhart and Siloni; I introduce it here as a technical means of preserving the decision computed by the CS marking rules, since the information on which they depend becomes inaccessible once the external theta role is assembled into the denotation of the verb. Like $\text{Acc}$, $\text{Ext}$ is a simple privative feature: it is either present or absent.

While the theory of the Theta System includes a detailed account of when external projection will take place, the relevant rules are subject to elaborate rule-ordering constraints as discussed earlier: The lexicon-marking rules (2), which will not apply to verbs with only one argument, do apply to verbs that have gained a second argument through the causativization operation. Therefore causativization must precede the application of the marking rules. But the marking rules are not blocked by reduction, saturation, and reflexivization, which suppress an argument position; a

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23 Chierchia (1989/2004) shows that it is possible to encode the difference between internal and external projection in the semantics, by means of an alternative semantic formalization. Chierchia’s system gives predicates an atomic type, $<\pi>$. A ‘predication’ operator, ‘$\mathcal{U}$’, converts predicates to functions of type $<e, p>$, where $<p>$ is the type of propositions. Because the predication operation is assigned to the $I^0$ projection, its output must combine with an argument external to IP (hence, an external argument). The distinction between $<\pi>$ and $<e, p>$ can be exploited to control the projection of arguments. Kratzer (1996) adopts another approach to this issue: following Marantz’s (1984) suggestion that the external argument is not part of a verb’s theta grid at all, she develops a neo-Davidsonian event semantics for verbs that does not need to separately encode the internal/external distinction in the syntax. This solution is incompatible with the Theta System, which crucially relies on including the external argument in the verb’s theta grid.
verb left with just one argument due to their application will retain its marking index, if any.

A fully faithful reconstruction of the Theta System would include a way to represent clusters marked with the indices 1 and 2. These indices, assigned by the lexicon marking rules and controlling external v. internal projection, are not explicitly represented in the model developed here. The reason is that the indices are fully predictable from the features of each cluster, being basically shorthand for being an all-plus or an all-minus cluster (indices 1 and 2, respectively). Rather than storing the indices in the theta grid $T$ and reading them off again, we will achieve the same effect by direct reference to the values of the theta clusters. At the point where the Theta system specifies that indexing takes place, it is sufficient to determine whether it should take place. As far as I can see, the change simplifies the workings of the system but has no effect on its empirical predictions. The choice is largely a matter of personal preference, however, and readers who find the orthodox version preferable can easily fall back on it.

The sequence of events, therefore, must be the following:

1. Apply causativization (if applicable).
2. Decide, based on the number of arguments, whether the marking rules will apply.
3. Apply other arity operations (if applicable).
4. Apply the marking rules (if allowed by step 2) and the CS merging instructions.

The simplest way to carry out this procedure is by means of another feature, MARK, added to the WS in step 2 if its theta grid contains more than one argument at that point. Step 4 will then apply the marking rules only if the feature MARK is present.\(^{24}\)

There is certainly more to argument order than the decision of which argument, if any, should project externally. The theory of the Theta System only imposes weak constraints on argument ordering, focusing mostly on the question of internal v. external projection. It is assumed that there are other factors, some unknown and

\(^{24}\) The manuscript version of this text adopted an insight by Siloni (2002), who points out that we can account for the different impact of the arity operations if we stipulate that the marking rules apply to the ‘maximal’ theta grid of the verb: causativization, which extends the theta grid, is visible when deciding whether to mark, while operations that reduce it are not. While this is in my opinion preferable on conceptual grounds, the criterion is not trivial to apply, since our sequential model can eliminate a cluster: at the point where the marking rules are applied, it is necessary to know whether a cluster was present but has been deleted. We can eliminate step 2, then, but not the feature MARK. Instead of adding it at a single point in the derivation, it would be added at any point at which the WS contains more than one argument. Adopting this approach would also complicate our presentation, since all aspects of the revised system must be precisely defined. Here I follow the standard formulation of the required sequence of events, which allows us to simply assert that all operations (modulo details of the implementation) are ordered and carried out as specified by the Theta System.
some possibly idiosyncratic, that further constrain the order in which arguments are projected. Whether any true optionality remains after such factors are considered is unclear. Our system is equally consistent with either state of affairs. The CS merging instructions compute constraints on argument projection; if more than one order would be grammatical, an order is arbitrarily selected either by the marking and merging process or (implicitly) during assembly.

(32) **CS merging instructions (partial description)**

a. When nothing rules this out, merge an argument externally.

b. If the WS contains the feature $Mark$, an argument realizing an all-minus feature cluster must merge internally. An argument with an all-plus cluster must always merge externally. Bundled clusters must merge externally if and only if one of the bundled roles is an all-plus cluster.

c. In accordance with instruction (a), an argument will merge externally unless:

   (i) some other argument is already merging externally,

   (ii) instruction (b) requires it to merge internally, or

   (iii) the verb has the $Acc$ feature, and no other argument is available to receive Accusative case.

d. If some argument can merge externally, add the $Ext$ feature to the WS.

We use the simple privative feature $Ext$ to record the outcome of the CS merging algorithm: if it is present, project the highest argument externally, otherwise project internal arguments only. Nothing hinges on this detail, however: readers are welcome to substitute any other feature assumed to encode externality in their model of syntactic derivation.

The above formulation duplicates the effect of Reinhart’s original lexicon marking rules and CS merging instructions. As discussed in section 12.2.2, her writings discuss some additional conditions that we will not give a full account of. Reinhart holds, inter alia, that certain co-occurrence conditions render the realization of some clusters optional or in some cases impossible. We therefore allow the following, without going into the details:

(33) **Non-realization**

Under the optional or obligatory conditions spelled out by Reinhart (2002; forthcoming, a), a cluster may be either deleted from $T$ or existentially closed prior to assembly.

12.4.4 **The assembly step**

The assembly step involves assembling the verb’s theta clusters, in the proper order, and the verb’s event type predicate into a single logical formula. To accomplish
this, we recursively define a series of argument projection operators, $Proj_n$, which add a theta-role predicate to a partially constructed verb denotation.\footnote{The operators are modeled after the Event Identification rule of Kratzer (1996).} The elementary one, $Proj_0$, adds a theta-role to an event type predicate. Higher-order projection operators operate on denotations that already include some arguments.

(34) **Argument projection operators**

\begin{enumerate}
\item $Proj_0 = \lambda R_{e,st} \lambda P_{st} [\lambda x_e \lambda e, P(e) \land R(x, e)]$.
\item $Proj_1 = \lambda R_{e,st} \lambda P_{e,st} [\lambda z_e Proj_0 (R, P(z))]$.
\item $\ldots$
\item $Proj_n = \lambda R_{e,st} \lambda P_{e, \ldots, st} [\lambda z_e Proj_{n-1} (R, P(z))]$.
\end{enumerate}

The above are applied to a theta-role predicate (the argument $R$) and a partially built verb denotation (the argument $P$). For the lexicon, we only need as many operators as the highest arity verb occurring in natural language. For ditransitive verbs, $Proj_2$ is the highest needed.

We can then carry out assembly as follows:

(35) **Assembly procedure**

1. Begin with the verb’s event type predicate.
2. If $T$ contains any saturated clusters generated by (30a, b), combine them with the partial verb denotation through generalized conjunction.
3. Select the verb’s theta clusters, one by one, in an order consistent with the CS merging instructions (lowest argument first). Use the appropriate projection operator to combine the theta cluster with the partial verb denotation, as follows:
   \begin{enumerate}
   \item For elementary clusters, merge the corresponding theta role predicate.
   \item For bundled clusters, merge the bundled predicate defined by (30d).
   \end{enumerate}
4. Remove each cluster from $T$ as it is used.

Generalized conjunction (step 2) combines two predicates of the same type, giving a predicate expressing a conjunction of their truth conditions over the same arguments. Because the result is also of the same type, generalized conjunction can be used as many times as necessary. For predicates of type $<s, t>$ (core verb denotations and saturated theta roles), it is expressed as follows:

(36) $P + Q \equiv \lambda e [P(e) \land Q(e)]$

The result of assembly is a function with a fixed hierarchical order for its arguments. It expresses the semantic content of the verb in the form of a traditional truth-conditional denotation. It enters the syntax embedded in a syntactic object of the sort.
assumed in Minimalist accounts (e.g. Adger 2000: 17ff.): a lexical head that also contains syntactic features controlling its behaviour during syntactic derivation. In particular, it should carry the features for accusative Case assignment and for whether to project an external argument (see section 12.4.3):

(37) If the features Ext and Acc are present in the WS, add them to the generated syntactic object.

The utilization of these features depends on one’s model of syntactic derivation, and will not concern us here. Our model implements the lexical arity operations as manipulations on the WS, and then converts the WS into the usual kind of semantic and syntactic object. In the next section, we discuss the argument for locating assembly at the intersection between the lexicon and the syntax. Because of this decision, the semantic effect of syntactic arity operations will only be given (in section 12.5) as operations on denotation functions.

12.4.5 Examples
As a simple example, consider the derivation of unaccusative open.

(38) a. Lexical entry for open
   Event type: \( P = \lambda e \text{open}(e) \)
   Arguments: \( T = \{ [+c+m], [-c-m] \} \) (Agent, Theme)
   Features: \( \Phi = \{ \ldots \} \)

   We will show \( \Phi \) as initially empty, since all features relevant to the Theta System are added during derivation. (Accordingly, we did not include features in (24), our model of the stored lexical entry.)

b. Initial WS
   \( WS = <P, T, \Phi> \), a copy of the stored lexical entry.

c. Derivation (only changed components are shown)
1. From lexical entry \( T = \{ [+c+m], [-c-m] \} \)
2. Add Acc, Mark \( T = \{ [+c+m], [-c-m] \}; \quad \Phi = \{ \text{Acc, Mark} \} \)
3. Apply reduction \( T = \{ [-c-m] \}; \quad \Phi = \{ \text{Mark} \} \)
4. Merging instructions Mark is present, so by merging instruction (32b), the surviving cluster projects internally (i.e. no Ext feature inserted).
5. Assembly \( \text{open} + \lambda x \lambda e \text{Theme}(e, x) = \text{Proj}_0 (\lambda x \lambda e \text{Theme}(e, x))(\lambda e \text{open}(e)) = \lambda x \lambda e \text{open}(e) \land \text{Theme}(e, x) \)

d. Syntactic object
   denotation: \( \lambda x \lambda e \text{open}(e) \land \text{Theme}(e, x) \)
   features: \( \{ \ldots \} \) (none inserted by the Theta System)
Assembly produces a single denotation function and simultaneously clears the contents of P and $\Phi$. The resulting syntactic object is ready to be used in syntactic derivation. It includes the assembled denotation function as the expression of its semantics, and consists of interpretable and uninterpretable features that encode, inter alia, the information that it projects as unaccusative. (In our model, this is expressed by the absence of the privative feature EXT.)

For a more complex example of the assembly operation, we illustrate the assembly of the final (highest) argument of the three-argument verb *peel*, whose lexical entry is given in (39a).

(39)  

a. **Lexical entry for peel**
   
   Event type: $\lambda e \text{peel}(e)$
   
   Arguments: $[[+c+m], [-c-m], [+c-m]]$ (= Agent, Patient, Instrument)

   Features: $\Phi = \{\ldots\}$

b. **Initial WS**

   $WS = <P, T, \Phi>$.  

c. **Derivation**

   No arity operations.

   1. Add features ACC and MARK. $\Phi = \{\text{ACC, MARK}\}$
   
   2. Merging instructions: Introduce EXT feature, and order the arguments with $[+c+m]$ last (highest).

   $\Phi = \{\text{ACC, MARK, EXT}\}$

d. **Partially built denotation**

   (We suppress the details of how the first two arguments are assembled.)

   $\lambda z \lambda y \lambda e (\text{peel}(e) \wedge \text{Instrument}(e, z) \wedge \text{Patient}(e, y)).$

   Remaining argument: $T = [[+c+m]] = \{\lambda x \lambda e \text{Agent}(e, x)\}$

e. **Argument projection**: Add role $[+c+m]$ to the partially built denotation of step d.

   1. $\text{Proj}_2 ([+c+m]) (\text{peel(Patient, Instrument )}) = $
   
   2. $\text{Proj}_2 (\lambda x \lambda e \text{Agent}(e, x)) (\lambda z \lambda y \lambda e (\text{peel}(e) \wedge \text{Instrument}(e, z) \wedge \text{Patient}(e, y))) =$
   
   3. $\lambda z' [\text{Proj}_1 (\lambda x \lambda e \text{Agent}(e, x)) (\lambda y \lambda e (\text{peel}(e) \wedge \text{Instrument}(e, z') \wedge \text{Patient}(e, y'))] =$
   
   4. $\lambda z' \lambda y' [\text{Proj}_0 (\lambda x \lambda e \text{Agent}(e, x)) (\lambda e (\text{peel}(e) \wedge \text{Instrument}(e, z') \wedge \text{Patient}(e, y'))]) =$
   
   5. $\lambda z' \lambda y' \lambda x \lambda e (\text{peel}(e) \wedge \text{Instrument}(e, z') \wedge \text{Patient}(e, y') \wedge \text{Agent}(e, x))$. 

f. **Syntactic object**

   Denotation $= \lambda z' \lambda y' \lambda x \lambda e (\text{peel}(e) \wedge \text{Instrument}(e, z') \wedge \text{Patient}(e, y') \wedge \text{Agent}(e, x))$

   Features = $\{\text{ACC, EXT, \ldots}\}$
In this case the assembled word projects an external argument and carries an accusative Case feature, which must be checked during syntactic derivation.

12.4.6 When does assembly happen?

We now return to the question: at what point is the information in the WS assembled into a denotation function? While I have located assembly just prior to lexical insertion, one might conceivably position it at any point between the stored lexical entry and the LF interface. We will consider, and reject, earlier or later alternatives.

1. Early assembly: assembly is made at the earliest possible moment, before any arity operations on the verb entry.
2. Late assembly: assembly is made somewhere in the course of syntactic derivation, after all syntactic arity operations.

The timing of the assembly step determines the form of semantic information at each stage of lexical-syntactic derivation. Before assembly, arity operations (and other operations that manipulate the lexical item) must work on the structured representation we have defined; after assembly, they must manipulate the semantic objects (functions) built by the assembly process. Conversely, the arity operations of the Theta System must be defined so as to operate on the types of objects available to them. The non-redundancy principle (27) implies that we cannot have access to both kinds of structures at once: When the semantic form is assembled, the corresponding information is removed from our working copy of the lexical entry. We can summarize this as follows:

(40) Post-assembly condition

After assembly is complete, all arity operations must operate on the resulting semantic object; their semantic effect must be expressible as operators on denotation functions of our model-theoretic logic.

Early assembly would mean that a denotation function is built immediately, directly from the verb’s lexical entry; all arity operations must work by manipulating the resulting function. This would allow us to define stored lexical entries that do not redundantly encode argument order, but obviously it would render useless our definitions of the arity operations in section 12.4.2, which operate on a modified copy of the lexical entry. As we have seen in section 12.3.4, however, some arity operations are impossible to define as manipulations of denotation functions. Early assembly would make it impossible to carry out these arity operations, and must therefore be rejected as an option.

Late assembly would most simply mean assembling the verb’s denotation at the LF interface, in the course of computing the compositional interpretation of the entire
sentence; but assembly might also happen at some intermediate point. Adopting late assembly would require our model of syntactic derivation, and perhaps our semantics, to be adapted to include the WS. While this is a rather radical solution, it might not present insurmountable difficulties if it can be shown to be necessary—especially if we could assume such a syntactic model rather than actually developing one. The advantage of late assembly is that all arity operations manipulate the same sort of objects regardless of whether they operate in the lexicon or in the syntax. Consequently a lexical component rule, e.g. reflexivization, can be formally identical to its syntax counterpart. However, assembly at lexical insertion allows us to account for the differences between lexical and syntactic operations, since they apply to different kinds of objects.

12.5 Lexical and syntactic arity operations

In section 12.3.4 we saw that there are indeed arity operations that cannot be written as operations on denotation functions: reduction (including decausativization), which completely removes a theta cluster from the verb’s grid, and causativization, which replaces a cluster with its –c counterpart (as well as adding a new argument). Remarkably, these are exactly the arity operations that, according to the Theta System, are never encountered in the syntax. Saturation, arbitrarization, and reflexivization are not restricted to the lexicon. They can occur in either component, although Reinhart and Siloni (2005) argue that the choice is not free but parametrically controlled by a parameter of UG (6). These operations are easy to define as operations on denotation functions, requiring only the manipulations already discussed in the conclusion of section 12.3.4.

Saturation and arbitrarization existentially close an argument, and can be readily applied in the syntax. For example, the operator defined in (41) will saturate the external argument of a transitive verb.

(41) SAT\textsubscript{ext}(V) = \lambda V_{<e, <e, st>>}. \lambda x \lambda e. \exists y V(x)(y)(e) \quad \text{(Type: <<e, <e, st>>, <e, st>>)}

Formula (42a) applies SAT to the transitive verb break. Part (b) shows the result of combining the passivized verb with an NP argument.

(42) a. SAT\textsubscript{ext} (\lambda x \lambda y \lambda e. break(e) \land \text{Agent}(e, y) \land \text{Patient}(e, x)) = \\
\lambda x \lambda e. \exists y. \text{break}(e) \land \text{Agent}(e, y) \land \text{Patient}(e, x)

b. The vase was broken. \rightarrow \lambda e. \exists y. \text{break}(e) \land \text{Agent}(e, y) \land \text{Patient}(e, \text{vase})

Arbitrarization is similar, but the introduced variable is of a special sort marked for arbitrary human reference (see Chierchia 1995 for discussion of its semantics):

26 A possibility proposed by Tanya Reinhart (p.c.) involves assembly at the VP level. Its potential advantages and disadvantages will not be pursued here.
(43)  $\text{ARB}_{\text{ext}}(V) = \lambda V_{<e, <e, st>>} \lambda x \lambda e \exists y_{\text{arb}} V(x)(y)(e)$  
(Type: $<e, <e, st>>, <e, st>>$)

It is easy to write a family of operators that saturate the arguments of predicates of any arity.

Reflexivization can also apply in either the lexicon or in the syntax. It is straightforward to write reflexivization as an operator on formulae, given Reinhart and Siloni’s (2005) conversion to the view that it involves identification of two roles (and not reduction of the internal role, as in Reinhart’s (2002) version of the theory). An operator that reflexivizes a transitive verb can be written as follows:

(44)  $\text{REFL}(V) = \lambda V_{<e, <e, st>>} \lambda x \lambda e V(x)(x)(e)$  
(Type: $<e, <e, st>>, <e, st>>$)

Following this approach, Reinhart and Siloni (2005) analyse lexical reflexivization as ‘bundling’ two theta roles, i.e., identifying them with a single projected argument. Syntactic reflexivization, however, proceeds in a somewhat different way. Rather than directly bundle the two theta-roles, it suppresses the Case feature of the verb. The corresponding theta-role remains unassigned, and has the opportunity to be discharged only when the external theta-role is merged. At that time, the two theta-roles are bundled together and assigned to the external argument.

12.5.1 Explaining the distribution

We conclude that assembly must take place after the lexical arity operations have applied, but may occur either before or after the syntactic operations. But we can go further than that: I propose that assembly in fact takes place at the dividing line between lexical and syntactic operations, just prior to lexical insertion and the beginning of syntactic derivation. We then have a way of correctly predicting which arity operations are restricted to the lexicon and which may occur in the syntax: causativization and decausativization are restricted to the lexicon because their operation cannot be expressed as an operator on functions. The remaining arity operations, which are not so restricted, can apply either in the syntax or in the lexicon.

27 At the time, Reinhart (p.c.) raised a ‘conceptual problem’ with the role identification proposal. If, as the Theta System proposes, individual theta features should be taken as having independent semantic content, what does it mean for an individual to be both Agent ($[+c+m]$) and Patient ($[-c-m]$)? We appear to be predicating of one and the same individual that it is a ‘sufficient condition’ for bringing about some event $e$, and also that it is not a sufficient condition for bringing it about. But this would be a contradiction.

The problem disappears if we take features to characterize not an individual but its relationship to an event. The feature $+c$ says that an individual is related to an event in a way that makes it a sufficient condition for this event, while $-c$ says that it is related in a way that does not make it a sufficient condition. There is no contradiction, only the entailment that our individual is related to the event in multiple ways—which is after all what assignment of multiple theta roles is intended to convey.
Let us reiterate here that a suitably constructed model of the syntax could provide a work-around for these limitations (most simply, we could postpone or eliminate assembly and simply retain a WS-like structure throughout syntactic derivation); but the present proposal, which involves nothing more than what is necessary to assemble ordinary event semantics denotations out of an unordered set of theta clusters, correctly predicts the distribution of arity operations.

12.5.1 An alternative explanation

In the previous section I showed that an arity operation occurs in the syntax just if the manipulation it performs can be expressed as an operation on lambda forms; causativization and decausativization operations, which manipulate feature clusters in ways that cannot be so expressed, are limited to the lexicon. I have argued that these arity operations are so restricted precisely because syntactic arity operations must be expressible as operators on lambda forms.

Siloni (2002) proposes an alternative explanation of this distributional pattern. Noting that reduction and causativization both make changes in the number and identity of clusters in a verb’s theta grid, she proposes that they are not possible syntactic operations because the theta grid of a predicate may not be changed in the syntax. This is summarized as the ‘Lexicon Interface Guideline’.

(45) The Lexicon Interface Guideline (Siloni 2002)

The syntactic component cannot change \( \theta \)-grids: elimination and modification of a \( \theta \)-role as well as addition of a role to the \( \theta \)-grid are illicit in syntax.

Reflexivization and saturation are understood as affecting the mapping of theta-roles to syntactic arguments, not the inventory of theta roles themselves. Therefore they are permitted in the syntax.

Both explanations rule out deletions or modifications of feature clusters in the syntax. The account I have proposed follows from properties of the semantic framework and the proposed model, while Siloni’s is based on the introduction of an intuitively plausible condition on what kinds of operations are permitted in the syntax. However well-motivated, the Lexicon Interface Guideline was specifically introduced to account for the observed distribution of arity operations. In the absence of strong independent motivation, it must be considered a stipulation and therefore a less parsimonious explanation than the independently developed account I have proposed. On the other hand, the Guideline is a strictly syntax-internal explanation, a characteristic that might appeal to some readers.

The two accounts are conceptually compatible, since they adopt different means of explanation. If they made identical predictions, choosing between them would ultimately be a matter of taste; but Siloni’s formulation makes a further prediction, which does not follow from our proposal: that it is also impossible to add a theta role in the syntax.
It appears that such operations do in fact occur in the syntax. The *applicative* construction is a well-known example of an operation that extends the argument structure of a verb, adding an internal argument. It is found (inter alia) in many Bantu languages, where it is expressed by a derivational verbal suffix (usually -i, -li, or a cognate), and is extremely productive. In Kichaga, for example, 'the new object may have the thematic roles of benefactor, malefactor, recipient, instrument, location, or motive (reason or purpose), depending on the semantics of the base verb’ (Bresnan and Moshi 1990).

(46) *Applicative* (Kichaga: Bresnan and Moshi 1990)\(^{28}\)

\(a\). N-ā-ī-ly-ā k-ēlyà.
Foc-1s-Pres-eat-FV 7-food
‘He/She is eating food.’

\(b\). N-ā-ī-ly-i-ā m̀-kà k-ēlyà.
Foc-1s-Pres-eat-Appl-FV 1-wife 7-food
‘He/She is eating food on (to the benefit/detriment of) his wife.’

\(c\). N-ā-ī-ly-i-ā mà-wòk ő k-ēlyâ.
Foc-1s-Pres-eat-Appl-FV 6-hand 7-food
‘He/she is eating food with his/her hands.’

That the added NP is an argument of the verb is not in dispute: it triggers object agreement on the verb, and it is treated as an object by subsequent productive arity operations, including passivization. If the applicative is a syntactic operation, as seems plausible given its productivity, regularity and other properties, then it contradicts the Lexicon Interface Guideline (45).

The system proposed in section 12.4 allows applicative formation to be formulated as an operation on denotation functions, and therefore predicts that it should be possible in the syntax.\(^{29}\)

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\(^{28}\) Numeric prefixes in the gloss indicate noun class. 1s = class 1 (animate singular) subject agreement; *Appl* = applicative; *FV* = final vowel; *Foc* = focus; *Pres* = present tense.

\(^{29}\) We have already seen formulas that add a theta-role predicate to the denotation of the verb: that is just what the argument projection operators in (34) do. While the argument they insert is always higher (merges later) than existing arguments, it is just as easy to add an argument that merges first (or, indeed, in any intermediate position; cf. formula (23d)). The following formula will add a Beneficiary role to a transitive verb:

\[(i) \quad \text{APP}_3 = \Lambda P_{xx}, <e, st> [\lambda z \lambda x \lambda y \lambda e \ P(x)(y)(e) \land \text{Ben}(e, z)] \text{ (Type: } <e, <e, st>, <e, <e, st>>>\)]
12.6 Conclusion

I have outlined a concrete proposal for embedding the Theta System in a simple account of event semantics. By positing a change of representation at the time of lexical insertion, the proposal makes empirically correct predictions about the types of lexical operations that are possible in the lexicon and in the syntactic component. It must be remembered that the restrictions leading to these predictions are not dictated by conceptual necessity, but follow from properties of the formal framework (Montague-style truth-conditional semantics). If verb denotations are not really model-theoretic functions but some richer kind of entity, they might not be subject to the restrictions we have demonstrated. The proposed explanation, then, relies on the premise that the logical formulae commonly employed by semanticists are not just convenient notation, but have expressive content that corresponds to the formal power of the semantic operations that take place during lexical and syntactic derivation. In finding a correlation between properties of the formal framework and actual properties of arity operations, it can be argued that we have obtained empirical support for our choice of (broad) formal framework. The correlation can be taken as evidence that the semantic component of grammar does in fact have properties analogous to those of our truth-conditional, model-theoretic framework.

In the appendix that follows, we consider the details of what can and cannot be accomplished by the manipulations that our semantic framework makes available.

Appendix. Deleting a theta-role from a lambda form

In this section I prove the claim, discussed in section 12.3.4, that there is no systematic way to completely remove a thematic role from the truth conditions of a verb denotation. Concretely, this means that reduction (employed by decausativization) and causativization cannot be defined as operations on functions, and therefore must be restricted to the lexical component.

Event semantics is designed to allow the participants in an event to be relatively independent. A proposition in neo-Davidsonian form, about an event and all its participants, is designed to license the inference of weaker propositions which do not mention some participants. For example, (47b) is logically entailed from (47a).

(47) a. Bill broke the glass.
    $\exists e \text{ break}(e) \land \text{Cause}(e, \text{Bill}) \land \text{Patient}(e, \text{glass})$

b. The glass broke.
    $\exists e \text{ break}(e) \land \text{Patient}(e, \text{glass})$

While such inferences are plainly valid in our logical system, I have asserted that the mechanics of lambda calculus (or any other system that treats verb denotations as indistinguishable from the corresponding truth-conditional functions) do not allow
us to define a general mapping from the first type of predicate to the second. We cannot manipulate the denotation of the transitive form of ‘break’, for example, in such a way that we delete (‘reduce’) its Cause role.\(^{30}\) That is, if we’re given a verb denotation like \(\text{break}^{(2)}\) (48a), there is no general way to construct from it a denotation like \(\text{break}^{(1)}\) (48b), which is identical except that it does not mention a Cause participant. (The superscripts denote the arity of each form.)

\[
\begin{align*}
(48) & \quad \text{a. } \text{break}^{(2)} = \lambda x \lambda y \lambda e \text{break}(e) \land \text{Cause}(e, y) \land \text{Patient}(e, x) \\
& \quad \text{b. } \text{break}^{(1)} = \lambda x \lambda e \text{break}(e) \land \text{Patient}(e, x)
\end{align*}
\]

More generally: given a function \(f\) representing the conjunction of two or more predicates over eventualities, or a function from other types that leads to such a conjunction, there is no way to identify the predicates that were conjoined to create \(f\)—even if we know all but one of them. In the following sections, I provide a mathematical proof of this claim. As we will see, the problem cannot be solved unless fairly restrictive conditions are imposed; and if solvable, the solution cannot be formulated in a general way but must be expressed in relation to a particular model. The reason, in brief, is that the extension of \(f\) is not rich enough to tell us which event type predicate went into its definition. Although we can write verb denotations as combinations of predicates and logical operators in the language of lambda calculus, each denotation is simply a function; it is not possible to ‘look’ inside it and recover the expressions that went into making it. For this reason, combining predicates together is a lot easier than pulling them apart.

Decausativization and causativization must additionally be able to detect the presence of particular roles: Decausativization can only reduce a [+c] role, while causativization must detect and adjust any existing +c roles to avoid conflict with the added Agent. This task raises similar problems, discussed in section 12.3.4. We do not consider them further in this appendix.

In section 12.3.4 we presented the analogy of a distance function, \(d\), that gives us the straight-line distance of any geographical location from some reference point. If I use \(d\) to calculate the distance of some location from the reference point, and I tell you that it is 42.195 metres, you do not have enough information to identify the location whose distance I calculated to arrive at this number. The problem cannot be solved because there are a great many points (a whole circle’s worth) for which this distance is the answer. This corresponds to the first of our findings: if I create a verb denotation \(f\) by conjoining an event type predicate and one (or more) theta-role predicates, the components are not identifiable: There are many combinations of predicates that would yield \(f\). To be clear, it is not difficult to find a set of predicates

\(^{30}\) Note that the term ‘reduction’ is used as defined in the Theta System: it is the complete elimination of a theta-role from the meaning of a predicate. In lambda calculus, ‘reduction’ refers to certain formal manipulations of lambda forms which can, of course, be successfully applied to verb denotations.
that give $f$ when combined; the insoluble problem is to find the predicates that actually went into building $f$.

Imagine now that I restrict the distance problem as follows. Instead of calculating the distance between arbitrary points, I restrict my attention to a specific set, perhaps the set of European cities (each represented by the location of its idealized centre). In this case the problem of going from distances to cities might have a unique solution: this will be the case as long as no two cities lie at the same distance from our reference point. This corresponds to our second result. In section 12.7.4 I spell out the conditions that guarantee the existence of a unique answer for the operation of reduction, i.e. for going from a transitive verb denotation to the denotation of its reduced form.

Finally, consider what is involved in calculating the distance between two cities. Given the geographic coordinates of two locations, there is a mathematical equation (the ‘orthodromic distance’) that gives us their straight-line distance along the surface of the earth. But there could be no mathematical equation that will convert a distance into the name of a city, or even into its coordinates. This can only be done by checking the distance of each candidate city (perhaps using something like the table of driving distances found in road maps). This corresponds to our third and final result: even when the conditions for uniqueness of the reduction operation are satisfied, the result can only be obtained by checking our function against the set $V$ of all event type predicates in our model. In this respect, reduction (decausativization) is still substantively more complex than saturation or reflexivization, which are easy to express in closed form.

### A.1 Minimal conditions

Recall (section 12.3.4) that saturation (existential closure) and reduction are different operations in the terminology of the Theta System, and yield predicates with distinct truth conditions. Formula (49b), the result of applying reduction to the verb `break`, can be satisfied by any event of breaking, whether or not this event has a Cause participant in our model; but (49c) can only be satisfied by events of breaking that do have a causal participant.

(49) a. $\text{break} = \lambda x \lambda y \lambda e \text{break}(e) \wedge \text{Cause}(e, y) \wedge \text{Patient}(e, x)$
b. $\text{break}_{\text{Red}} = \lambda x \lambda e \text{break}(e) \wedge \text{Patient}(e, x)$ (Reduction)
c. $\text{break}_{\text{Sat}} = \lambda x \lambda e \exists y \text{break}(e) \wedge \text{Cause}(e, y) \wedge \text{Patient}(e, x)$ (Saturation)

If we apply each of the reduced expressions to an individual $z$, we get the following predicates over events:

(50) a. $\lambda e \text{break}(e) \wedge \text{Patient}(e, z)$ (from reduced verb)
b. $\lambda e \exists y \text{break}(e) \wedge \text{Cause}(e, y) \wedge \text{Patient}(e, z)$ (from saturated verb)
Suppose our semantic model was such that all events of breaking happen to have a Cause participant. Knowing that \( e \) is an event of breaking would then allow us to conclude that there is some \( y \) that is its Cause. In other words, the two predicates above would be truth-conditionally equivalent since they would be satisfied by exactly the same set of events. Since reduction and saturation are in fact operations with truth-conditionally distinct results (representing unaccusatives and passives, respectively; cf. section 12.3.4), we will assume that this does not happen. We must allow that for some event types at least, there will be individual events with different assortments of roles.\(^{31}\)

\[\text{A.2 A simple version: predicates over events}\]

We begin with a lemma that may serve to persuade readers of the plausibility of the complete result:

\[(51) \quad \text{Lemma}\]

Let \( P \) and \( A \) be arbitrary subsets of a superset \( E \), with \( P \subseteq A \) and \( A \neq E \). The equation \( P = B \cap A \) does not have a unique solution for \( B \).

\[\text{Proof}. \text{Let } X \text{ be any subset of } E - A. \text{ Then } X \cup P \text{ is a solution, since } P = (X \cup P) \cup A. \text{ Since } E - A \text{ is non-empty, there are multiple subsets and hence multiple solutions.} \]

The set relationships involved in the lemma are shown in Fig. 12.A.

\(^{31}\) It is not necessary to assume that all event types show variation in their argument realization. Perhaps only a few event types do. Still, any definition of arity operations should be valid for all models and for all event types and theta-roles to which the operations might be applied. We will assume for purposes of demonstration that we are dealing with the non-trivial cases.
Fig. 12.A is meant to show that knowing the intersection of B with a known set is not enough information to determine B uniquely. E can be thought of as the set of events, A as the set of events that have an Agent (from now on we’ll use Agent as our example theta-role to be deleted), and P as the set of events denoted by the agentive version of some verb. Our task, which the lemma shows to be impossible, was to discover the non-agentive version. This task is impossible because of the lack of uniqueness: because there are multiple sets that might have been used to construct P, it is impossible to determine the set that was used to construct P.

The condition A \( \neq \) E is a weaker form of our assumption that some event types will allow variation in their inventory of theta roles: if A represents all events that have an Agent, and some event type comes in both agentive and non-agentive variants, we can minimally conclude that there exist some non-agentive events (not elements of A). This weaker condition, that some events are not elements of A, is all we needed to prove our lemma.

Knowing the intersection of B with A, then, is simply not enough to recover B: there are many sets whose intersection with A is P, and all are solutions to the equation P = B \( \cap \) A.

It is a trivial matter to apply this result to predicates over events:

\[ (52) \quad \textbf{Corollary} \]

Let P and A be predicates over events, where \( P(e) \Rightarrow A(e) \) and A \( \neq \) E (i.e., there is some \( e_0 \in E \) such that \( \neg A(e_0) \)). The equation

\[ \forall e (P(e) \iff B(e) \land A(e)) \]

does not have a unique solution for B.

**Proof.** Apply lemma (51) to the sets characterized by P, A, and B. \( \square \)

These results show that, although we can write a lambda form as a conjunction of two predicates over events, appearances are deceiving. A characteristic function constructed as the conjunction of two predicates does not actually ‘contain’ the conjoined predicates: it is just a function. There is no way to pick out the original conjuncts from among all the predicates that satisfy the equation of corollary (52).

\[ \{32 \] Note that switching to an intensional model does not help: if A, P, and f are intensional functions from worlds \( w \) to sets of events such that \( P_w = f(w) \cap A_w \) and \( A_{w_0} \neq E \) for some world \( w_0 \), I can construct another solution \( f' \) with the property \( P_w = f'(w) \cap A_w \) as follows: Choose an event \( c \notin A_{w_0} \), and define \( f' \) as follows:

(i) \( f'(w) = f(w) \) if \( w \neq w_0 \)
(ii) \( f'(w_0) = f(w_0) \cup \{c\} \) if \( c \notin f(w_0) \)
(iii) \( f'(w_0) = f(w_0) - \{c\} \) if \( c \in f(w_0) \)

Note that \( c \notin P_w \), since \( P_w \subseteq A_w \). It is easy to see that \( f \neq f' \), and that both are solutions to equation \( P = B \cap A \) in all possible worlds.
If we think of the conjunction of two functions as being itself a function (a mapping), this function is many-to-one and therefore has no inverse.

In the next section, we prove that the same holds when we move up from predicates over events to functions from individuals to such predicates. Removing a theta role is tantamount to going from an intersection to one of the intersected sets, which is impossible. Our proof must deal with more technicalities but otherwise follows the same approach.

A.3 Reducing a role from a transitive verb

Our goal is to prove the following:

(53) **Theorem**

Let \( P_{e, s, t} \) be the denotation of a transitive verb, expressed as the conjunction of an event type predicate and two thematic roles, i.e., in the form

\[
\lambda x \, \lambda y \, \lambda e. \, V(e) \land R_1(e, x) \land R_2(e, y).
\]

There is no general way to compute the predicate \( B_{e, s, t} \) that would have resulted by conjoining just the event type predicate and the internal (respectively, external) thematic role of \( P \).

It is easy to reverse the order of arguments in a lambda form, so the problems of deleting the internal or external role are equivalent. Without loss of generality, we will consider reduction of the external argument. Moreover, our task assumes that we do not know which thematic role the external argument expresses (Agent, Experiencer, etc.). But since we are proving a negative result, it is enough to consider the easier task of deleting a known theta role, e.g. Agent. We will show that no solution to the simpler task is possible. From this, theorem (53) follows, since if we had a solution that works for an unknown theta role, we could use it even if we know that we are deleting an Agent role.

The conjunction of the internal theta role and the event type predicate \( (R_1 \text{ and } V \text{ in the theorem’s statement}) \) does not need to be decomposed; we will treat their combination as a single predicate, \( B_{e, s, t} \). For example, perhaps \( B = \lambda x \, \lambda e. \, \text{break}(e) \land \text{Patient}(e, x) \).

To prove theorem (53), then, it suffices to prove the following:

(54) **Theorem**

Given a function \( P_{e, s, t} \) that is of the form \( \lambda x \, \lambda y \, \lambda e. \, B(e, x) \land A(e, y) \), it is not possible to uniquely determine \( B \) if we only know \( P \) and \( A \).

\[\text{The expression } \lambda x \, \lambda y \, P(y)(x) \text{ is equivalent to } P, \text{ except that its arguments are reversed.}\]
Proof. Suppose \( B \) can be determined given only \( P \) and \( A \). Then \( B \) must be the unique set satisfying the condition of the theorem. We will construct another function that satisfies it, deriving a contradiction.

Without loss of generality, we can assume (as before) that reduction and saturation give truth-conditionally distinct results for our event type predicate; this happens just if there is some event \( e_0 \) such that \( \exists x B(e_0, x) \land \neg \exists y A(e_0, y) \). (For instance some events of the type in question are not agentive.) \(^{34}\)

Let \( B \) be a solution to the equation of the theorem. Construct \( B' \) as follows:

(i) Fix an arbitrary individual \( a \in D \).
(ii) Let \( B'(e_0, a) = \neg B(e_0, a) \).
(iii) For all other \( e, x \), let \( B'(e, x) = B(e, x) \).

Suppose that \( B' \) is not a solution to the required equation. This means that when written into the equation, it gives us a function that differs from \( P \). Then there must be some triple of arguments (an event and two ordinary individuals) for which \( B \) satisfies the equation of the theorem, but \( B' \) does not. By construction, \( B \) and \( B' \) are identical for all values not including \( e_0 \) as the event parameter, so the problem triple must include \( e_0 \).

Because \( e_0 \) has no \( A \) role, \( A(e_0, y) \) is false for all \( y \). It follows that \( (B(e_0, x) \land A(e_0, y)) \) is false for all \( x, y \), and so is \( B'(e_0, x) \land A(e_0, y) \). That is, if \( B \) satisfies the equation for some triple of values including \( e_0 \), so does \( B' \). Hence \( B' \) satisfies the equation of the theorem for all triples of values, and therefore it is a solution.

We have shown that \( B \) and \( B' \) both satisfy the equation of the theorem but are distinct predicates, contrary to the assumption that \( B \) is unique. \( \square \)

Since our problem does not have a unique solution, it is not possible to recover an event type predicate by removing (reducing) one theta-role from a verb denotation: The conjoined denotation is compatible with a multitude of constituent predicates, with no way to determine which ones actually went into creating it.

A.4 Constraints that permit reduction

In our formulation of theorem (54), we have treated event type predicates as arbitrary predicates over events. But in our semantics, event type predicates are drawn from a set \( V \), which is fixed by our model. This does not in itself invalidate our results (since we have not placed any restrictions on \( V \), our predicates are still effectively arbitrary), but we now turn to the following question. Under what conditions on \( V \), and on other aspects of the model, does the problem of reducing a theta-role have a unique solution?

\(^{34}\) Since our theorem is concerned with computing an answer in the general case, it is enough to show that there are conditions where no answer exists. It follows that we cannot always compute an answer.
In this section, we show that uniqueness can be ensured in a linguistically plausible special case. Even in this restricted domain, however, reduction is qualitatively harder to express than operations, such as saturation, that do not alter or delete an existing theta-role. In particular, the mapping from a transitive verb denotation to its reduced form cannot be expressed in the language of our semantic model; it can only be defined by reference to the metalanguage, or by stipulation ('brute force').

While there is no solution to the general problem of computing the reduction of a verb denotation $P$, the reduction operation in a linguistic context is not equivalent to looking for arbitrary predicates over events. In truth, the result of reducing one role of a transitive verb would be a combination of a theta-role and a basic event type; given the sets $R$ and $V$ of all possible theta-roles and event types, respectively, we can construct a set $C$ of all possible combinations. We can then simplify our task by considering only elements of $C$ as possible solutions.

For simplicity, we once again ignore individual arguments and restrict ourselves to predicates over events. We assume that $P$ is always of the form $P = B \cap A$ for some $B \in C$, so that the task of finding $B$ always has at least one solution. Informally, we will consider $A$ to represent the set of agentive events. Our task then is to go from the agentive version of the verb to the non-agentive (reduced) version. We formalize this by defining a ‘solver’ function $\Phi$ that gives us, for each set of agentive events $P$, all qualifying sets of events with the property that they have $P$ as their agentive subset:

$$\emptyset(P) \equiv \{ X \in C \mid P = X \cap A \}$$

In effect, $\Phi$ is the closest we can come to a function that inverts the addition of an Agent. Our problem has a unique solution just if $\Phi(P)$ is a singleton for all non-empty $P$ in its domain. ($\Phi(\emptyset)$ will give us all events whose type cannot have an Agent in our model; we can safely ignore these as irrelevant.) Note that $\Phi$ was specifically defined to allow us to reverse intersection with $A$, i.e. to delete an Agent theta role. Similar uniqueness conditions must hold for any other role that will need to be reduced.

Uniqueness is equivalent to requiring that if $F$ and $H$ are distinct event type predicates, and the event types they describe are compatible with Agents, the sets of agentive events of type $F$ and $H$ should be distinct. This is reasonable in a linguistic context: even though there are agentive and non-agentive breaking events, I can expect agentive events of breaking to differ from agentive events of running, of sinking, etc. We do expect some overlap; if $F$ and $H$ are the sets of smashing and breaking events, respectively, there may be some events that qualify both as smashing and as breaking; but even then we can require that our models are rich enough for the agentive subsets of $F$ and $H$ to be distinguishable. In this linguistically plausible special case, $\Phi(S)$ is always a singleton if $S$ is non-empty,
and our problem at least has a solution: given a set $P$ of agentive events, there is only one event type predicate they could have come from.\footnote{We have glossed over the effect of the remaining thematic role in this discussion.} We can now consider how difficult it is to find this solution.

We can express the solution to our problem as follows: $B = \Phi_o(P)$, where $\Phi_o(x)$ is the unique element of the set returned by $\Phi(x)$. But we were only able to do this by referring to the set $C$, and hence to the sets $V$ and $R$, which are part of our model. Our solution function, in other words, is a contingent property of particular models meeting the distinctness condition we have outlined. By contrast, arity operations like saturation and reflexivization, which can apply in the syntax, can be expressed in a general, model-independent way: they are necessary properties of our semantic system.

It is also remarkable that all syntactic arity operations can be written as rather simple lambda forms: they are straightforward combinations of the elementary operations of standard model-theoretic logic. In a sense, they can be said to be logically simpler operations than deleting a role. To demonstrate this, consider that all the predicates and logical operators we have used in our semantics represent total, not partial functions.\footnote{While Landman (2000) defines theta-roles as partial functions from events, we have defined them as truth-valued relations between events and individuals.} The composition of total functions is also a total function, and thus every expression we can construct in our logical language will be defined (have a value) over all objects of the appropriate type. The solver function $\Phi_o(P)$, on the other hand, is only defined in models, and for event types, for which $\Phi(P)$ is a singleton. It follows that $\Phi_o$ cannot be written as an expression in our logical calculus; since it is a partial function, it cannot even be introduced as a primitive unless we allow partial functions in our semantic system.

If we extend our logic with the $\iota$ (iota) operator for higher types, we can now express $\Phi_o$ as a logical formula: $\Phi_o(P) = \iota Q. (P = Q \cap A)$.\footnote{\(\iota^x P(x)\) reads ‘the unique $x$ with the property $P(x)$’, so our formula simply states that $\Phi_o(P)$ is the unique solution to our equation.} Iota, of course, defines a partial function.

In short, saturation and other arity operations that apply in the syntax can be expressed in a very restrictive logical system, without partial functions. While the iota operator is commonly utilized in natural language semantics (at least for simple types), it can still be argued that a mapping that irreducibly requires such powerful tools is logically more complex, and perhaps cognitively more difficult to carry out, than the much simpler operations of adding a thematic role.
A.5 Summary

We have shown that (a) the problem of deleting a theta-role does not have a solution (because it does not have a unique one) unless certain uniqueness properties hold of the inventory of event types, $V$. (b) If the uniqueness condition holds, the mapping representing deletion of a theta-role is not expressible in a logical language that allows only total functions. (c) Deletion of a theta-role can be expressed in a logical language that includes the iota operator. It is then contingent on the necessary uniqueness properties.
Children Acquire Unaccusatives and A-Movement Very Early

JOÃO COSTA AND NAAMA FRIEDMANN

13.1 Introduction

In an influential study on the acquisition of syntactic movement, Borer and Wexler (1987) argued that movement is acquired early, but not all types are acquired equally early. These authors contend that A-bar movement is available from the onset, whereas A-movement is subject to maturation. They based this claim on the observation that passives are not available until the age of four or even five years. Their idea was that the problem with passives is determined by the unavailability of A-movement. This, in turn, is sustained by alleged problems with unaccusative verbs. According to this hypothesis, children who have not acquired A-movement yet are expected not to be able to move the argument of unaccusatives to subject position. As a result, unaccusatives are expected either to appear in VS order exclusively or to be analysed as unergatives by children when they do produce them in SV order.

Under Tanya Reinhart’s Theta System, a small set of merging (mapping) instructions captures the distinct mapping of unaccusatives v. unergatives (as well as other types of predicates) on the basis of their role composition and derivational history (for details, see Reinhart 2002; forthcoming, a, and Chapter 1 above). The thematic properties of unaccusatives are taken by Reinhart, among many others, to be universal and innate. Under Reinhart’s system, and in contrast with Borer and Wexler’s suggestion, children are not expected to map the subject of unaccusatives externally.

In the current study we compare these two opposing views, and try to find out whether young children have difficulties in A-movement and misanalyse unaccusatives as unergatives, as suggested by Borer and Wexler, or whether, as Reinhart’s system predicts, children analyse correctly the thematic properties of unaccusatives from the outset.

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The delay of A-movement account encountered many empirical problems. Various studies that assessed the acquisition of passives, raising, and unaccusatives, all structures that involve A-movement, yielded evidence against Borer and Wexler’s claims. With respect to the claim that the acquisition of A-movement is delayed, these studies report that each of these A-movement structures is not problematic in general. In addition, they show that in specific constructions where children’s comprehension or production is impaired, it is not A-movement that is impaired, but something else. In particular, Fox and Grodzinsky (1998) showed that children are able to comprehend passives as long as the presence of the agent and the type of verb (actional/non-actional) is controlled for. These authors argue that children’s difficulties with passives have to do with limitations on theta-role transmission, and not with A-movement, which is involved in all types of passive structures they study (i.e. also in passive structures that are unproblematic for children). In a similar vein, Becker (2006) explored English-speaking children’s acquisition of raising structures, and found that three-to-four year-old children already understand raising structures. This was assessed in two experiments. The first provides evidence for the children’s good comprehension of raising sentences (acceptance of raising sentences with compatible embedded predicates, rejection of raising sentences with incompatible embedded predicates). The second shows that children distinguish copular verbs from raising verbs, discarding the possibility that children treat raising verbs as copulas. This is also in line with the findings of Froud, Tsakali, and Wexler (2010), who found that English-speaking children aged three to six years do not have a general problem with raising structures. The children they tested could understand raising structures like Pooh seems to be holding an umbrella (but failed to understand the structure when another PP was added: Pooh seems to Piglet to be holding an umbrella).

Another line of studies strongly suggests that young children master unaccusatives early and classify them correctly as unaccusatives rather than as unergatives. One type of evidence comes from children’s good ability with auxiliary selection. Snyder, Hyams, and Crisma (1995) investigated auxiliary selection in Italian-speaking children, and revealed that children select essere (be) for unaccusatives and avere (have) for unergative and transitive verbs, which provides evidence against the idea that unaccusative verbs are being analysed as unergative verbs (see also Guasti 2002). Further evidence against the idea that children do not distinguish unaccusative verbs from unergatives verbs comes from word order facts, reported in Pierce (1992) and Déprez and Pierce (1993), who show that children acquiring English only produce VS orders with unaccusative verbs, and never do so with unergatives. Additional studies on the acquisition of unaccusatives provide evidence for early knowledge of the properties associated with this verb class. For instance, Lorusso, Caprin, and Guasti (2005) show that children acquiring Italian accurately select auxiliary verbs when using unergative and unaccusative verbs, and that in their spontaneous speech, unaccusative and unergative verbs show different distributions with respect to
overt subjects. Likewise, Sano, Endo, and Yamakoshi (2001) show that children acquiring Japanese distinguish unergative from unaccusative verbs in the case morphological system. Similarly, Shimada and Sano (2007) provide evidence in favour of early knowledge of unaccusatives, by showing that children correctly assign the aspectual properties associated with each verb class, not mixing them up. Beyond this long line of empirical evidence, showing early mastery of A-movement and of the distinction between unaccusatives and unergatives, notice that Borer and Wexler’s unergative misanalysis of unaccusatives assumption poses de-learning problems, specifically—what would trigger their adult use?

In spite of this evidence, some researchers still hold that A-movement is difficult for young children.\footnote{See e.g. Babyonyshev et al. (2001), who assess Russian-speaking children’s performance on genitive of negation, and take their difficulties in this structure as indicating difficulty in A-movement. Partee and Borschev (2009) convincingly show that many factors other than unaccusativity are involved in the genitive of negation in Russian. Accordingly, one should be cautious in interpreting children’s late acquisition of this structure, and try to isolate the several variables involved.} The purpose of this chapter is to contribute a lot more data to this debate, by providing evidence from Hebrew and European Portuguese in favour of two related claims: first, we will show that children do distinguish the two verb classes, unaccusatives and unergatives; second, we will show that children are able to perform A-movement. The comparison between these two unrelated languages is important, since it will be hard to ascribe similarities in development to common superficial or genetic features of this pair of grammars. Rather, if children behave alike in the two languages, it is very likely that we are dealing with an abstract property of the developing grammar.

The chapter is structured as follows. In section 13.2, we present the diagnoses for unaccusativity in Hebrew and in European Portuguese, establishing the set of properties distinguishing unaccusative from unergative verbs. Section 13.3 presents seven structured tests and seven analyses of spontaneous speech that assessed the acquisition of word order and unaccusativity. Together they provide strong evidence for the idea that children distinguish unaccusative verbs from unergatives from an early stage, and that they are able to move the argument of unaccusative verbs from object to subject position. Section 13.4 discusses the results, emphasizing their relevance to Reinhart’s view of unaccusativity as developed in the Theta System.

### 13.2 Unaccusative verbs in Hebrew and in European Portuguese

Both languages under consideration distinguish unaccusative verbs from unergative verbs very clearly.
13.2.1 European Portuguese

In European Portuguese, the following tests distinguish between unaccusatives and unergatives (Eliseu 1984; Mateus et al. 2003):

(i) Only unaccusative verbs enter participial clauses:

(1) **Unaccusatives**

Chegado o navio, . . .
Arrived the ship, . . .
‘The ship having arrived . . .’

Unergatives

*Nadado o atleta, . . .
Swum the athlete, . . .
‘After the athlete swum . . .’

(ii) Only unaccusative verbs form adjectival participles:

(2) **Unaccusatives**

Todos viram o navio afundado.
Everybody saw the ship sunk
‘Everybody saw the sunk ship.’

Unergatives

*Todos viram o atleta nadado.
Everybody saw the athlete swum
‘Everybody saw the swimming athlete.’

(iii) Nominalizations with the suffix -or, parallel to the English -er nominals, can be derived only from verbs with an external argument, and hence can be created for unergative, but not for unaccusative, verbs (3):

(3) **Unaccusatives**

crescer  *crescedor
to grow  grower

Unergatives

correr  corridor
to run  runner

VS orders in sentence-focus context are legitimate with unaccusatives only:

(4) A: What happened?

**Unaccusatives**

O rapaz chegou./Chegou o rapaz.
The boy arrived/Arrived the boy
Unergatives

\[ \text{O rapaz nadou.} / \# \text{Nadou o rapaz.} \]

The boy swam./Swam the boy

VS with unergatives is only legitimate in narrow subject-focus contexts (Costa 1998). Standard views on Portuguese syntax analyse the change from VS to SV as involving A-movement of the argument, as depicted in (5):

(5)

\[ \text{The boy} \_ \text{arrived } t_i \]

There are several arguments for this A-movement analysis (and contra Barbosa’s (1995) left-dislocation analysis fronting the subject in null subject languages). We give two arguments here. First, this type of argument movement is clause-bound, as shown in (6), a property differentiating A-movement from A-bar movement. Movement of the NP to the higher clause, illustrated in (6b), yields an ungrammatical result.

(6) a. \textit{Diz-se} que a \textit{folha} \_ \textit{caiu} \_ \textit{t_i}  
   \textit{Says-SE} that the leaf fell  
   ‘It is said that the leaf fell.’

\b. \textit{*A folha} \_ \textit{diz-se} que \textit{t_i} \_\textit{caiu} \_\textit{t_i}.
   \textit{The leaf says-SE} that fell.

The second argument comes from agreement facts. In certain registers of European Portuguese, it is possible for an unaccusative verb not to agree with the post-verbal argument (Costa, 2001). In pre-verbal position, however, agreement is obligatory in all registers. This contrast is shown in (7). These agreement patterns are good evidence for A-movement, since agreement-triggering operations are restricted to A-environments. A-bar movement does not induce agreement changes.

(7) a. \textit{Caem árvores.} / \textit{Cai árvores.}  
   \textit{fall.3PL} trees/falls trees

\b. \textit{Árvores caem.} / \textit{*Árvores cai.}  
   \textit{Trees fall.3PL} / \textit{Trees fall.3SG}  
   ‘Trees fall.’

As shown in (8), agreement is obligatory pre- and postverbally with unergative verbs (when this word order is allowed in subject-focus contexts):

(8) a. \textit{Riem crianças.} / \textit{*Ri crianças.}  
   \textit{laugh.3PL} children/\textit{laugh.3SG} children

\b. \textit{Crianças riem.} / \textit{*Crianças ri.}  
   \textit{Children laugh.3PL} / \textit{Children laugh.3SG}  
   ‘Children laugh.’
13.2.2 Hebrew

Just as in European Portuguese, in Hebrew unergative and unaccusative verbs are easy to tease apart.

(i) VS orders in sentence-focus contexts are legitimate with unaccusatives only (9):

(9) A: What happened?
   Unaccusatives
       Ha-ke’ara nishbera./Nishbera ha-ke’ara.
       the-bowl broke/broke the-bowl
   Unergatives
       Ha-yeled saxa./*Saxa ha-yeled.
       The-boy swam/swam the boy

(ii) VS orders are possible for both unaccusatives and unergatives (as well as transitives) when the subject is a full NP (not a pronoun). However, VS with unergatives (and transitives) has to be preceded by a sentence-initial trigger (unless it is a storytelling context), whereas VS with unaccusatives does not require a trigger (Reinhart and Siloni 2004), as illustrated in (10).

(10) Unaccusatives
    a. Ha-ke’ara nishbera./Nishbera ha-ke’ara.
        the-bowl broke/broke the-bowl
    b. Etmol ha-ke’ara nishbera./Etmol nishbera ha-ke’ara.
        Yesterday the-bowl broke/Yesterday broke the-bowl

    Unergatives
    a. Ha-yeled saxa./*Saxa ha-yeled.
        The-boy swam/swam the boy
    b. Etmol ha-yeled saxa./Etmol saxa ha-yeled.
        Yesterday the-boy swam/Yesterday swam the-boy

(iii) Agent nominals/adjectives, parallel to the English -er nominals and the European Portuguese -or nominals, can be derived only from verbs with an external argument (Reinhart and Siloni 2005), and hence can be created for unergative, but not for unaccusative, verbs (11). Namely, a verb that allows for an agent nominal is unergative, and cannot be unaccusative.

    Daniel all the-time smiles. He really smiler
    ’Daniel smiles all the time. He is really a smiler.’
(iv) Hebrew verbs agree with the subject in gender and number (and person), but sentences in which the verb does not agree with the feminine or plural subject are acceptable with unaccusatives that appear in VS order in some registers (see Berman 1992; Danon 2006; Friedmann and Biran 2003; Meir 2005). This relaxation of the agreement requirement is acceptable for many unaccusatives, but not for unergatives (see (12)), similarly to the European Portuguese agreement facts.

(12) **Unaccusatives**

*Nigmera lanu ha-granolal. Nigmar lanu ha-granola.*

finished.F.SG to. us the-granola/ finished.M.SG to. us the-granola

**Unergatives**

*Etmol saxta ha-yalda ba-brexa. / *Etmol saxa ha-yalda ba-brexa.*

Yesterday swam.F.SG the-girl in. the-pool / Yesterday swam.M.SG the-girl in. the-pool

(v) Possessive datives are legitimate with unaccusatives, but not with unergatives (Borer and Grodzinsky 1986):

(13) **Unaccusatives**

*Nigmera le-Dani ha-granolal. Ha-granola nigmera le-Dani.*

finished.F.SG to-Dani the-granola / the-granola finished.F.SG to-Dani

'Dani’s granola finished.’

**Unergatives**

*etmol saxa le-Dani ha-yeledal. / *etmol ha-yeled saxa le-Dani.*

Yesterday swam.SG to-Dani the-boy/Yesterday the-boy swam.SG to-Dani

(with unergatives, the dative cannot receive the meaning of a possessive)

The SV order in Hebrew is interpreted as an instance of A-movement of the NP from its object position (post-verbal) to -IP position (Borer and Grodzinsky 1986; Friedmann and Costa, 2011; Preminger 2005; Shlonsky 1997; Sichel 2002).

Several arguments can be given for the A-movement, rather than A-bar-movement, analysis of SV sentences with unaccusatives in Hebrew. One argument, taken from Borer (1995), relates to the impossibility of parasitic gaps. Whereas parasitic gaps are allowed with A-bar movement, A-movement fails to license them. And indeed, whereas topicalization structures in which the movement targets spec-CP, an A-bar position, allow parasitic gaps (14a), unaccusative subjects do not (14b).
(14) a. \([Et \ ha-perax \ ha-ze], \) Robert gidel t, kimat bli le-hashkot PG,  
\text{ACC the-flower the-this Robert grew almost without to-water}
‘This flower, Robert grew almost without watering.’

b. \([Ha-perax \ ha-ze], \) gadal t, kimat bli le-hashkot PG,  
\text{the-flower the-this grew almost without to-water}
‘This flower grew almost without watering.’

Another argument, based on Shlonsky and Doron (1992: 439), relates to extraction. Whereas the extraction of an adjunct over an NP in topicalized position is ungrammatical (as shown in (15)), it is grammatical when the moved element is the subject of an unaccusative verb (15c). This indicates that the subject does not undergo A-bar movement but is rather in subject position.

(15) a. \(Mi-mi, \) xashavta she-Daniel kibel et ha-korkinet t,?  
\text{From-whom you.thought that-Daniel received ACC the-scooter?}

b. \(^*\!Mi-mi, \) xashavta she-[et ha-korkinet] \(_2\) Daniel kibel t, t,?  
\text{From-whom you.thought that-ACC the-scooter Daniel received?}

c. \(Mi-ma, \) xashavta she-ha-korkinet \(_2\) hitlaxel t, t,?  
\text{From-what you.thought that-the-scooter got. dirty?}

An additional argument against an A-bar-movement analysis of SV order with unaccusatives comes from the fact that sentences with two A-bar movements to clause-initial position are ungrammatical, but A-bar movement can still be grammatical when it crosses an instance of SV with unaccusative. Shlonsky and Doron (1992) observe that Hebrew does not allow a \(wh\)-extraction over a topicalized object (16). But (17), in which \(wh\) is extracted over the subject of unaccusative is completely grammatical, indicating that the subject of the unaccusative did not undergo A-bar movement.

(16) \(^*\![Mi-eize \ madafeit] \(_2\) [et ha-kos], \) lakaxt t, t,?  
\text{from-which shelf ACC the-glass took. 2. F.SG}

(17) \([Mi-eize \ madafeit] \(_2\) [ha-kos], \) nafla t, t,?  
\text{From-which shelf the-glass fell?}

13.2.3 Interim summary: unaccusatives and A-movement in the two languages

The evidence from the two languages leads to the following conclusions:

(a) Although unrelated, both Hebrew and European Portuguese distinguish unaccusative verbs from unergative verbs in a set of constructions.

(b) In the two languages, there are SV–VS alternations with unaccusative verbs.

(c) In the two languages, the movement yielding SV order with unaccusative verbs is a case of A-movement.
On the basis of these conclusions, the study of children’s acquisition of unaccusativity may be revealing for the following reasons:

(i) If the word order facts differentiate unaccusative from unergative verbs in children’s productions, we will have evidence against the claim that children treat unaccusative verbs as unergative verbs.

(ii) If children produce SV–VS alternations in unaccusative contexts, they are likely to master A-movement, since SV is obtained from VS via A-movement.

(iii) Since there is independent evidence to claim that SV in unaccusative contexts is not a case of subject left-dislocation, if children produce SV with unaccusatives, it is safe to claim that A-movement is acquired early.

(iv) If there is independent evidence to claim that SV in unaccusative contexts is not a case of unergative analysis of an unaccusative verb by children, it is safe to claim that A-movement is acquired early.

13.3 Acquisition of unaccusatives in European Portuguese and Hebrew

In this section, we report on a series of experiments assessing whether children under the age of three are able to distinguish unaccusative from unergative verbs, and whether they are able to perform A-movement operations, by testing whether they can produce SV orders in unaccusative contexts. Knowing that SV derives from VS by A-movement in the adult grammar, if children fail to perform A-movement, we would have expected them not to be able to produce SV order with unaccusative verbs, and to produce them only in VS order. As we will see, however, the results of the line of experiments clearly show that this prediction of the delay of A-movement theory was not borne out: children are perfectly able to produce SV sentences with unaccusatives.

To make sure that children analyse unaccusatives as unaccusatives rather than as unergatives, and hence that the SV is indeed derived from A-movement, rather than base-generated, we use two methods. The first is demonstrating that children show differential behaviour with unaccusatives and unergatives with respect to the word orders they produce. The second is the use of possessive datives in Hebrew, which are only possible with verbs with an internal argument (Borer 1994; Borer and Grodzinsky 1986), and hence indicate an unaccusative, rather than unergative, interpretation for intransitive verbs that appear with them.

13.3.1 European Portuguese

13.3.1.1 Spontaneous speech Adragão (2001) and Adragão and Costa (2004) studied the acquisition of word order in the spontaneous speech of a child acquiring European Portuguese between the ages of 2;7 and 3;7. The data we report on comes
from 357 utterances containing both subject and verb. The data contain 242 sentences with unergative verbs, and 115 sentences with unaccusative verbs. As Table 13.1 shows, there is a very clear preference for SV over VS. However, in unaccusative contexts, the rate of VS is significantly higher than with unergative verbs, $\chi^2 = 25.67, p < .0001$.

Since discourse effects play a role in the SV–VS variation, in Friedmann and Costa (2011) we isolated those contexts in which VS would be expected in the adult grammar. These are the cases of subject-focus context, like answers to subject \textit{wh}-questions. We found 121 such cases (101 with unergative verbs and 20 with unaccusatives).

As shown in Table 13.2, in this specific context, only VS emerges in unaccusative contexts, but even though VS is the expected order also with the unergative, SV is still the preferred word order with unergative verbs. The difference between the two verb types in the ability to use VS when it was needed was significant, $\chi^2 = 87.55, p < .0001$.

The results presented in Table 13.2 reveal a very strong preference for SV in unergative contexts, a matter we will not discuss here (we discussed it in Costa and Friedmann 2009, and in Friedmann and Costa 2011). What is relevant for the purposes of this chapter is that these spontaneous speech data reveal that the child distinguishes unaccusative verbs from unergative verbs quite clearly. This is shown by the avoidance of VS orders, which affects only unergative verbs. Under the unergative analysis of unaccusatives, this differential behaviour would remain unaccounted for.

Another important challenge for the hypothesis that children lack A-movement comes from the combination of the results presented in Tables 13.1 and 13.2. As just mentioned, the difference in behaviour between unergative and unaccusative verbs

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### Table 13.1. Sentences produced in spontaneous speech in SV or VS orders with unergative and unaccusative verbs

<table>
<thead>
<tr>
<th>Age</th>
<th>Unergative</th>
<th></th>
<th>Unaccusative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SV</td>
<td>VS</td>
<td>SV</td>
</tr>
<tr>
<td>2;7–3;7</td>
<td>97.5%</td>
<td>2.5%</td>
<td>82.6%</td>
</tr>
</tbody>
</table>

### Table 13.2. Spontaneous speech data for target VS sentences

<table>
<thead>
<tr>
<th>Age</th>
<th>Unergative</th>
<th></th>
<th>Unaccusative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SV</td>
<td>VS</td>
<td>SV</td>
</tr>
<tr>
<td>2;7–3;7</td>
<td>94.1%</td>
<td>5.9%</td>
<td>0%</td>
</tr>
</tbody>
</table>
reveals that children know this distinction. One could speculate that children know unaccusative verbs, but still lack A-movement. In that case, they could only do VS orders with unaccusative verbs. However, this position cannot be held, since the results of Table 13.1 show that the child does produce SV (alongside VS) orders with unaccusative verbs.

Adragão and Costa (2004) report that there are no occurrences of object left dislocation in the child’s utterances. This is consistent with Carrilho’s (1994) finding that topicalization strategies are not frequent in early spontaneous speech in European Portuguese (contrasting, for instance, with the finding of de Cat (2003) for French). This observation is relevant, since it allows us to discard an alternative interpretation of these data, according to which the productions of SV would be instances of subject left-dislocation. Since left-dislocation appears to be infrequent and acquired late, it is highly unlikely that SV with unaccusatives can be analysed in these terms.

In short, the analysis of the spontaneous speech data from a child acquiring European Portuguese reveals that the child knows the distinction between unaccusative and unergative verbs, and is able to perform A-movement.

13.3.1.2 Repetition task A repetition task elicited the production of SV and VS with unergative and unaccusative verbs in European Portuguese (Costa and Friedmann 2009; Friedmann and Costa 2011). The method was the following: a native speaker of European Portuguese said a sentence, and the children were asked to repeat the sentence as accurately as they could. For each sentence the children repeated (regardless of their success), they were awarded with a building block which they used to build a building-block tower ‘way up to the sky’. Whenever the child requested, the experimenter repeated the sentence, as many times as the child needed. Each participant was tested individually in a quiet room. No time limit was imposed during testing, and no response-contingent feedback was given by the experimenter. The sentences of the various types were semi-randomly ordered, so that there were no more than two consecutive sentences of the same condition. All the tests were tape-recorded and transcribed in full during the testing as well as after the test by two independent native speakers.

The rationale behind repetition tasks is the following: speakers of a language cannot repeat a sentence in their native language as a simple auditory string. Because language processing is mandatory, repetition of a sentence in one’s language involves comprehension and production, and therefore difficulties in the comprehension and production of a syntactic structure are manifested in difficulties in repeating this structure (Friedmann 2007; Friedmann and Grodzinsky 1997; Friedmann and Lavi 2006; Lust, Flynn, and Foley 1996). Specifically, if our control sentence and target sentence are similar in all respects (same length, same words, etc.) and differ only in the tested syntactic feature, then if a participant repeats the control sentence well but
fails to repeat the target structure, this might indicate a specific difficulty with the target; in our case, it might indicate that the child has already mastered the control structure, but the tested structure has not been fully acquired yet. Consistent structural errors in the repetition of a certain structure by a child (and good repetition of the control sentence) can thus indicate that this structure is not yet mastered.

The repetition task consisted of forty sentences: twenty sentences with unaccusative verbs, half of them in SV order and half in VS order, and twenty sentences with unergative verbs, half of them in SV order and half in VS order. The sentences in the unaccusative and unergative conditions had the same length, three words. The participants in this experiment were twenty-one children aged 2;1 to 3;0 (ten boys, eleven girls). In (18), we provide examples for the sentences used in the experiment:

(18) a. *Unaccusative verbs SV/VS*  
    O balão rebentou. / Rebentou o balão.  
    the balloon popped/ popped the balloon  
    ‘The balloon popped.’

b. *Unergative verbs SV/VS*  
    O rapaz correu. / Correu o rapaz.  
    the boy ran/ ran the boy  
    ‘The boy ran.’

The results of this task, summarized in Table 13.3, reveal that whereas the children had significantly better performance in the repetition of SV than VS in unergative contexts, they showed no difference between SV and VS with unaccusative verbs. The rate of correct repetition of VS to the correct repetition of SV for unergatives was significantly lower than this rate with unaccusative verbs, \( t(20) = 5.47, p < .0001 \), and the repetition of VS sentences was significantly better with unaccusative than with unergative verbs, \( t(20) = 6.49, p < .0001 \). The error analysis is also telling about the syntactic abilities of the children acquiring European Portuguese. Reversal errors were only found for the repetition of VS with unergatives. In all the other conditions, the only errors found were omissions of the subject or the verb or no response. The reversal errors with unergative VS reveal that this is the only problematic order for children, as argued in Friedmann and Costa (2011), where it is shown that children

| Table 13.3. Repetition of SV and VS in unergative and unaccusative contexts |
|-----------------|-----------------|-----------------|-----------------|-----------------|
| Age             | N               | Unergative      | Unaccusative    |
|                 |                 | SV              | VS              | SV              | VS              |
| 2;1–3;0         | 21              | 92.9%           | 41.9%           | 81.4%           | 71.4%           |
cannot produce this word order because of constraints on V-to-I movement (but can produce SV with unergatives).

The results obtained for this experiment bear on the questions we are trying to answer here. First, it is clear that children distinguish unaccusative from unergative verbs, since they have problems with the repetition of VS only in unergative contexts. In unaccusative contexts, the repetition of VS is much better, and not different from the repetition of SV. The different performance in unergative and unaccusative contexts casts doubt on the hypothesis that unaccusatives are analysed as unergatives by children. If this were so, children should have experienced difficulties on the repetition of unaccusative VS, just like they do when they try to repeat unergative VS.

Second, there is a very high rate of success in the repetition of SV with unaccusative verbs. The simplest hypothesis, then, is that this word order is created via A-movement. Moreover, the unergative misaanalysis seems implausible given that children clearly distinguish between unaccusatives and unergatives. This challenges the hypothesis that A-movement is acquired only after the age of 4.

### 13.3.3 Summary: European Portuguese

Summarizing, the two sources of data for European Portuguese—spontaneous speech and the structured task—provide sound evidence in favour of the claim that children map unaccusatives properly, and have no problems performing A-movement.

### 13.3.2 Hebrew

For Hebrew, we report on six experiments and six spontaneous speech analyses, some of which are new, and some taken from Friedmann (2007), Friedmann and Costa (2011), and Friedmann, Reznick and Lavi (forthcoming). They all converge in showing that children acquiring Hebrew, too, distinguish unaccusative from unergative verbs, and do not have any problems in performing A-movement.

#### 13.3.2.1 Analyses of spontaneous speech

The broadest analysis of the acquisition of unaccusatives and A-movement as reflected in spontaneous speech is reported in Friedmann et al. (forthcoming). This analysis included fifty-six children aged 1;6–6;1 (fifteen samples from children aged 1;6–2;9; eight samples from children aged 2;1–2;6; eight samples from children aged 2;8–3;0; nine samples from children aged 3;1–4;0; six samples from children aged 4;3–4;11; and nine samples from children aged 5;1–6;1), with a total of 6,400 clauses, an average of 114 clauses per participant. The transcripts were taken from Berman (1985), Bibi (2003), and Davidson (2002) in MacWhinney (2000).

The 6,400 utterances were first sorted out according to whether they involve structures with A-movement (in adult grammar). Passive did not occur at all, in any of the samples. However, this lack does not indicate that Hebrew-speaking children have a problem with A-movement. Even much older children and
adolescents who speak Hebrew do not use passives (Berman 1997; Berman and Sagi 1981; Jisa et al. 2002), and in fact, adults also rarely do in informal everyday speech.

Of the 56 children, 45 produced at least one unaccusative verb (i.e. 45 samples included an unaccusative); 42 of these children (93%) produced the unaccusative in SV order, and the sentences of the 27 (60%) of the children included an unaccusative verb in VS order. Thus, significantly more samples included unaccusatives in SV than in VS order, \( p < .0001 \). Of the 45 children who produced an unaccusative verb, 40% produced unaccusatives only in SV order, 53% produced unaccusatives in both SV and VS orders, and only three children produced unaccusatives only in VS order. Importantly, even the youngest children did not show a preference for producing unaccusatives in VS, rather than SV, order, which could suggest they do not have A-movement. Of the eleven children who were younger than two years old, three produced unaccusatives only in SV order, and one produced them only in VS order.

The comparison of unaccusatives and unergatives yields a similar picture to the one witnessed in European Portuguese: children almost never produced VS order with unergatives, indicating, again, that they made a clear distinction between unaccusatives and unergatives. Unlike unaccusative verbs, which occurred in both SV and VS orders, unergatives appeared almost exclusively in SV order: 36 samples included an unergative verb and a subject, all of them appeared in the SV order, and only one child, who was already 5;8, produced an unergative also in VS order (with a sentence-initial trigger, which is possible also in adult grammar, as mentioned in 13.2.2).

Table 13.4 presents the results of the comparison of the production of SV and VS sentences with unaccusative and unergative verbs. For both unaccusatives and unergatives, it was calculated out of the number of samples with the relevant type of verb that included a full NP subject (not a pronoun, which cannot be post-verbal: see 13.2.2). These results, again, show that Hebrew-speaking children distinguish between unaccusative and unergative verbs. Given that children know the traits of unaccusative verbs, it is implausible that they misanalyse unaccusatives in SV orders as unergative. It follows that they must perform A-movement in order to derive SV sentences with unaccusatives.

<table>
<thead>
<tr>
<th>Age</th>
<th>N</th>
<th>Unergative</th>
<th></th>
<th>Unaccusative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SV</td>
<td>VS</td>
<td>SV</td>
</tr>
<tr>
<td>1;6–6;1</td>
<td>56</td>
<td>100%</td>
<td>3%</td>
<td>63%</td>
</tr>
</tbody>
</table>

*Table 13.4. Hebrew spontaneous speech: percentage of samples that included unergative and unaccusative verbs with a full NP in SV and VS order*
Very similar results emerge from Friedmann et al.’s (forthcoming) analysis of the longitudinal data of a Hebrew-speaking girl, Hagar (from Berman’s longitudinal CHILDES corpus), which consisted of thirty-one bi-weekly samples between ages 1;7 and 2;11, amounting to 6,780 utterances. The study shows that when she was 1;7, Hagar already produced sentences with unaccusatives in both SV and VS order, which kept appearing in the subsequent samples. The analysis of her thirty-one samples, presented in Table 13.5, shows that at the tested ages, she produced both SV and VS orders with unaccusative verbs, without a clear preference between the orders, $\chi^2 = 0.18, p = .67$. These results come from thirty different verb forms—sixteen different verbs in various inflections—and therefore represent a robust phenomenon.

The picture was completely different with unergative verbs. Hagar produced unergative verbs only in SV order, and did not produce a single instance of an unergative verb in VS order. The difference between unaccusatives and unergatives in the rate of samples that included SV and VS orders was significant, $\chi^2 = 52, p < .0001$. Hagar had significantly better ability to produce VS with unaccusative than with unergative verbs, $\chi^2 = 31.75, p < .0001$.

At this young age range, Hagar showed no change in her ability to produce SV and VS with unaccusatives, and was able to produce both already from the beginning. She also showed no change in her ability to produce unergative verbs in VS order, as she was unable to produce this structure throughout the sampling period. These findings are consistent with the results presented above. They indicate that Hagar distinguishes between unaccusative and unergative verbs. Hence, her production of SV order with unaccusatives is unlikely to result from an unergative misanalysis. This, in turn, suggests that she is already able to produce A-movement.

Friedmann (2007) reports on an additional kind of analysis of spontaneous speech. This analysis examined the spontaneous speech of twenty-one children aged 1;6–2;11 (eleven boys and ten girls, mean = 2;4, s.d. = 0;4; eleven children aged 1;6–2;5 and ten children aged 2;6–2;11), analysing a corpus from Berman (1985), Berman and Dromi (1984), MacWhinney (2000). The whole corpus, encompassing 177 utterances with either an unaccusative or an unergative verb, was analysed for the number of occurrences of unaccusative and unergative verbs in SV and VS orders.
Table 13.6 shows that in the utterances with unaccusative and unergative verbs that the twenty-one young children produced, almost all the sentences with unergatives were produced in SV order, whereas the unaccusatives appeared in both SV and VS sentences.

Finally, we looked at cases in which SV is obligatory with unaccusative verbs. In Hebrew, full pronouns, kinship nominals, and proper names obligatorily appear in pre-verbal position with unaccusatives. That is, with these subjects, SV order, and hence A-movement, is obligatory. We analysed the children’s ability to produce SV in these ‘obligatory contexts’ for all the samples described above: the fifty-six children, the longitudinal thirty-one samples of spontaneous speech of Hagar, and the corpus of the twenty-one children.

For the samples of the fifty-six children, we looked for children who produced at least one instance of pronoun/kinship nominal/proper name subject with an unaccusative. Of these children, we analysed how many children produced SV order with these components; for the longitudinal samples, we counted how many of the samples included these subjects with unaccusatives, and how many of them were produced in SV order. For the corpus of twenty-one children, we counted how many of the sentences included these subjects with unaccusatives, and how many of them were produced in SV order.

The results, summarized in Table 13.7, were clear-cut: when A-movement is obligatory (in adult grammar), children obey this requirement and move the argument to subject position, although at the same period they produced unaccusatives in non-obligatory contexts with both SV and VS, as discussed above (Tables 13.4–13.6).
These results show that not only do children know that VS order is allowed with unaccusatives and not with unergatives, but in addition they assign the VS construction the same analysis as adults do. This is shown by the fact that the construction is subject in their grammar to the same constraints it obeys in adult grammar.

In sum, the spontaneous speech results reveal that children acquiring Hebrew distinguish unaccusative from unergative verbs in their spontaneous productions, since VS only occurs with unaccusative verbs. Furthermore, they are able to produce SV in unaccusative contexts, and do so almost exclusively in obligatory SV contexts, which provides positive evidence for the claim that A-movement is accessible to children before the age of three.

13.3.2.2 Repetition tasks Two repetition tasks were administered to the Hebrew-speaking children in order to test their ability to produce SV and VS sentences with unaccusative, unergative, and transitive verbs. The procedure of the repetition tasks was similar to the one reported in section 13.3.1.2 for European Portuguese.

13.3.2.2.1 repetition of unaccusatives (and transitives) in SV and VS order. An experiment reported in Friedmann (2007) assessed sentence repetition of eighteen native speakers of Hebrew aged 2;3–3;10 (in three age groups: 2;3–2;8, 2;11–3;4, 3;6–3;10, with six children (four boys, two girls) in each subgroup).

The experiment included forty sentences in SV and VS order. In this experiment, unlike the other experiments reported here, unaccusatives were compared with transitive verbs; the positioning of subject and verb in SV and VS orders in transitive and unergatives is assumed in the literature to be identical. There were ten sentences of each type, three to four words long. All the sentences started with a temporal adverb (etmol ‘yesterday’) to allow for VS with the transitive verbs. The youngest group was given only the twenty unaccusative sentences.

As can be seen in Table 13.8, the children were very successful in the repetition of both SV and VS, but only in unaccusative contexts. They had difficulties repeating VS structures with transitive verbs. Shlonsky and Doron (1992) analyse

| Table 13.8. Repetition performance in the transitive and unaccusative verbs (% correct) |
|----------------------------------------|-------|----------------|----------------|----------------|----------------|
| Age                     | N=18  | Transitive     | Unaccussative  |                |                |
|                         |       | SVO | VSO | SV | VS |                |
| 2;3–2;8                 | 6     | 92% | 82% | 97% | 100% |
| 2;11–3;4                | 6     | 93% | 30% | 100% | 100% |
| 3;6–3;10                | 6     | 98% | 43% | 100% | 100% |
non-unaccusative VS structures as involving verb movement from I to C (Friedmann forthcoming). Most probably, then, the difficulties with transitives (and in VS with unergatives in the other experiments) follow from the fact that children have not yet mastered verb movement to C (Friedmann and Costa 2011). At the same period, though, they are able to produce SV unaccusatives, which most plausibly results from A-movement to the subject position.

13.3.2.2.2 repetition of SV order with unaccusative and unergative verbs. The second repetition task aimed at determining whether young children are able to repeat SV sentences with unaccusatives as well as they do with unergative verbs. The task was also targeted at testing the ability of children at this age to repeat VS sentences with unergative verbs. The procedure was the same as in the experiment reported in section 13.3.2.2.1, but the sentences were longer. The participants were sixty children aged 2;2–3;10 (thirty two-year-olds and thirty three-year olds). The test included thirty sentences, semi-randomly ordered, so that there were no more than two consecutive sentences of the same condition. Ten sentences with unaccusatives in SV order, ten sentences with unergatives in SV order, and ten sentences with unergatives in VS order, with a total of 600 sentences for the group for each condition (ten sentences of each type per each of the sixty participants). The sentences of the three types were matched in length (this was part of a larger study reported in Friedmann and Lavi 2006).

As can be seen in Table 13.9, children performed very well in the SV sentences with the two verb types, reaching average correct rates of 93.5% and 93.8%. The repetition of SV in the two verb types did not differ significantly in any of the age groups, nor did it differ for the whole group, \( t(59) = 0.0, p = 1 \).

As we saw in the spontaneous speech samples and in the previous repetition test with transitive verbs, the children had considerable difficulty repeating sentences in VS order with an unergative verb, repeating correctly only 36% of the sentences on the average.

<table>
<thead>
<tr>
<th>Age</th>
<th>N</th>
<th>Unaccusative SV</th>
<th>Unergative SV</th>
<th>Unergative VS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2;2–2;11</td>
<td>30</td>
<td>87%</td>
<td>88%</td>
<td>38%</td>
</tr>
<tr>
<td>3;0–3;10</td>
<td>30</td>
<td>99%</td>
<td>99%</td>
<td>33%</td>
</tr>
</tbody>
</table>
Importantly, also, there was no correlation with age for the production of SV with unaccusatives, $r = .21, p = .10, Rpb = .13, p = .32$—i.e. within the tested ages, there was no age at which the children could not repeat an SV sentence with an unaccusative verb.

The data suggest further support for the difficulty children experience in the production of VS sentences with unergative verbs. In the current study it manifested itself in the considerable difficulties children had in repeating VS sentences with unergatives. This is in marked contrast to their ability to produce VS sentences with unaccusatives at the same age, as shown in the experiments and spontaneous speech analyses reported above.

Further, children show similar production of SV sentences with unergatives and unaccusatives. This does not per se provide direct evidence in favour of the claim that they distinguish between the two types of intransitives. However, since the experiments and spontaneous speech analyses reported above indicate that children treat unergatives and unaccusatives differently, the unergative analysis of SV unaccusatives become untenable, as already mentioned above. If so, then, if they lacked the ability to perform A-movement, one would expect them to fail to repeat SV unaccusatives. But they don’t—they produce SV unaccusatives as well as SV unergatives; this reinforces the claim that they employ A-movement.

13.3.2.3 Story retelling

13.3.2.3.1 Unaccusatives in VS and SV order. Another method we used to assess children’s unaccusatives was story retelling. Using this task we tested unaccusatives in even younger children, aged 1;6–2;0. The participants were thirty typically developing monolingual Hebrew-speaking children.

In the story-retelling task, the children were looking at a colourful illustrated story that was read to them enthusiastically by the experimenter or by their mother. After reading each target sentence, the experimenter asked the child to retell it. The target sentences in the story were twenty-seven two-word utterances with an intransitive verb and a full NP subject: eight SV unaccusatives, eight VS unaccusatives, and eleven SV unergatives. These were interspersed within the story, and sentences of the various conditions appeared in a semi-random order. Owing to their young age, only seventeen of the thirty participants were able to repeat more than two sentences. For these seventeen children, a total of 111 unaccusative SV sentences, 113 unaccusative VS sentences, and 134 unergative SV sentences was collected.

The results indicate a very similar picture to the one that emerged from the spontaneous speech analyses and the repetition tasks. The children’s retelling of unaccusatives in SV orders did not differ from their retelling of unaccusatives in VS order. They produced as full sentences 36% of the SV unaccusative sentences, and 40% of the VS unaccusative sentences, without significant difference between the orders, $t(16) = 0.85, p = .35$. Even the youngest children, aged 1;9–1;10, were able to produce unaccusatives in both VS and SV order. There was also no difference between their ability to repeat SV sentences with unaccusative and unergative verbs (35%).
Again, the results reveal that children are able to produce SV and VS with unaccusatives. If they lacked A-movement, one might expect a prevalence of VS with unaccusatives, and a better performance on unergative SV than unaccusative SV, contrary to fact.

13.3.2.3.2 Story retelling: unaccusatives in obligatory SV context. As mentioned above, in Hebrew SV order is mandatory in unaccusative context whenever the argument is a weak pronoun, a proper name, or a kinship nominal. The same story-retelling procedure used in the previous experiment was used with these types of subjects. This allowed us to assess whether children are able to apply A-movement in obligatory contexts.

This experiment was administered to the seventeen children (aged 1;9–2;0) who produced at least two sentences in the story retelling test described in 13.3.2.3.1. The story included nine unaccusative SV sentences: seven with a pronoun subject, and two with a proper name subject. The sentences were presented within the same story as the one reported in 13.3.2.3.1.

The children provided responses to 119 sentences with pronouns/proper names in total that they were asked to repeat. They were able to produce full sentences in 32 of these 119 responses (27%), and there was only a single instance in which a child changed the SV order into VS order. Namely, they are able to produce both VS and SV with unaccusatives, but when SV is obligatory, they perform A-movement.

These results, together with the results reported earlier, reveal that not only do children master A-movement, but they also know the constraints on sentences with unaccusatives. They know the contexts in which A-movement must apply, and apply it.

13.3.2.4 Possessive datives in repetition, story retelling, and spontaneous speech An important marker for unaccusativity in Hebrew is the possessive dative, which indicates the existence of an underlying internal argument (Borer and Grodzinsky 1986). Possessive datives can serve as possessors to objects of transitive verbs (19):

(19)  
Ha-geshem hirtiv le-miri et ha-ciyyur.
the rain wet to-Miri ACC the-drawing,
‘The rain wet Miri’s drawing.’

but also as possessors of subjects of unaccusatives (20):

(20)  
Ha-ciyyur nirtav le-miri.
the-drawing got-wet to-Miri
‘Miri’s drawing got wet.’
Crucially, possessive datives cannot modify external arguments (i.e. cannot be used in sentences without an internal argument), and hence cannot be used as possessors of subjects of unergatives. For example, (21) cannot be interpreted as ‘Yoni’s guide sneezed’.

(21) *Ha-madrix hit’atesh le-Yoni.
    the-guide sneezed to-Yoni

We used this marker as another way to discard the hypothesis that children use an unergative variant of the unaccusative verb when they utter SV sentences. Friedmann (2007) used a repetition and a story-retelling tasks in which children had to produce sentences with an unaccusative verb and a possessive dative, in SV and VS orders. We add here new data from the spontaneous speech of fifty-six children acquiring Hebrew, and from longitudinal data of two more children. The rationale was that, given that possessive datives are possible with unaccusatives but not with unergatives, if children produce SV unaccusatives with possessive datives, it would indicate that they analyse the verb as unaccusative, and move the subject from the internal argument position.

13.3.2.4.1 Sentence repetition with possessive datives. Twenty typically developing children participated in this study, seven children aged 2;0–3;0, and thirteen children aged 3;4–4;0. The procedure was similar to the one used in the repetition tasks presented above. The test consisted of forty sentences of five types, eight of each type: SV sentences with unaccusatives ending with a possessive dative (*ha-dubi nafal la-yalda: the bear fell to. the-girl), four of them with a pronominal possessive dative and four with a full NP possessive, SV and VS sentences with unaccusatives ending with PP adjuncts (in-the-yard, on-the-floor), as controls for the possessive dative, and SV and VS sentences with transitive verbs (ending with the verb complement). The sentences were presented in a random order.

As summarized in Table 13.10, the children had no difficulty producing unaccusative SV orders with a possessive dative. They repeated equally well sentences with pronominal and full NP possessive datives. The performances were comparable to

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2 Another type of non-thematic dative exists in Hebrew, the ethical dative (Borer and Grodzinsky 1986). However, children of the ages tested in the current study do not use this ethical dative, so it is not possible that the datives they produced were ethical. Furthermore, some of the possessive datives in the children’s spontaneous speech, as well as in the repetition task, were full dative NPs, which cannot serve as ethical datives, only as possessive datives.

3 We are deeply grateful to Julia Reznick for the data and analysis of these spontaneous speech samples.
and even slightly better than) those obtained for unaccusative SV sentences ending with a different PP.

This allows us to conclude that children correctly analyse SV unaccusatives as structures involving A-movement. The rationale is the following. Assume children had no A-movement, and their ability to produce unaccusative SV orders resulted from the unergative misanalysis they assign to the verb in such sentences. If this were the case, then they would be expected not to produce SV with a possessive dative but only VS. But they did produce SV sentences with possessive datives very well, indicating that they analyse the verb as unaccusative and move the argument from object to subject position.

13.3.2.4.2 Story retelling with possessive datives. Possessive datives were also tested using a story-retelling task that compared the repetition of unaccusative sentences with possessive datives in VS and SV order.

The participants were the same children who participated in the other story-retelling tasks, namely the seventeen children aged 1;9–2;0 who produced at least two sentences throughout the study. The procedure was the same, and the materials included five SV sentences with a full NP, an unaccusative verb, and a pronominal possessive dative, and six VS sentences with an unaccusative verb and then a pronominal possessive dative and a full NP.

The results show that the children retold sentences with an unaccusative verb and a possessive dative in both SV and VS orders without significant difference, \( t(16) = 0.60, p = .56 \). Only two subject–verb order reversals occurred in the VS target sentences, and one reversal in the SV order.

These results reveal that children do not have a preference for one of the word orders when the possessive dative is present—i.e. they interpret unaccusatives, even in SV orders, as unaccusatives.
Possessive datives in spontaneous speech. In addition, we examined the occurrence of possessive datives in sentences with unaccusatives in the spontaneous speech of the fifty-six children discussed in section 13.3.2.1. Of the forty-five children who produced an unaccusative verb in their sample, eighteen produced at least one unaccusative verb with a possessive dative. Of these eighteen children, fifteen produced a possessive dative with an unaccusative in VS order, and ten produced a possessive dative with an unaccusative in SV order (with the possessive dative placed after the verb, as in the adult order). The first production of a possessive dative was by a child aged 2;5, who produced it with unaccusative verbs in both SV and VS orders. The children produced both pronominal and full NP possessive datives. This early production of possessive datives with unaccusative verbs indicates that Hebrew-speaking children already properly analyse unaccusatives as including an internal argument even in SV order.

A similar picture emerged from the analysis of the longitudinal data of Hagar (for details, see section 13.3.2.1). Hagar started producing unaccusatives (in both SV and VS order) when she was 1;7, and already at 1;8 she produced an unaccusative with a possessive dative, in SV order. Up to the age of 2;11, her corpus includes ten samples with a possessive dative and an unaccusative: seven samples in SV order (all of them in the adult order with the dative placed after the verb), and four samples in VS order (one sample included both).

The picture is similar in the longitudinal speech sampling of another child, Leor, between the ages 1;9 and 3;0, encompassing 9,222 utterances. Six of Leor’s fifteen monthly samples that included an unaccusative verb also included a possessive dative. His first possessive dative with an unaccusative occurred at 2;5;15, and was in VS order, and the next one, two weeks later, was in SV order. In general, he had six monthly samples with an unaccusative and a possessive dative, three in SV order and five in VS order.

Thus, the longitudinal analyses show, as do the analyses of the spontaneous speech samples of fifty-six children, that children start producing unaccusatives early, and that when they produce unaccusatives, they already produce them with possessive datives in both SV and VS orders. This indicates that they analyse them as verbs with an internal argument.

If children analysed unaccusatives in SV order as unergatives, we would expect possessive datives to appear with unaccusatives only in VS order, but not in SV order. The results from repetition, story retelling, and spontaneous speech show that this is clearly not so, reinforcing the claim that the unergatives misanalysis of unaccusatives in SV order is untenable. Children analyse unaccusatives, even in SV order, correctly as unaccusatives.

Hebrew summary The analyses of spontaneous speech and structured tests of repetition and story retelling in Hebrew show that young children distinguish
unaccusatives from unergatives. Children treat them differently with respect to word order. Whereas they are practically unable to form VS order with unergatives, they produce unaccusatives in both SV and VS orders, and at a similar rate. It follows that they analyse unaccusatives correctly. Moreover, children use possessive datives with unaccusatives in both VS and SV orders. Since the possessive dative cannot modify external arguments, it follows that they analyse the subject of unaccusatives is an internal one, even when it surfaces in subject position. That is, children correctly analyse unaccusatives in both VS and SV orders, and are able to perform A-movement. Finally, it is important to emphasize that we tested children younger than two years, and still there was no stage in which children could only produce unaccusatives in VS order. In other words, they master unaccusativity and A-movement at a very young age.

13.4 Discussion

We presented here data from in Hebrew and European Portuguese that are based on seven structured tests of repetition and story retelling and the analyses of seven large corpora of spontaneous speech. We focused on two related main questions: can young children distinguish unaccusatives from unergatives? and can they perform A-movement? To test whether they can distinguish unaccusatives from unergatives or whether they misanalyse unaccusatives as unergatives, we used two sorts of litmus test. One was whether young children treat unaccusative and unergative verbs differently with respect to word order. The second was the possessive dative which, in Hebrew, can only appear with an internal argument. The results all converge into the following two conclusions:

(a) Children distinguish unaccusative verbs from unergative verbs, as indicated by the different word orders they employ with the two verb types, and by the use of possessive datives in Hebrew.
(b) Children are able to produce SV orders with unaccusative verbs, and there is no age at which they can produce unaccusatives only in VS but not in SV order. Given that they distinguish unaccusatives from unergatives and do not misanalyse unaccusatives in SV order as unergatives, these findings indicate that they master A-movement.

These two conclusions hold for both European Portuguese and Hebrew. Given that these languages are unrelated, their similar behaviour cannot be ascribed to some genetic feature. Rather, they reflect a common, non-superficial property of their developing grammar.

Recall that, according to Borer and Wexler (1987) and followers, children should not be able to perform A-movement for maturational reasons. As such, they should display one of the following behaviours:
1. Avoid unaccusative constructions—this was disconfirmed by the high rates of production of unaccusative contexts.
2. Analyze unaccusative verbs as unergatives—this was disconfirmed by the different patterns of production of unaccusatives and unergatives. Only with unaccusatives have children produced VS.
3. Avoid SV with unaccusatives—this was disconfirmed by the accurate productions and repetitions of SV with unaccusative verbs.
4. Produce SV in unaccusative contexts without A-movement (e.g., with left-dislocation)—this was disconfirmed by the lack of independent evidence for postulating left-dislocation constructions at this stage of development in European Portuguese. In other words, given that there are no occurrences of object left dislocation in children’s utterances at that stage, it is difficult to accept that they employ this strategy with SV unaccusatives.
5. Produce SV in unaccusative contexts without A-movement (e.g. restricting the unergative treatment of unaccusatives to SV orders)—this was disconfirmed by the accurate production of possessive datives with unaccusatives in SV order in Hebrew.

These results are in line with those of Snyder, Hyams, and Crisma (1995), Guasti (2002), Lorusso et al. (2005), who report that children acquiring Italian already select auxiliaries correctly, indicating that they distinguish between unaccusative and unergative verbs.

The evidence put together here and the cross-linguistic robustness of the data seriously challenge the maturational view on A-movement. Moreover, the results reported here constitute positive evidence that children identify unaccusatives very early, and that they employ A-movement, as posited by Fox and Grodzinsky (1998), among others.

Tanya Reinhart’s Theta System is a step forward in the understanding of the lexicon–syntax interface. It has inspired a series of studies, some of which are grouped together in this volume. The Theta System grew out of Tanya’s examination of unaccusative and subject Experiencer derivations (see Reinhart 2002; forthcoming, a, and Chapter 1 above). Tanya’s view with regard to unaccusativity and lexical information more generally was that it must be largely universal/innate. On such view, children are not expected to misanalyse unaccusatives as unergatives. And indeed, there is no reason to assume they do. They are very good thetists. They analyse unaccusatives correctly as unaccusatives, and can move the argument of unaccusatives from object to subject position, performing A-movement from the very first stages of language acquisition.
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