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Scalarity and Unaccusativity at the Lexicon-Syntax Interface

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Il y a des vers qu'on trouve. Les autres, on les fait.

On perfectionne ceux qu'on a trouvés.

On "naturalise" les autres.

Double simulation en sens inverse pour atteindre ce faux: la perfection – également éloignée et du spontané pur qui est n'importe quoi, et de la production toute volontaire qui est pénible, filiforme, niabile par toute volonté autre; incapable de se soumettre autrui.

Paul Valéry

יש טורי שיר שאתה מוצא, ויש כאלה שאתה עושה.
את אלה שמצאת יש לשכלל ולהביא לכלל שלמות.
את האחרים יש להביא לכלל "טבעיות".

זוהי פעולת הסוואה כפולה, בשני כיוונים הפוכים, שמטרתה להגיע אל אותו הכזב שהוא השלמות – הרחוקה במידה שווה מן הפעולה הספונטנית הטהורה, שהיא הבל ורעות-רוח, ומן הייצור הרצוני לחלוטין, שהוא מאולץ, קלוש-כוח וניתן לכפירה בידי כל רצון אחר – ואשר אין לאל ידו להכניע את הזולת.
(פול ואלרי, תרגום: דורי מנור)

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1 Introduction

1.1 Argument mapping

1.1.1 Unaccusativity

The linguistic field of argument realization, or the study of the possible syntactic expressions of a verb, has been fertile ground for linguistic research in the past decades. Within this field, two central empirical sub-domains of independent historical origins have often been collapsed together: (i) the study of mapping (or linking) of arguments, and (ii) the study of argument alternations. In this chapter I introduce each of these fields, their main research questions, their development in linguistic literature, and my stance toward them in the thesis.

In the domain of argument mapping, a most natural starting point would be Perlmutter's (1978) seminal work, arguing for the existence of two syntactically distinguishable classes of intransitive verbs: unaccusatives, which map their argument internally; and unergatives, which map their argument externally. The unaccusative hypothesis received strong empirical support from cross-linguistic tests, including correlations with "-er" nominals in English (Rappaport Hovav & Levin 1992), auxiliary selection, *ne/en* cliticizations in Italian and French (Burzio 1986), genitive of negation in Russian (Pesetsky 1982), and untriggered inversion in Hebrew (Shlonsky 1997).

The unaccusative hypothesis was introduced by Perlmutter in the context of a broader Universal Alignment Hypothesis (UAH), which puts forth the idea that the syntactic positions of arguments are derivable from their roles in the verb's meaning. The UAH was challenged by two types of competing theories: (i) syntactic unaccusativity is the claim that unaccusativity cannot be fully determined on semantic grounds (Rosen

1984). (ii) semantic unaccusativity is the claim that semantics is a sufficient condition to generate the two intransitive classes; the assumption that they also represent different syntactic structures is superfluous (Van Valin 1990).

A representative proponent of syntactic unaccusativity approaches, Rosen (1984) argued that the fact that unaccusatives lack a single semantic determinant but share a common syntactic configuration, suggests that the choice of structure cannot be reduced to semantics. Her argument does not hold, because the existence of such a determinant is in fact unlikely: since the number of syntactic positions is smaller than the number of proposed semantic factors (abstracting away from theory-specific details), it is directly expected that some of these units will trigger the same mapping (i.e. the pigeonhole principle in math).

Rosen further claims that the unaccusativity hypothesis is challenged by the observation that a verb may be unergative in one language but unaccusative in another. Her claim does not in fact challenge semantic encoding of unaccusativity because the encoding itself may vary across languages. For example, *arrossire*, ‘blush’ in Italian, literally means ‘become red’. Given that Italian and English encode the blushing concept differently, and that a change-of-state interpretation is semantically relevant for unaccusativity (as we will see below), we can expect different mapping results for *blush* in the two languages.

The same reasoning is fruitfully extended to a multi-faceted behavior within a single language. Variable auxiliary selection in Germanic and Romance languages, possibly the most researched unaccusativity diagnostic, has been shown to correlate with agentivity and telicity (see Hoekstra & Mulder 1990; Sorace 2000; Hovav & Levin 2000;

Randall 2006, among others). If auxiliary selection is an unaccusativity diagnostic, it is no surprise that variable interpretations may give rise to variable structures. In sum, syntactic unaccusativity fails to provide us with a predictive alternative theory. The unaccusative hypothesis, by contrast, allows us to maintain flexible syntactic output as a function of flexible semantic input.

A representative proponent of semantic unaccusativity approaches, Van Valin (1990), suggests that there is no need to further assume that semantic encoding of the classes is also syntactically represented. The strongest argument in favor of such an approach is that the different proposed unaccusativity diagnostics pick out disjointed sets of unaccusative verbs. This means that we do not have empirically compelling evidence that all unaccusatives evince the same structure, because no diagnostic detects the alleged structure they all share. For example, Zaenen (1993) convincingly argues, contra Perlmutter, that in Dutch impersonal passivization and auxiliary selection pick out different sets of verbs, and therefore they cannot be argued, based on these diagnostics, to have the same syntactic structure.

Indeed, such data pose a serious challenge to syntactic representations of unaccusativity. Because UAH and semantic unaccusativity converge on the same set of inputs and predict the same classifications, then *prima facie*, postulating additional structural consequences would not be in the spirit of Occam's razor (though perfectly compatible with the evidence). However, I believe that there is independent evidence in favor of structural encoding of unaccusativity that may be gleaned from the architecture of grammar. Van Valin posits "only a single level of syntactic representation... there is a direct mapping between the semantics and syntactic representation" (1990:222). In

chapter 4, I show this claim to be incorrect. Briefly, unlike the transitive *I/the system sucked the reservoir dry*, a sentence such as **the reservoir sucked dry* is a hypothetical unaccusative that denotes a change-of-state akin to *the reservoir dried*. The fact that the grammar cannot generate change-of-state unaccusatives that have arbitrarily-large syntactic projections (i.e. as large as we would like), strongly indicates that these unaccusatives are not generated by a syntactic engine, i.e., in the Computational System, and that we must posit a semantic level of representation that encodes unaccusatives prior to the emergence of syntactic structure. Since unaccusatives and unergatives pattern differently with respect to syntactic phenomena such as secondary predication (as will be shown in chapter 3, see also Simpson 1983; Levin & Rappaport-Hovav 1995), it suggests that their differences are syntactically represented, because the relevant semantic features have already been interpreted (“checked”) in an earlier level of the computation. We have no evidence they are still syntactically active.

Having denied both purely syntactic and purely semantic approaches, linguists today are in agreement that a verb’s semantics dictates the morphosyntactic realization of its arguments. Taking UAH to be uncontroversial, a theory of mapping is tasked with formulating the exact mapping architecture:

- (1) Architecture of a mapping system
 - (i) What are the syntactically relevant semantic units? (input)
 - (ii) In which module of the grammar are these units represented?
 - (iii) How does the system map semantic input to syntactic output? Some possible questions are: is mapping rule-based? If so, what are the rules?

Are they ordered? Does the output of the rule depend only on the rule itself (i.e. absolute) or also on the output of other rules (i.e. relative)?

In what follows, I briefly cover selected theories of argument realization and the way they address the questions raised in (1). I also position my thesis in the space of possible frameworks.

1.1.2 Localist, aspectual and causal approaches to argument realization

An early attempt at formalizing coherent semantic units in argument mapping is found in the localist framework, developed in the works of Jackendoff (1976,1983,1987), Anderson (1977) and Van Voorst (1993). The localist framework introduces two types of events: location and motion. Location events involve individuals and their locations, whereas motion events involve individuals and their paths. The moving or located individual, which is found in every event, correspond to the THEME role. The predicates GO, BE and STAY (and in a later stage, also CAUSE and LET) have a range of fixed interpretations that allows us to create simplex and complex predications based on locations and paths. Jackendoff proposes that even verbs that do not trivially denote spatial configurations are nonetheless represented abstractly as such via “positional fields”. For instance, *the leaves reddened* would abstractly signify that the THEME would GO to the LOCATION red.

The localist approach turned out to be infeasible for several reasons, two of which are mentioned here. First, a large number of verbs such as *chew*, *cry*, *knead* and *play* simply cannot be regarded as having an abstract level of spatial interpretation in any theoretically defensible way. Second, the individuals in given locations may appear in

both subject (e.g. *the scooter belongs to Taylor*) and object positions (vs. *Taylor owns the scooter*). The subject position may be occupied by sources (e.g. *Travis gave the scooter to Mary*), goals (e.g. *Mary borrowed the scooter*), or neither (*John moved the meeting from 4 to 6*). Thus, there is no systematic way to map locations and their predications to syntactic positions (see Levin & Rappaport Hovav 2005:78-86 for a detailed discussion).

In the mid-1980s, a second type of argument mapping theories emerged. The aspectual approach promotes the view that the temporal make-up of events provides the semantic inventory relevant to argument mapping. Historically, the inventory of aspectual classes was introduced to account for a variety of linguistic phenomena, including the interpretation of tense, the availability of the progressive, the distribution of various types of temporal adverbials, and the availability of certain entailments ("the imperfective paradox"; see Dowty 1979:60 for summary). Later, aspectual notions began to figure in mapping theories (Hopper & Thompson 1980; Tenny 1994; Verkuyl 1996)

The Kenny-Vendler-Dowty typology (Kenny 1963; Vendler 1967; Dowty 1979) divides verbs into four aspectual classes: states, activities, accomplishments and achievements. States have no internal structure or change within the span of time during which they are true (e.g., *love* as in *Walter loves Marian*). An activity is an ongoing event with internal change and duration, but no necessary temporal endpoint (e.g., *walk* as in *Frederick walked along the river*). Accomplishments are events with duration and an obligatory temporal endpoint (e.g., *consume* as in *Laura consumed the pineapple*). Achievements, on the other hand, have an instantaneous culmination or endpoint and are without duration (e.g., *arrive* as in *Anne arrived in London*). These four classes have been

organized by various authors into different subgroups; the distinction most commonly made is between statives and non-statives.

Although explorations of notions such as *incremental theme*, *telicity* and *measuring out* contributed greatly to our understanding of the field, a purely aspectual approach is not adequate because empirical research yielded that representatives of each of the aspectual classes can be found in both intransitive classes. That is, empirically, unaccusativity and aspect are independent (see McClure 1995; Tenny 1994; Levin & Rappaport-Hovav 1995; Tenny & Pustejovsky 2000):

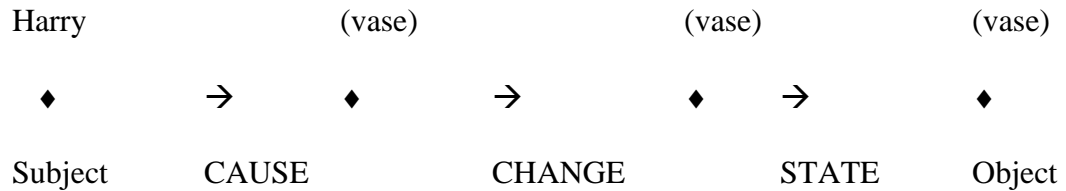
(2) Unaccusativity and Aspect:¹

	States	Activities	Achievements
Unaccusatives	<i>live, remain</i> (Hoekstra 1984)	<i>roll, cool</i>	<i>break, open</i>
Unergatives	<i>stink, gleam</i> (L&RH 1995)	<i>run, cry</i>	<i>abdicate, triumph</i> (McClure 1995)

Today, the commonly held branch of theories maintains that causal relations (partly) govern the mapping of arguments (Croft 1994; Levin & Rappaport-Hovav 1995; Reinhart 2002; Borer 2005; Pylkkänen 2008; Horvath & Sioni 2011a, among many others). Under this approach, the syntactic positions of arguments are determined by their relative positions in causal chains expressed by the predicate. Generally speaking, an individual interpreted as the first participant in the CAUSE relation will head the chain and be mapped to the subject position. Subsequent participants will be mapped to increasingly lower syntactic positions. Each link of the chain connects two participants (or possibly the same one). For instance:

¹ Accomplishments are transitives and are therefore irrelevant here.

(3) Harry broke the vase (Croft 1994:38, (12), L&RH 2005:118)



A causal chain perspective is implicit in many theories with generalized semantic roles (Van Valin 1990; Dowty 1991; Reinhart 2002, among others), because the representation of roles relies (partly) on the causal information they contribute to the event. Moreover, a causal chain approach has the advantage of explicitly motivating a subject selection hierarchy: the fact that instruments may be subjects only in the absence of agents receives a natural explanation under a causal model since agents precede instruments in a chain.

Unaccusativity under a causal approach is an intricate and controversial matter. Researchers disagree on whether unaccusatives include causal semantics. Koontz-Garboden (2009) and Beavers & Koontz-Garboden (2013), following Chierchia (2004), suggest that unaccusatives are reflexivized causatives. Härtl (2003), Reinhart & Siloni (2005) and Horvath & Siloni (2010, 2013) reject his position and argue that subjects of unaccusatives are devoid of causal semantics altogether. Levin & Rappaport Hovav (1995) claims that while most unaccusatives are noncausative, there is a specific internally-caused subset (e.g. *bloom*). Pytkäinen 2008 promotes the idea that there are languages (Japanese and Finnish) which separate the external argument from causing events and these languages show causative unaccusatives (but see Neeleman & van de Koot 2012 for criticism).

In my thesis, I approach unaccusativity from a different viewpoint. I draw upon studies of scalar structure (Hay, Kennedy & Levin 1999; Kennedy & McNally 2005;

Levin & Rappaport Hovav 2010; Beavers 2011) and argue that only unaccusatives, but no unergatives, show scalar structure. The observation leads me to propose the following rule:

(4) **Scalarity Mapping Rule:**

An argument projected on a verbal scale is mapped to the direct object position. The notion of scalar structure is a semantic facet which is independent of causality, but interacts with it in specific and predictable ways. In chapter 2, I show how their interaction gives rise to a constraint on the causative-unaccusative alternation. My position here is to adopt the null hypothesis that unaccusatives lack causative ingredients altogether (i.e either a cause role or causing event).

1.1.3 Projectionist and constructional perspectives

Apart from the choice of the relevant semantic units that decide the syntactic positions of arguments, mapping systems sharply diverge with respect to the locus of their application. Lexical (often projectionist) mapping systems argue that the relevant semantics are evaluated at the syntax-lexicon interface. A given argument is considered in a specialized lexical system according to its semantic contribution to the event, and is mapped accordingly. The task can be accomplished in a variety of mapping algorithms, two of which I review below.

By contrast, radical syntactic approaches to argument realization (Borer 2005; Arad 2006, Pytkäinen 2008, Harley 2012, among others) claim that a lexical system is superfluous. Rather, they suggest that a more parsimonious solution is to project dedicated functional heads, which in turn bestow their interpretation on the arguments.

This assumption leads proponents of syntactic approaches to propose an architecture in which the heads occupy fixed syntactic positions, such that they reflect precisely the observable semantic properties of the arguments in the constructions. More generally, syntactic approaches hypothesize that it is the relevant heads that give rise to the semantic roles.

Mixed lexical-syntactic approaches, such as Ramchand's (2008) and Alexiadou, Anagnostopoulou & Schäfer (2006) also exist. Ramchand proposes a two-tiered architecture. In her system, lexical items with purely categorial features project them to form a specific syntactic projection, but at the same time also carry lexical-encyclopedic content which can identify the content of the same projection.

My position in the thesis is that there are good reasons to favor a lexical mapping system and that a syntactic approach to mapping cannot be maintained in the face of evidence. In chapter 4, I show that semantic components of meaning in alternating verbs (specifically, a RESULT STATE projection) are insensitive to syntactic structure. This means that the component of meaning is coded prior to the emergence of syntactic structure and cannot be represented by a dedicated corresponding syntactic projection.

1.1.4 Mapping rules

Once one adopts a lexical approach to mapping, the precise mapping procedures must be articulated. The description of an entire mapping system is well beyond the scope of this thesis, but in order to get the flavor of mapping systems and the way they operate, I offer a comparative characterization of L&RH's (1995) and Reinhart's (2002) systems, based on some meta-theoretic parameters:

(5) Comparison of two mapping systems:

Parameter	L&RH (1995)	Reinhart (2002)
Type of theory	Lexical predicate decomposition	Generalized semantic roles
Semantic units	1. Causation 2. Directed change 3. State (existence)	Features: 1. /c – causation 2. /m – mental state relevant
Are the rules ordered?	Yes	No
Are the rules absolute or relative?	Absolute	Relative
Is there a default rule?	Yes	Yes

L&RH's system is characteristic of **lexical predicate decomposition** theories that have their origins in generative semantics (McCawley 1968; Lakoff 1970; Jackendoff 1983). Under L&RH's account, the semantic determinants are constant units found in templates representing the composition of a verb's meaning from primitive predicates. These templates capture patterns of argument realization. For instance, CAUSE is a predicate which relates an individual to an event and can be manifested in the following template:

(6) externally caused state template

[[x ACT] CAUSE [y BECOME <STATE>]] (L&RH 205:72)

Reinhart's θ -system belongs to another branch altogether, which can be labeled **generalized semantic roles**. A generalized role allows us to project its members to the same syntactic position without forcing them to have the same thematic interpretation. In the θ -system, this is achieved by decomposing thematic roles into clusters of features (but see Dowty 1991 for proto-roles).

The inherent difference between the systems is therefore the way they address patterns of argument mapping. L&RH's theory views mapping as a function of the

organization of predicates, whereas Reinhart's theory views it as a function of the organization of semantic roles.

I do believe that there is a way to reduce L&RH's system to the θ -system and vice versa since CAUSE, ACT, BECOME and STATE operators apply to a specific individual. In order to generate the corresponding theta clusters, we map the operators into the /c and /m values for that individual in a certain way (say, ACT maps to /+m, CAUSE to /+c, BECOME to /-c, and so on; the exact mapping from one system to the other is irrelevant for the purposes of the discussion). The other way around is also true: a lexical template is equally derivable from feature values. More generally, if it is true that both systems predict the same syntactic positions for the same arguments (and they should, otherwise one of them can be said to perform less well in the face of evidence), then a homomorphism must hold between the systems.² Empirically speaking, it is difficult to decide between representations that have the same input-output relations without independent evidence about the entities inside the "black box". We must obtain more data about the psychological reality of a lexical /+c feature, or conversely, about a lexical CAUSE operator.

The systems also differ in their technical articulation. In L&RH's system, an argument may fall under the scope of two ordered mapping rules. In such a case, only the first one applies. By contrast, the θ -system gives each cluster a unique index for merging instructions. Moreover, the θ -system's algorithm takes into consideration the relations between indices of clusters as a mechanism to allow for a variable mapping (see Reinhart

² To the best of my understanding, L&RH (1995) do not deal with experiencer derivations. Hence, the θ -system has more empirical coverage.

2002 for a detailed discussion regarding variability in experiencers and instrument derivations).

In this dissertation, I share with both systems the belief that mapping is lexical, i.e. that the relevant procedures apply at the lexicon-syntax interface. Deciding the architecture of an entire mapping system is an ambitious and complex task which I do not embark upon here. Rather, I put forth the idea that the Scalarity Mapping rule is one of the building blocks in the foundation of mapping, and aim to show its linguistic independence of other rules (or other semantic roles), in the hope that it can be integrated into a fully-fledged architecture in future research.

1.2 Transitivity alternations

A second empirical domain in the investigation of argument realization is the study of argument alternations:

- (7) a. (i) John sprayed paint on the wall. (Locative variant)
- (ii) John sprayed the wall with paint. (*With* variant)
- b. (i) John gave the present to Mary. (PP variant)
- (ii) John gave Mary the present. (Double object variant)
- c. (i) The car collided with the bicycle. (*With* variant)
- (ii) The car and the bicycle collided. (Reciprocal variant)

The central question that arises with respect to alternations such as (7) is: do the variants differ in meaning? If the answer is positive, then the variants are reflections of the multiple meanings associated with the verb and are derivable from general mapping principles. If the variants share a single meaning, then mapping cannot give rise to

alternations (i.e, assuming Baker's Uniformity of Theta Assignment Hypothesis), and other means must be postulated; often the alternations are achieved via syntactic transformations.

Regardless of the position one ultimately adopts for the question posed above, a specific type of alternations, namely transitivity alternations, is “easier” in the sense that it is abundantly clear that the alternates differ in meaning and therefore mapping principles can account for them:

- (8) a. The door opened. (Unaccusative variant)
b. The wind opened the door. (Causative variant)

However, the question of whether the principles that govern alternations are the same principles that govern mapping must be carefully examined. The null hypothesis for (8) would be to assume that if the surface difference between the alternates is reducible to the projection of the external argument, then we need go no further than positing either its addition or its removal to derive the alternation.

In fact, the null hypothesis is not straightforwardly borne out and the picture is more complex than it initially seems. This observation goes back as far as Fillmore’s “The grammar of hitting and breaking” (1970):

- (9) a. The boy broke the window.
b. The window broke.
c. The boy hit the window.
d. *The window hit.

Given that the subjects of both *hit* and *break* correspond to a cause role, the ungrammaticality of (9d) cannot be explained in terms of the external argument alone.

We must appeal to independent information about the predicate: a change-of-state interpretation which is present in *break* but absent in *hit*. The finding need not be a problem: the mapping system can be extended to incorporate a change-of-state component of meaning into the inventory of semantic input units, which allows it to handle the causative-unaccusative alternation in (8). This is the line of inquiry pursued in the thesis: the Scalarity Mapping rule (that reflects the change-of-state interpretation in (8)) generates an input licensing the causative-unaccusative alternation.

1.3 Goals, structure and main claims of the thesis

The thesis aims to explore the domains of argument mapping and transitivity alternations from a scalar perspective, in the following manner:

Chapter 2 deals with the constraints on the causative-unaccusative alternation. Its first part shows that a change-of-state interpretation of the internal argument is obligatory for the availability of the alternation.

(10) Main Claim, Chapter 2: The COS constraint

No COS → No transitive-unaccusative alternation.

In more detail, causatives that do not denote COS in their internal argument do not show an unaccusative alternate (e.g. *cross, touch, hit, support, caress, carry, attack, defend, protect, secure, encircle, frame, surround, isolate, occupy, mark, encourage, risk*, among others). Likewise, unaccusatives that do not denote COS do not show causative alternates either (e.g. *exist, dwell, reside, cost, weigh, sit, lie*). Further evidence from verbs such as *fill* or *bloom* show that the alternation is available only under a COS interpretation. In sum, evidence will be presented that corroborates Fillmore's initial observation as to the realization patterns of *break* and *hit*.

The second part of chapter 2 is dedicated to the derivation of the constraint from a formal framework. I define states in terms of scalar structure and changes of states as scalar changes. Generally speaking, a state of an object is a list of pairs of intrinsic properties of the object and the value of those properties as they describe the object at a specific time. Each property value is assigned to the object by a measurement of the object on some scale. More formally, the state of an object is a point in n-dimensional space of its relevant measurements (where each dimension corresponds to a specific property; see chapter 2 for a detailed formal definition).

I subsequently argue that the interaction of scalar structure with a standard model of causation (as a counterfactual dependence, see Lewis 1973), yields the COS constraint. Hence, given the empirical finding that the alternation is constrained, the assumption that unaccusatives are scalar provides an explanation for the findings.

Chapter 3 continues where chapter 2 left off: having concluded that unaccusatives are scalar, the hypothesis that scalarity is relevant to mapping becomes plausible. The chapter explores the following hypothesis:

(12) **Main Claim, Chapter 3: The Scalarity Mapping Rule**

An argument projected on a verbal scale is mapped to the direct object position. I show that the interpretational differences between unaccusatives and unergatives indeed correlate with the presence of a scalar structure (an idea which has its precursors in Levin & Rappaport Hovav 2010). The validity of the mapping rule is also evaluated in the prism of variable unaccusativity phenomena: (i) Locative Inversion, and (ii) Manner-of-Motion verbs with goal PPs. In order to answer whether the shift in unaccusativity is related to the shift in scalarity, I consider the syntactic module at three of its interfaces:

lexicon-syntax, pragmatics-syntax and syntax-semantics. The results of the investigation indicate that the scalarity rule exists and is operative at the lexicon-syntax interface.

Chapter 4 addresses the issue of the locus of the alternation. Given the result in chapter 3 that the relevant mapping rule is lexical, it is plausible to assume that the alternation is lexical as well:

(13) **Main Claim, Chapter 4:**

The causative-unaccusative alternation is derived in the lexicon.

In order to establish this claim, I pursue two complementing tracks of argumentation. The first track, which corresponds to the first part of chapter 4, surveys the predictions made by syntactic decompositional accounts of English causatives (Dowty 1979; Beck 2005; Borer 2005; Pylkkänen 2008; Ramchand 2008 and Harley 2012 among others).

Generally, the behavior of adverbial modifications (e.g. *partway*, *again*, *for x minutes*) is taken to support a syntactic decomposition of alternating verbs. I show that predictions of decompositional theories regarding these adverbials are in fact not borne out.

In the second part of chapter 4, I show that a lexical theory of English causatives makes specific predictions regarding the availability of the alternation, and that these are borne out. That is, not only is there no positive evidence for syntactic decomposition theories, there is evidence that the alternation is insensitive to compositionality. The argument I employ relies on the observation that no compositional introduction of RESULT STATES into a causative or an intransitive structure gives rise to the alternation. It necessarily shows that the alternation cannot be derived from a structural relation alone, because syntactic decomposition theories explicitly argue that alternating verbs are represented by their decomposition into a RESULT STATE constituent. Such

approaches turn out to be untenable (Borer 2005; Folli & Harley 2005; Alexiadou et al 2006; Schäfer 2008 and Pykkänen, 2008 for the case of English zero-causatives). The findings constitute robust evidence in favor of the hypothesis that the causative-unaccusative alternation is determined prior to the emergence of syntactic structure.

Recapitulating, the principal claims and findings of the dissertation are as follows:

(14) Main claims and findings:

Chapter 2:

- i. No COS → No transitive-unaccusative alternation.
- ii. The constraint is derivable from the interaction of scalar structure and causation.

Chapter 3:

- i. Scalarity Mapping Rule: an argument projected on a verbal scale is mapped to the direct object position
- ii. Unaccusatives, but not unergatives, are scalar.
- iii. Investigation of variable unaccusativity phenomena leads to the conclusion that the Scalarity Mapping Rule operates at the lexicon-syntax interface.

Chapter 4:

- i. Behavior of adverbials is contrary to the predictions of a syntactic decomposition analysis. Thus, there is no positive evidence that the alternation is fixed in the syntactic component of the grammar.
- ii. There is positive evidence that the alternation is determined in a lexical component, contra decompositional approaches.

2 Constraining the Causative-Unaccusative Alternation

2.1 Introduction

It is commonly assumed that the subject of the transitive participating in the unaccusative alternation (henceforth 'the alternation') is interpreted as causally responsible for the occurrence of the event; the sentence *the sun melted the ice* is understood to mean *the sun caused the ice to melt*. The transitive subject position may be occupied by agents, natural forces or instruments (Levin & Rappaport-Hovav 1995; Van Valin & Wilkins 1996; Reinhart 2002).

- (1) a. The painter / the brush / autumn reddened the leaves. (Reinhart 2002)
- b. The leaves reddened.
- c. Walter / the heat / the candle melted the ice.
- d. The ice melted.

Furthermore, transitive verbs whose external argument is exclusively agentive do not exhibit the alternation.

- (2) a. John / *the straw /* his thirst drank the lemonade.
- b. *The lemonade drank.
- c. Mary /* the brush / *the renovations painted the house.
- d. *The house painted.

In light of the above, the thematic role of the external argument of the transitive member is often taken to be causative and underspecified, labeled effector (Van Valin & Wilkins 1996), abstract causer/initiator (Ramchand 2008) or cause (Reinhart to appear). In order to capture this underspecification, theories supplied abstract linguistic entities which encapsulate realizations of thematic roles; entities such as an underspecified cause role

(e.g. [+c], see Reinhart to appear), or a "flavor" of voice (e.g. V_{cause} , see Folli & Harley 2005; Schäfer 2008).

I show that thematic variability, or underspecification, by itself, does not entail the availability of the alternation: many verbs allow freedom in the choice of their external argument but disallow the alternation. A few examples follow (to be extended in section 2.2):

- (3) a. John / the kitchen / the machine occupied the ground floor.
- b. *The ground floor occupied.
- c. John / the weather conditions / the walls protected the city.
- d. *The city protected.
- e. John / the river / the airplane crossed the desert.
- f. *The desert crossed.

The examples in (3) show that that an underspecified external thematic role is not sufficient to license the alternation. The question is: what is the constraint that blocks the alternation in the examples in (3) above?

In this chapter, I show that regardless of one's views on whether the external argument is added via a causativization operation (Pesetsky 1995; Harley 2008; Ramchand 2008, to name a few), or conversely, is eliminated via a reduction operation (Levin & Rappaport Hovav 1995; Reinhart 2002; Härtl 2003; Horvath & Sioni 2011a, among others), the alternation is constrained by the semantics of the internal argument: a change of state (henceforth COS) interpretation is necessary to manifest the alternation:

(4) **Main Claim: The COS constraint**

No COS \rightarrow No transitive-unaccusative alternation.

Variants of such a claim exist since at least Fillmore's (1970) grammar of hitting and breaking. A question springs to mind: why would there be such a pre-condition on the alternation? Observe that causative constructions are not constrained to have a change in an argument in the general case (for example, causing someone to read a book or to say a word). This chapter offers a principled account for the constraint.

The chapter is structured as follows: in Section 2.2, I present data supporting my hypothesis that a COS interpretation necessarily mediates the alternation, followed by an interim theoretical discussion. Since the notion of COS in the literature is often intuitively used and not well-defined, I present in Section 2.3 a formal definition for COS and explore its relations to Intrinsicity and to scalar structures. Section 2.4 takes stock of the overall picture which has emerged, discusses implications for representations of the alternation, and delineates topics for future research.

This chapter disregards sporadic, language-specific gaps in the alternation, which may disappear and reappear in various stages of development of a language; their absence is not universal. For instance, *fall* and *destroy* do not alternate in English, but they do in Hebrew. I address only verbs which I found to have consistent gaps crosslinguistically (see Reinhart 2002 for discussion of frozen entries, and Fadlon 2014 for psycholinguistic tests probing them)

2.2 The COS constraint

This section is divided into two principal parts. The first part presents empirical evidence reinforcing the claim that lack of a COS interpretation blocks the alternation (section

2.2.1). I also provide diagnostics for COS interpretation (section 2.2.2). The second part discusses the theoretical implications of the evidence (section 2.2.3).

2.2.1 Evidence for COS involvement in the alternation

2.2.1.1 Non-alternating transitives

Many transitives do not exclusively select agents as external arguments, allowing for a variety of thematic choices; at the same time they do not show a corresponding intransitive. I present below such transitives falling into four classes whose common semantic denominator is that their direct object is interpreted as not undergoing COS. The evidence supports the hypothesis that a lack of COS entails a lack of alternation. At the moment, it suffices to compare the interpretation of the objects in these sets of verbs to the objects of the verbs traditionally referred to in linguistic literature as change-of-state verbs (e.g. *break*, *melt* or *open*). In Section 2.2.2, I extend the investigation, proceeding to present novel diagnostics for COS interpretation; in Section 2.2.3 I will give a clear definition of COS semantics.

2.2.1.1.1 Verbs of positioning with respect to stationary objects

This large class consists of many smaller subclasses of verbs. A list of representative verbs is found below:

(5) **Stationary object verbs:**

verbs of crossing: *cross*, *traverse*, *reach*, *enter*...

verbs of surface contact: *touch*, *hit*, *support*, *caress*, *carry*...³

³ The observation that verbs of surface contact do not alternate dates back to Fillmore (1970). Here I exclude strictly agentive verbs, in order to control for agentivity (see (2)).

verbs of attack and defend: *attack, defend, protect, secure...*

others: *encircle, frame, surround, isolate, occupy...*

The lack of alternation is attested crosslinguistically. Some examples in English have already been provided in (3). Below are other selected examples from English, Hebrew and French:

- (6) a. The armies / the water / the walls surrounded the city.
b. *The city surrounded.
c. The army / heat wave / the crisis attacked Japan.
d. *Japan attacked.
e. John / the breeze / the silk scarf caressed Mary's cheek.
f. *Mary's cheek caressed.
- (7) a. ha-cva'ot / ha-mayim / ha-xomot hekifu et ha-ir. (Hebrew)
the-armies/ the water / the walls surrounded the-city
'The armies / the water / the walls surrounded the city.'
b. *ha-ir nikfa/hitnakfa.⁴
the-city surrounded
c. ha-cava / gal xom / ha-mašber takaf et yapan.
The-army / wave heat / the-crisis attacked Japan.
'The army / heat wave / the crisis attacked Japan.'
d. *yapan nitkefa/hittakfa
Japan attacked

⁴ Unaccusatives in Hebrew appear canonically in two binyanim: nif'al and hitpa'el, thus they have two possible morphological realizations.

- e. dan / ha-ru'ax / ce'if ha-meši litem et lexya šel dina.
 dan / the wind / scarf the-silk caress cheek-POSS of dina
 'Dan / the breeze / the silk scarf caressed Dina's cheek.'
- f. *lexya šel dina niltefa/hitlatfa
 cheek-POSS of dina caressed
- (8) a. les armées / l'eau / les murs a(ont) entouré la ville. (French)
 The armies / the water / the walls has (PL) surrounded the city
 'The armies / the water / the walls surrounded the city.'
- b. *la ville s'est entourée.⁵
 the city se is surrounded.
- c. l'armée / vague de chaleur / la crise a attaqué le Japon.
 The army / wave of heat / the crisis has attacked the Japan
 'The army / heat wave / the crisis has attacked Japan.'
- d. *le Japon s'est attaqué
 the Japan se is attacked.
- e. Jean / la brise / le foulard de soie a caressé la joue de Marie.
 Jean / the wind / the scarf of silk has caressed the cheek of Marie
 'Jean / the wind / the silk scarf caressed Marie's cheek.'
- f. *la joue de Marie s'est caressé.
 The cheek of Mary se is caressed

⁵ A reflexive, but not unaccusative, reading is possible: *la ville s'est entourée d'un rempart* 'the city has surrounded itself with a rampart'.

Examples (6)-(8) above show that, crosslinguistically, transitives denoting an event in which a stationary direct object undergoes no obligatory change in its properties or state, do not exhibit the alternation.⁶

2.2.1.1.2 Verbs of description

Another set of transitives that denote no COS in their direct object is the class of verbs of description. Similarly to the group of stationary object verbs (2.2.1.1.1), their external argument is not exclusively an agent:

- (9) **verbs of description:** *describe, represent, demonstrate, illustrate, spell out, mark, indicate...*

The lack of alternation is attested crosslinguistically. Examples from English, Hebrew and French follow:

- (10) a. John / the war / the unjust taxes represented our weakness.
 b. *Our weakness represented.
 c. John / the war / the declining sales demonstrated the problem.
 d. *The problem demonstrated.
 e. John / the forest clearing / the map indicated the spot.
 f. *The spot indicated.
- (11) a. dan / ha-milxama / ha-misim ha-lo codkim yiceg(a/u) et xulšatenu.
 Dan /the-war /the-taxes the-not unjust represented weakness-ours
 'John / the war / the unjust taxes represented our weakness.'
 b. * xulšatenu nicga/hityacga.
 Weakness-ours represented

⁶The examples throughout this section are all transitives, as evidenced by the possibility of passivization: *the city was surrounded by walls, Japan was attacked by the army.*

- c. dan / ha-milxama / ha-mexirot ha-conxot hidgim(a/u) et ha-be'aya.
 Dan / the-war / the-sales the-declining demonstrated the-problem
 'John / the war / the declining sales demonstrated the problem.'
- d. *ha-be'aya nidgema/hitdagma
 The-problem demonstrated
- e. dan / karaxat ha-ya'ar / ha-mapa ciyen(a) et ha-nekuda.
 Dan / clearing-PSS the-forest / the map indicated the-spot
 John / the forest clearing / the map indicated the spot.
- f. *ha-nekuda nicyena/hictayena
 The-spot indicated
- (12) a. Jean /la guerre /les taxes injustes a(ont) représenté notre faiblesse.
 Jean /the war /the taxes unjust has (PL) represented our weakness
 'Jean / the war / the unjust taxes represented our weakness.'
- b. *Notre faiblesse s'est représentée.
 Our weakness se is represented
- c. Jean / la guerre / la baisse des ventes a(ont) démontré le problème
 Jean / the war / the decline of sales has(PL) demonstrated the problem
 'John / the war / the declining sales demonstrated the problem.'
- d. *Le problème s'est démontré
 The-problem se is demonstrated
- e. Jean / la clairière de la forêt / la carte a indiqué le point.
 Dan / the clearing of the forest / the map indicated the-spot
 John / the forest clearing / the map indicated the spot.

- f. *Le point s'est indiqué

The-spot se is indicated

Concluding, the examples above show that crosslinguistically, transitive verbs of description whose direct object undergoes no obligatory change in its properties or state, do not exhibit the alternation.

2.2.1.1.3 Verbs of guarantee and violation

Similarly to the two previous sets of transitives, verbs of guarantee and violation denote no COS in their direct object.

(13) **Verbs of guarantee and violation:** *guarantee, justify, warrant, ensure, encourage, discourage, confirm, corroborate, disprove, refute, violate, contradict...*

The lack of alternation is attested crosslinguistically. I continue to provide examples from English, Hebrew and French.

- (14) a. John / the river / the infrastructure guaranteed fresh water.
b. *Fresh water guaranteed.
c. John / the river / the infrastructure encouraged rapid growth.
d. *Rapid growth encouraged.
e. John / the discoveries / the video contradicted the claim.
f. *The claim contradicted.

- (15) a. dan / ha-nahar / ha-taštit hivti'ax(a) mayim triyim.
Dan / the-river / the-infrastructure guaranteed water fresh(PL)
'John / the river / the infrastructure guaranteed fresh water.'
b. *mayim triyim nivtexu/hitbatxu.
water fresh(PL) guaranteed

- c. dan / ha-nahar / ha-taštit oded(a) gidul mahir.
 dan / the-river / the-infrastructure encouraged growth fast
 'John / the river / the infrastructure encouraged rapid growth.'
- d. *gidul mahir ne'odad/hi'toded.
 growth fast encouraged
- e. dan / ha-tagli'ot / ha-video satar(u) et ha-ta'ana.
 Dan / the-discoveries / the-video contradicted the-claim
 'John / the discoveries / the video contradicted the claim.'
- f. *ha-ta'ana nistera⁷ / histatera
 the-claim contradicted
- (16) a. Jean / le fleuve / de l'infrastructure a garanti d'eau douce.
 Jean / the river / the infrastructure has guaranteed water fresh
 'Jean / the river / the infrastructure guaranteed fresh water.'
- b. *De l'eau douce s'est garantie.
 water fresh se is guaranteed
- c. Jean / le fleuve / de l'infrastructure a encouragé croissance rapide.
 Jean / the river / the infrastructure encouraged growth rapid
 'John / the river / the infrastructure encouraged rapid growth.'
- d. *croissance rapide s'est encouragée.
 growth rapid se is encouraged

⁷ A passive reading exists: *ha-ta'ana nistera (al yadey ha-ed)* 'the claim was contradicted (by the witness)'. The verb *nistar* is incompatible with 'by-itself' modification: **ha-ta'ana nistera me-acma* 'the claim contradicted by itself' (for more information about the 'by-itself' test and forms ambiguous between passives and unaccusatives, see section 2.3.1).

- e. Jean / les découvertes / la vidéo a(ont) contredit l'allégation.
 Dan / the discoveries / the video has (PL) contradicted the claim
 'John / the discoveries / the video contradicted the claim.'
- f. * l'allégation s'est contredite.
 the-claim se is contradicted

Recapitulating, the data presented in (14)-(16) patterns with the previous sets of transitives lacking COS interpretation in their direct object.

2.2.1.1.4 Other non-alternating transitives

Similarly to the three previous sets of transitives, I present below verbs which I have not classified in a specific semantic group, sharing with the verbs discussed previously the characteristics of non-agentive uses as well as a lack of COS in their direct object. The same pattern is observed for these verbs, as in (18)-(20):

(17) **Other non-COS verbs:** *demand, require, regulate, risk, endanger, commemorate...*

- (18) a. John / the task / the machine required our collaboration.
- b. *Our collaboration required.
- c. The passenger / the sally / the damaged wheels risked the airplane.
- d. *The airplane risked.
- e. John / the celebrations / the plaque commemorated the battle.
- f. *The battle commemorated.

- (19) a. dan / ha-mesima / ha-mexona daraš(a) et šituf ha-pe'ula šelanu
 Dan / the-task / the-machine required share-POSS the-action ours
 'Dan / the task / the machine required our collaboration.'
- b. *šituf ha-pe'ula šelanu nidraš/hitdareš⁸
 share-POSS the-action ours required
- c. ha-nose'a / ha-gixa / ha-galgalim ha-pgui'm siken(a/u) et ha-matos
 the-passenger / the-sally /the-wheels the-damaged risked the-airplane
 'The passenger / the sally / the damaged wheels risked the airplane.'
- d. *ha-matos niskan/histaken
 the-airplane risked
- e. dan / ha-xagigot / ha-šelet hinci'ax(u) et ha-krav.
 Dan / the-celebrations / the-plaque commemorated (PL) the-battle
 'Dan / the celebrations / the plaque commemorated the battle.'
- f. *ha-krav nincax/hitnace'ax
 the-battle commemorated
- (20) a. Jean / la tâche / la machine a exigé notre collaboration
 Jean / the task / the-machine required our collaboration
 'Dan / the task / the machine required our collaboration.'
- b. *Notre collaboration s'est exigée.
 our collaboration required
- c. Le passager / la sortie / les roues endommagées a(ont) risqué l'avion
 the-passenger / the-sally /the-wheels the-damaged risked the-airplane

⁸ *nidraš* has a passive reading only, and is incompatible with 'by-itself' modification: *šituf ha-pe'ula šelanu *nidraš me-acmo* 'our collaboration required by itself' (for more information about the 'by-itself' test and disambiguating passives from unaccusatives, see section 2.3.1).

'The passenger / the sally / the damaged wheels risked the airplane.'

d. *L'avion s'est risqué

the airplane risked

e. Jean / les célébrations / la plaque a (ont) commémoré la bataille

Jean / the celebrations / the plaque has (PL) commemorated the battle

'Jean / the celebrations / the plaque commemorated the battle.'

f. *La bataille s'est commémorée

The battle commemorated

Recapitulating, I have presented a considerable number of non-alternating transitive verbs (listed in (21), whose external role is underspecified) which share a single semantic determinant: their direct object does not undergo COS. Transitives patterning with *hit*-verbs (Fillmore 1970, see (5) above) encompass a far larger class which may not be characterized as contact verbs. In section 2.3, I develop a semantic theory which derives the COS constraint.

(21) **non-alternating transitives:** *cross, traverse, reach, touch, hit, support, caress, carry, attack, defend, protect, secure, encircle, frame, surround, isolate, occupy, describe, represent, demonstrate, illustrate, spell out, mark, indicate, guarantee, justify, warrant, ensure, encourage, discourage, confirm, corroborate, disprove, refute, violate, contradict, demand, require, regulate, risk, endanger, commemorate...*

At this point, the reader may ask whether there could be another independent common denominator to all these sets which is not a lack of COS in the direct object: perhaps an aspectual facet? Indeed, there is some correlation with stativity. In their non-agentive uses, many verbs may have a stative interpretation: *the walls protected the city, the river*

guaranteed fresh water or the map indicated the spot. However, this tendency cannot define the set of non-alternating transitives, since other members of the set do allow eventive interpretation in their non-agentive uses: *The tsunami attacked the shores of Japan, the airplane crossed the Atlantic Ocean, the wind caressed my cheek, the stream carried the detritus , the smoke entered the room* etc. It emerges that the restriction involved here does not depend on the compositional aspectual behavior of the entire predicate – the behavior of the internal argument is sufficient to predict the pattern. The generalization here brings to mind Jaeggli's (1986) affectedness constraint:

(22) Affectedness Constraint (Jaeggli (1986))

If a complement of x is unaffected, it is impossible to eliminate the external theta role.

Originally, the constraint was formulated to capture the set of verbs disallowing NP-preposing in passive nominals. It is often also associated with the study of middles (Roberts 1987; Fellbaum & Zribi-Hertz 1989; Fagan 1992; Hoekstra & Roberts 1993, among others). According to Jaeggli, a relation between an affected complement and its predicate is always 'well defined', by virtue of being independent of the relation holding between the predicate and its external argument. By his account, such a 'well-defined' relation is absent when unaffected objects are involved. Unfortunately, it is not formally clear what 'well-defined relation' here means. In section 2.3 I show exactly what the nature of this relation is, and why it motivates the witnessed behavior.

2.2.1.2 Non-Alternating unaccusatives

2.2.1.2.1 Verbs of existence

A mirror-image to non-alternating transitives, non-alternating unaccusatives also exist.

As expected under my hypothesis, they are characterized by a lack of COS. The first class in this set is verbs of existence (Levin & Rappaport-Hovav 1995). Below is a table of crosslinguistic verbs of existence (in (23)), as well as select examples in English (in (24)) demonstrating that these verbs do not have transitive alternates:

(23) Verbs of existence

	English	Hebrew	Spanish	Italian	French	Russian
(a)	exist	kayam	Existir	esistere	exister	sushhestvovat'
(b)	dwell live reside	šaha gar hitgorer	Vivir	vivere abitare	vivre habiter	zhit' prozhivat' obitat'
(c)	live	xay	Vivir	vivere	vivre	zhit'
(d)	wait	xika himtin	Esperar	attendere	attendre	zhdatt' ozhidat'
(e)	survive	sarad	sobrevivir	sopravvivere	survivre	vyzhit' ucelet'

- (24) a. The solution exists.
 b. *John exists the solution.
 c. John waited (for an hour).
 d. *Mary / the rain waited John (for an hour).
 e. The archaeological findings survived.
 f. *Luck survived the archaeological findings.

Thus, the behavior of existence verbs corroborates my claim that only COS verbs may participate in the alternation.⁹

⁹ It seems that at least some of these verbs are dyadic and include a spatio-temporal argument (e.g. *live*, see also Levin & Rappaport-Hovav 1995). The assumption that some dyadic verbs do not alternate for independent reasons does not detract from the line of inquiry that for each of the instances where no change

2.2.1.2.2 Measure verbs

A second class of unaccusatives which do not denote COS are verbs of measurement.

Verbs such as *cost*, *weigh*, *last* and *measure* do not show causative alternates. Below are examples from English (the same holds in Hebrew and French):

- (25) a. The present cost ten dollars.¹⁰
b. *John / *the expenses / *the wrapping cost the present ten dollars.
c. The box weighed five kilograms.
d. *John / *the mass / *the machine weighed the box five kilograms.
e. The movie lasted two hours.
f. *John / *the screening / *the TV lasted the movie two hours.

The examples above show that measure verbs pattern with existence verbs with respect to the (un)availability of the causative.

2.2.1.2.3 Spatial Configuration verbs (in a "simple location" sense)

Verbs such as *sit*, *stand* and *lie* have a range of meanings associated with them.

Languages diverge with respect to the morphological realizations of those different meanings. What will be relevant here is the meaning of 'simple position', in which the unaccusative verb is predicated of inanimates and describes their location (e.g. *The statue stood in the corner*, see Hoekstra & Mulder 1990; Levin & Rappaport-Hovav 1995).

Under that interpretation, verbs of spatial configuration pattern with verbs of existence

of state is involved, there is consistent lack of alternation (other dyadic unaccusatives in Hebrew, such as *barax* 'escape', or *hitxolel* 'occur', **do** show causative alternates). I motivate the presence of the spatio-temporal PP in section 2.3.4.

¹⁰ Measure phrases (MP) are not referential arguments. They cannot be used with quantifiers or with pronouns: *the present costs (*every/any) ten dollars/(*it)*. MP also cannot be extracted from wh-islands (see Rizzi 1990).

and verbs of measurement: they do not have COS interpretation and lack causative alternates. What makes the class unique is the availability of agentive transitives (beyond the scope of this chapter) which pattern neither morphologically nor thematically with canonical causatives (for a full discussion, see Levin & Rappaport-Hovav 1995:128-130). Below are examples from English (adapted from L&RH 1995:129, the same data are repeated in Hebrew and French):

- (26) a. The statue stood in the corner.
b. John / *gravity / *the lever stood the statue in the corner.
c. The books sat on the table.
d. John / *gravity / *the box (*sat)/set the books on the table.
e. The dress lay on the bed.
f. John / *gravity / *the hanger (*lay)/laid the dress on the bed.

The examples above show that spatial configuration verbs in a simple position sense pattern with measure verbs and existence verbs with respect to the availability of the causative. Concluding, non-alternating unaccusatives (existence verbs, measure verbs and spatial configuration verbs) reinforce the hypothesis that a lack of COS blocks the alternation.

2.2.1.3 Fill verbs

A third phenomenon providing relevant evidence is the situation where both alternates exist, but only under certain entailments. Verbs such as *fill*, *cover* or *obstruct*, in their transitive use, show two readings: an eventive reading, where the direct object undergoes COS, and a stative reading, where it does not. The intransitive counterpart of these verbs

allows only a COS interpretation, thus lacking the stative reading, as shown in (27) below. The same observations carry over to Hebrew.

- (27) a. The water filled the pool. (water level increased / is constant)
- b. The pool filled (with water). (water level increased / * is constant)
- c. The statues filled the hall. (their number increased / is constant)
- d. The hall filled (with statues). (their number increased / *is constant)
- e. *ha-šeleg kisa et ha-arec.* (Hebrew)
the-snow covered the-earth
The snow covered the earth. (snow level increased / is constant)
- f. *ha-arec hitkasta be-seleg.*
the-earth covered (intr) in-snow
The earth covered with snow. (snow level increased /*is constant)

The examples in (27) provide additional indication that the alternation requires COS of the direct object. Otherwise, the unavailability of the intransitive stative reading is unexpected.

2.2.1.4 Bloom verbs

Additional reinforcement is provided by the intransitive mirror image of *fill* verbs, namely, verbs which show two intransitive uses. There is only a single transitive use: the one corresponding to a COS interpretation in the direct object.

Verbs such as *bloom*, *blossom*, *rot*, *erode* and *decay* have been labeled as verbs of internal COS. A subset of internal COS verbs, such as *bloom*, *sprout*, *flower* or *grow* also

has a mode-of-being sense which describes a certain state of existence (Levin 1993:250-251). The transitive (where it exists) corresponds only to the COS.

- (28) a. The cactus blossomed (for two days). (the cactus changed / was in blossom)
b. Bright sun blossomed the cactus. (the cactus changed / *was in blossom)
c. The corn grew in the fields. (the corn changed / was ripe)
d. The hot sun grew the corn in the fields (the corn changed /*was ripe)

In each of the intransitive sentences in (28), the subject may be interpreted as being a certain state for the lifespan of the verb - an interpretation which is blocked in the transitive alternate.

2.2.1.5 Interim Summary

I hypothesized that the common denominator for all the sets of verbs which disallow the alternation is a lack of a COS interpretation for the internal argument. The verb sets are:

- (i) Transitive verbs that lack an unaccusative alternate. These transitives are not exclusively agentive. They share the characteristic of having an object which lacks a COS reading (section 2.2.1.1).
- (ii) Unaccusative verbs that lack a transitive alternate. These unaccusatives share the characteristic of a subject which lacks COS reading (section 2.2.1.2).
- (iii) Alternating verbs in which the transitive has two readings but the unaccusative shows only the COS reading (section 2.2.1.3).
- (iv) Alternating verbs in which the unaccusative has two readings but the transitive shows only the COS reading (section 2.2.1.4).

Thus, the alternation obeys the following generalization, ((4) repeated):

(29) **The COS constraint:**

No COS → No transitive-unaccusative alternation.

Before discussing the theoretical significance of my findings, I conclude the empirical section by providing a few diagnostics detecting a COS interpretation or its absence.

2.2.2 Diagnostics for detecting COS

Although my analysis of COS (to be presented in section 3) differs from the traditional approach, it is fruitful to observe some canonical entailments in order to better understand the nature of the phenomenon. If so, COS was traditionally formulated as entailing a result state ψ , which obtains for participant x as a result of predicate ϕ being true (dating back to Wright 1968; Lakoff 1970; Dowty 1979). Hence, if ϕ , *but not* ψ is a contradiction, COS has occurred (for instance, by employing past participles, e.g. *#John cleaned the house but it is not cleaned*). Beavers (2011) proposes a general test which abstracts away from concrete ψ s: if *but nothing is different about* x is a contradiction, then a COS in some property of x took place. For instance (examples taken from Beavers 2011):

- (30) a. John just painted the bedroom, #but nothing is different about it.
b. John just carved the wood into a toy, #but nothing is different about it.

What is it about the word *different* used here that licenses COS? Beavers (2011) answers that "Intuitively, *something is different about* X only picks out properties that can be observed by looking at X itself". Therefore, *different* in this context means that two observable states of the object in time are unequal. As such, it suffices to speak of different states (or different observations) of the object, not necessarily of result states.

To further advance this observation, recall that there are (atelic) COS verbs which do not entail result states (e.g. *widen, cool...*). The end state is not the semantic determinant involved in the test.

2.2.2.1 Successive object modifications test

I wish to add two of my own tests to the family of φ , *but not* ψ COS entailment tests. Keeping in mind that COS may minimally be achieved by requiring two different states in time, let us assume that an object is in a certain original state at a given time t_1 . The object transitioned later to a different state at t_2 . Therefore, as of time t_2 , another hypothetical change of the object from the original state to the newer state is contradictory, because the object is no longer in its original state. To flesh it out, consider a context where John wishes to perform a certain action on an object. To his annoyance, Mary has preceded him and performed the same action (expressed by the same verb) on the same object. Although Mary just did it, John is determined to carry out his plan nonetheless. Now, if the object has a certain state with respect to this verb which has changed, John's actions would lead to a contradiction.¹¹ By contrast, if the object has no state with respect to the verb, or a state which has not changed, John's actions are licit.

Consider the following examples:

(31) Non COS verbs

a. John crossed the road (too) right after Mary had done it / right after it had been crossed.

¹¹ If one accommodates the context described above, then it follows that there is a presupposition of a counter-directional change which reverts the object to its original state, under the condition that the change is reversible. For instance, for *John opened the door (too) right after Mary had done it* to be acceptable, it follows that the door reverted from an open state to a closed state, after Mary opened it and before John opened it again (see Fabricius-Hansen 2001; Horvath & Siloni 2011a).

- b. John touched Ed's cheek (too) right after Mary had done it.
- c. John described the sea (too) right after Mary had done it.
- d. John guaranteed the wares (too) right after Mary had done it.
- e. The French army surrounded the city right after the British one had done it.
- f. John demanded the (too) right after Mary had done it.
- g. John supported the old woman (too) right after Mary had done it.
- h. John contradicted Ed (too) right after Mary had done it.

(32) COS verbs

- a. *John broke the window (too) right after Mary had done it / right after it had been broken.
- b. *John emptied the pool (too) right after Mary had done it.
- c. *John killed the woman (too) right after Mary had done it.
- d. *John opened the door (too) right after Mary had done it.
- e. *John froze the water (too) right after Mary had done it.
- f. *John melted the ice (too) right after Mary had done it.¹²
- g. *John heated the soup (too) right after Mary had done did it.
- h. *John moved the stone (too) right after Mary had done it.

The reader is welcome to verify that all non-alternating transitives in section 2.2.1.1 (from which the examples in (31) are taken) are noncontradictory in the test's environment. As such, the test reinforces the intuition that these verbs do not denote

¹² (32f), (32g) and (32h) denote atelic COS verbs. They are acceptable only under the reading in which John continues the action on the object from the state where Mary left off; i.e. from a changed state (but possibly a non-final state, since the verb is atelic). In (32f), John melts the parts of ice which have not yet been melted, in (32g), John heats the soup from an intermediate temperature, in (32h) John moves the stone from its intermediate location. In each of these sentences, a reading where John operates on the original state of the object (e.g. location/temperature) is contradictory. (e.g. #*John moved the stone from the mountaintop (too) right after Mary had done it*). Here, change-of-location verbs pattern together with canonical COS verbs (see also footnote 13).

COS. By contrast, the examples in (32), alternating verbs, are contradictory; corroborating the claim that they involve COS. The test does not discriminate alternating verbs from non-alternating ones. Rather, it allows distinguishing COS verbs, alternating and non-alternating alike, from non-COS verbs, which are uniformly non-alternating, according to the constraint.

Lastly, the test does not detect COS in periodic verbs, which allow the original and last states to be identical: *rotate*, *turn*, *spin* (i.e. the last orientation may be the original one, although it changes in course of the event). Their detection failure is fully expected due to the rationale of the test: it works because the desired state is different from the original one. However, the next test is suited for periodic verbs.

2.2.2.2 Simultaneous object modifications test

Similarly to the previous test, let us assume an object is in a certain state at time t_1 . Two independent, simultaneous actions denoted by a given verb are performed on this object; each is directed at transitioning the object to some new state independently of the other action. The result is contradictory, because an object cannot be in two distinguishable states at the same time. Consider a context where John and Mary are competitors and they are given a task to perform a certain action on the same object at the same time. Mary has managed to fully accomplish the task by herself, while John was not as successful. Now, if each person transits the object to a different state the result is contradictory (i.e. Mary, but not John, reached the result state). Alternatively, if the object has no state with respect to the verb, or has a state which has not changed, competitive simultaneous actions are licit. Consider the examples below:

(33) Non COS verbs

- a. They crossed the road at the same time; John crossed it only halfway when Mary finished...
- b. John and Mary caressed David's cheek at the same time; John barely touched it when Mary finished...
- c. They secured the castle at the same time; John was only halfway securing it when Mary finished...
- d. They described the book; John was only halfway describing it when Mary finished...
- e. They demanded the sugar; John was only halfway demanding it when Mary finished...

Compare with COS-verbs below, which are ungrammatical in the test's environment.

Recall that the context is that John and Mary are competitors; their actions are simultaneous and take the same time on the same object. Mary has managed to fully accomplish the task by herself (each example below has a slightly different continuation, depending upon the less-than-maximal degree value obtained by John).

(34) COS verbs

- a. *They opened the door at the same time; John opened it only halfway when Mary finished... / * was only halfway opening it...
- b. *They froze the water; John froze only half of it when Mary finished...
- c. * They heated the soup; John heated it only two degrees when Mary finished ...¹³
- d. * They moved the stone; John moved it only two meters when Mary finished ...
- e. *They spun the top; John spun it only half circle when Mary finished ...

¹³ I assume a contextually specified result state/degree for open-scale atelic verbs. Let us say, in (33d), John and Mary had to bring the soup to 50 degrees; which Mary did by herself. It cannot be that John brought it to 40 degrees at the same time. In (33e), John and Mary had to move the stone 10 meters, which Mary did by herself. It cannot be that John moved it 2 meters at the same time.

Once more, the reader is welcome to verify that non-alternating transitives in section 2.2.1.1 (from which the examples in (33) are taken) are felicitous in the test's environment. As such, the test reinforces the intuition that these verbs do not denote COS. By contrast, the examples in (34), alternating verbs, are unacceptable, corroborating the claim that they involve COS. However, this test is less general than the previous one, because it requires that the object be able to transit to at least two different states (gradable verbs); if John and Mary operate on the same object but their actions may only lead to the one common (final) state, the test is inapplicable as we cannot create a potential contradiction. Hence, the simultaneous object modifications diagnostic is not suited to test predicates with binary states such *kill* or *break* (e.g. **John killed David to a lesser degree than Mary*. Levin & Rappaport-Hovav 2010 call these two-point scales); for these verbs, the successive object modifications test still applies. The simultaneous modification test however is able to cover periodic verbs (see (34e)).

Summarizing, I presented two tools to distinguish between COS and non-COS sets of verbs: the successive and simultaneous object modifications tests demonstrate the different truth conditions of these sets. As such, there are good reasons to believe that the COS / non-COS distinctions are linguistically relevant. Observe that the relevant distribution does not correspond to the telic/atelic distinction (i.e. both telic *break* and atelic *cool* are COS verbs).

The data I have provided so far were not couched in terms of any theoretical framework. Let me now elaborate on the consequences of my findings on existing theoretical frameworks.

2.2.3 Theoretical Implications

An important correlation has been noted between the thematic distribution of the external argument and the transitive-unaccusative alternation: when the alternation is manifested, the external argument enjoys a wide thematic range (agents, natural forces, instruments, and sometimes eventualities), but when the thematic choice of external arguments is limited to agents, the alternation does not exist. This observation provided motivation for researchers to posit semantic inventories which differentiate between agents and (underspecified) causes. For instance, Reinhart (to appear) introduces [+c] and [+c +m] theta clusters representing causes and agents, respectively, whereas Schäfer (2008), Pylkkänen (2008), Folli & Harley (2005) and Embick (2004), among others, distinguish between V_{do} (or V_{agent}) and V_{cause} heads.

This distinction, by itself, is not enough to predict the alternation. As previously shown (section 2.1.1), the subjects of many transitives show thematic underspecification, yet they do not alternate. Hence, theories must introduce a semantic inventory and appropriate rules which will predict the available syntactic realizations.

In principle, there is a possibility to assume that the subject of a non-alternating transitive does not correspond to a cause role (or its linguistic equivalent in various theories), but to some new linguistic entity which differs from both causes and agents. Namely, to argue that for these verbs, the subject is not interpreted as causing the event. I will not adopt this view because there is no independent empirical evidence that the underspecified role of the non-alternating verbs and that of the alternating verbs differ.

It is a better theoretical practice to treat the subjects in both alternating and non-alternating transitives as causes. There are good reasons to believe that the subjects of

both sets do share causal semantics which entail their external merging: a counterfactual analysis of causation (detailed in section 3, see also Dowty 1979) can account for these verbs too. For example, in *John/the walls protected the city*, *John* or *the walls* are interpreted as causally responsible for the protection of the city, because the predicate expresses a counterfactual dependence on them; i.e, if *John* or *the walls* had not played 'their part', *the city* would not have been protected. The other way around is not true: *John* or *the walls* do not depend on *the city*. (For a proposal, see 'maintenance verbs' in Neeleman & van de Koot 2012).

In light of the above, I leave the causative treatment of the external argument of non-alternating verbs intact. I now turn to developing a rigorous analysis of the COS constraint. What, precisely, is a state of an object? What are its semantic consequences? The next section is dedicated to the task of defining the relevant notions and deriving the corresponding linguistic behavior.

2.3 What is COS?

2.3.1 Intrinsicity

The first step toward formally defining states of objects is the intuition that the state of an object is fully determined by the object itself (at a certain time). Namely, the state of an object is a function of what has been labeled as its intrinsic properties. In what follows, I present a theory of Intrinsicity by Lewis (1986), upon which I proceed to define states in section 2.3.2.

Most approaches agree that the unaccusative verb is predicated of a single individual, its subject.¹⁴ Schematically, the formula of the intransitive sentence is $\lambda x.P(x)$ and the controversial question is what captures the property P: does it include a COS ingredient or its equivalents (e.g. BECOME and/or CAUSE operators, see Dowty 1979;Parsons 1990; Chierchia 2004, or FIENT head, Embick 2004). Let us ignore for the moment the various suggestions as to the precise content of P, and focus on the shared denominator: no other individuals are included in P.

Therefore, the subject, x, has at least one property which must be compatible with the restrictions of the verb, P, since it is true that P(x). For example, for the sentences *the vase broke* and *the soup cooled*, the subjects have the properties of being solid and having temperature, respectively (hence, *#the oil broke* and *#the noise cooled* are infelicitous because their subjects do not have the relevant properties). As such, with respect to the domain of individuals, an unaccusative is predicated of its subject alone. This is the main difference between unaccusatives and passives, as seen below:

- (35) a. *The window broke by John.
 b. The window was broken by John.

The example in (35b) is taken to support the claim that the passive existentially closes a distinct external argument, which remains a part of the verb's representation. (35a), on the other hand, does not include a distinct external argument. The "by itself" diagnostic also differentiates between unaccusatives and passives:

- (36) a. The window broke by itself.
 b. *The window was broken by itself.

¹⁴ There are two exceptions: a. lexical binding in Levin & Rappaport-Hovav 1995: the argument participating in the causing event is lexically bound and appears in the semantic representation of an unaccusative verb. b. Alexiadou et al 2006, arguing for the presence of a CAUSE head in unaccusatives.

The incompatibility of the passive with "by-itself" modification, (36b), clearly shows it to include a distinct argument in its semantic representation. By contrast, the unaccusative is compatible with "by-itself" modification (36a), and thus does not have a-priori to include an additional distinct argument in its semantic representation. Whether there actually is another argument in the representation is a matter of debate (see Chierchia 2004, Alexiadou et al 2006, Koontz-Garboden 2009 and Beavers & Koontz-Garboden 2012 for arguments in favor of including CAUSE as a part of the unaccusative structure, and Horvath & Sioni 2011b, 2013 for the opposite view). I hold here the null hypothesis that there is no other argument in the representation. Below, I also provide new evidence arguing for the lack of an additional argument.

As such, we understand that the subject of the unaccusative verb has an autonomous property (with respect to the eventuality denoted by the verb): it is not evaluated relatively to other individuals. I call it here *intrinsic property* (following Lewis 1986; Lewis & Langton 1998). From a philosophy of the mind viewpoint, Lewis argues that intrinsic properties of objects are purely by virtue of the ways objects are: mass, shape, having five fingers. On the other hand, *relational properties* of objects are the opposite of intrinsic properties: they obligatorily depend on other objects in the world: being a brother, thinking of Paris, being next to John.¹⁵

(37) Intrinsicity

Intrinsic properties of an object *d* do not depend on objects other than *d*.

If an object has a property intrinsically, then it has it independently of the way the rest of the world is. The rest of the world could disappear, and the object might still have that

¹⁵ There are several views regarding the distinction between intrinsic and non-intrinsic properties; here I restrict myself to using relational properties as the negation of intrinsic properties, which I find sufficient to characterize the relevant linguistic phenomena.

property. Lewis (following Kim 1982) supplies several philosophical criteria for establishing a property as intrinsic, one of which suffices for linguistic purposes: a property P is intrinsic if it is possible for a lonely object to have it. A lonely object is defined to co-exist only with its proper parts, and no accompanying objects.

Indeed, *the window broke* or *the soup cooled* denote intrinsic properties because they entail that there is a past time in which a lonely window or a lonely soup had the property of being broken (along with its proper parts) or being cool, without any reference to other individuals. By contrast, **the road crossed*, **the book read* or **the plank carried* are ungrammatical because *cross*, *read* and *carry* do not denote intrinsic properties. I suggest they do not give rise to an intransitive verb as this is possible only when the property denoted by the intransitive is intrinsic. The hypothetical intransitive version of *cross* or *read* would entail there being a past time in which a lonely road, a lonely book or a lonely plank had the property of being crossed, being read or being carried, respectively, without any reference to other individuals, which is impossible in the way we perceive the world.

At this point, one understands that the distinction between intrinsic and relational properties is driven by our perception of relations, but not by mathematical necessity. If any property could have been perceived to be intrinsic or to have an intrinsic equivalent, then we would have expected to find for every transitive verb an intransitive alternate which denotes the intrinsic property, contrary to fact. Mathematically speaking, however, it is possible to treat functions with multiple arguments as a composition of functions with lesser arity (by partial function application). While we are capable of imagining that properties of being crossed, read or carried hold for objects at certain times, we do not

seem able, linguistically, to treat these properties as intrinsic, at least in the languages tested here.

The "lonely object" test is further argument in favor of the null hypothesis (see also Horvath & Sioni 2011b) that unaccusatives denote intrinsic properties and do not include an additional individual in their representation:

(38) **Intrinsicity of unaccusatives**

Unaccusatives denote intrinsic properties.

The above excludes unaccusatives from denoting relational properties because a related distinct subject would have to participate in the semantic representation of the unaccusative, contrary to fact. Unergatives, which are also semantically intransitive verbs, are intrinsic as well. I will however withhold their discussion until section 2.3.4.3 which compares them with unaccusatives.

2.3.2. States of objects

2.3.2.1 A short introduction to states

We have seen that a COS interpretation is necessary for the availability of the alternation, but the notion of "state" itself relied, so far, on intuitive judgments. I now proceed to formally define states of objects and changes of states of objects. My goal is to derive the following relation between states and causation:

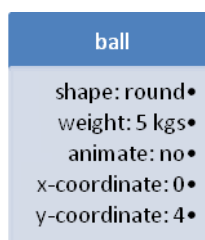
(39) Lemma: Interaction of states and causation (to be modified later)

if an event (of an intransitive verb) depends only on the states of its argument, d,
then causation of that event entails COS of d.

As will be discussed subsequently (section 2.3.4), we will understand that causation, in the general case, does not entail COS (for instance, causing someone to drink does not entail that he did not drink previously, nor does it entail a change in his properties). This is expected because causation and states of objects are two independent linguistic entities. They may, however, co-appear. In such a case, their semantic interaction, which follows naturally from my account, yields the COS constraint. Hence, the fact that unaccusatives show the COS constraint strengthens their analysis as intransitives which depend only on the states of their argument. Similar claims have been made in literature, most notably, manner/result complementarity (see Rappaport Hovav & Levin 2010).

Intuitively speaking, a state (to be defined formally in section 2.3.2.2 below) is a "snapshot" of an object at a certain time. The snapshot is a list of pairs of intrinsic properties and their values, which describe the object at that time. According to the definitions of Intrinsicity in section 3.1, these properties depend only on the object itself. A graphic illustration of a state would be something like diagram (1):

Diagram (1): a state of a ball

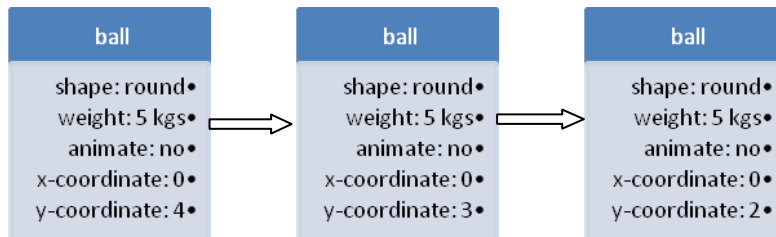


The most important thing to understand about states is that they may be **compared**. Hence, not every intrinsic property is qualified to be a part of the list of properties in a state. The ability to compare states requires that for two given values of the same property, we can decide whether they are either the same value or two different ones (the object is not required to receive every possible value of the property). Slightly more

formally, a property in the state projects the object upon some scale (e.g. weight, location, color, animacy, and so forth).¹⁶ The function which projects the argument along the appropriate scale is called a measure function and the value of that property along the scale is called a degree. A state ("a snapshot"), then, is a list of the results of measurements of intrinsic properties of the object.

Change of State (COS) in an object exists if the object is in two different states at two different times, i.e. if the measurements along some relevant scale are not the same at two different times. Below is a diagram showing that a ball dropped from height of 4 units to height of 2 units, at three times.

Diagram (2): Change of State in a ball (at three consecutive times).



In what follows I formalize what has been argued now.

2.3.2.2. States and Scales

In order to define states of objects, I use mathematical entities called scales. Following Hay, Kennedy, & Levin (1999), Kennedy & McNally (2005), Levin & Rappaport Hovav 2010, Beavers (2008; 2011; 2013) and Landman (p.c), I adopt here a model of change along a nominal/categorical scale. A scale \mathbb{S} is a triple $\langle S, R_{\mathbb{S}}, \mu_{\mathbb{S}} \rangle$ where:

¹⁶ For the purposes of this chapter, I make no distinction between (scalar) properties of objects and locations of objects; I treat location as scalar property of physical objects (e.g. $\langle x, y \rangle$ coordinates or $\langle \text{radius}, \text{angle} \rangle$ coordinates relative to some arbitrary coordinate system). This decision is profitable since change-of-state and change-of-location pattern in object realizations in nearly identical ways (see also Tenny 1994; Levin & Rappaport Hovav 2010).

- (40) a. S = a set of degrees for having property δ , where δ is some intrinsic property/dimension (e.g. height, length, temperature, position). Intrinsicity is defined as in section 2.3.1.
- b. R_S = an inequality relation between members of S .
- c. μ_S is a measure function. μ_S is a partial function from objects, worlds and times to values in S . $\mu_S : D \times W \times T \rightarrow S$ (D is the domain of objects, W is the domain of worlds, T is the domain of times).

For instance, scale S may be "height-in-inches". In that case, μ_S assigns to objects their height-in-inches. The specific units are unimportant; what is relevant here is that there is a function from objects to values on the scale. We write $\mu_{s,w,t}(d)=s$, where d is an object and $s \in S$, the set of degrees. Also note that measurement is a function. Thus an object d at time t at world w cannot be mapped to more than one value.

When an object changes in an intrinsic property δ (which has a scale S at a given world w), the object receives two different measurements: $\mu_{s,w,t_1}(d) \neq \mu_{s,w,t_2}(d)$. Namely, the object is mapped into two unequal degrees at two different times, $s_1 \neq s_2$. My model slightly deviates from common models by relaxing the relation between the degrees. I leave open here the question whether the scale may be strengthened from a nominal scale to an ordinal scale by turning the inequality relation R_S into an ordering relation $<_S$, since it neither adds to nor detracts from my argument. I do not require measuring out of events (Tenny 1994) or telicity (Hay, Kennedy, & Levin 1999).

In order to define a state of an object, we need to determine what dimensions are relevant for it. Let Δ be a contextual dimension function which assigns to a property P an n -tuple of scales $\Delta_P = \langle S_1, S_2, \dots, S_n \rangle$ that are contextually relevant for the objects that

fall under P. Let us also write Δ_P^i to be the i-th element of Δ_P . For instance, the property *being a ball*, in a given context, would involve the scales of weight, animacy, x-location, y-location, color, etc. Thus $\Delta_{(\text{being a Ball})} = \langle \text{weight, animacy, x-location, y-location, color, ...} \rangle$ in some relevant context; $\Delta_P^1 = \text{weight}$, $\Delta_P^2 = \text{animacy}$, and so on.

Given this, we define a state function:

(41) The state function

If P is a property, Δ_P a contextual dimension function, w a world, t a time, d an object such that d has P in w at t, then the state function is:

$$\text{state}_{\Delta_P, w, t}(d) = \langle \mu_{\Delta_P^1, w, t}(d), \mu_{\Delta_P^2, w, t}(d), \dots, \mu_{\Delta_P^n, w, t}(d) \rangle$$

So, the state function maps an object d (relative to the dimensions in Δ_P) to its state: the tuple that consists of the measure values that the dimensional scales assign to d in w at t. In other words, the state of an object is a point in n-dimensional space of its relevant measurements.

Change of State (COS) in an object exists if the object is in two different states at two different times, i.e. if the measurements along some relevant scale are unequal at two different times. Since the measurements on each relevant scale stand in the inequality relation, the inequality relation extends to states too: two states (relative to the same Δ_P) are unequal if there is at least one scale for which the measurements of the object are unequal (between the two states).

States of an object are based on its intrinsic properties by definition (see (40a), but can any intrinsic property serve as a basis to define object states? The answer is negative; specifically, an inequality relation must hold between states (see 40c).

To understand why a scale (minimally a two-point categorial scale) is necessary for states of objects, reflect on the identification of a certain state of an object. We need, at least, to be able to contrast it with other states of the same object. There would be no sense in speaking about the different states the object may be in, if we cannot take two states at two times during the event and decide whether they are not the same state. In other words, to have a discernible state of an object we must also have the ability to determine whether two states are unequal (i.e., to determine whether two degrees s_1, s_2 , along the relevant dimension, differ). For instance, consider *John worked, John worried* or *John washed*. Imagine a hypothetical state of John in t_1 . As the event of *working, worrying* or *washing* (separately) unfolds, what would John's new states be? It is impossible to answer this question (without strong context) because we do not know if John's state (of *work, worry* or *wash*) in t_2 is different from his state in t_1 . Worse, we do not know even if John's state in a given t_2 is necessarily identical to his state in t_1 .¹⁷ By contrast, in *the window broke, the stone fell* or *the door opened*, the verbs are committed to an inequality relation between states of their subjects (say, defined by number of pieces for *break*, by location along a given vertical axis for *fall*, and by the angle of the door for *open*).

To further establish the distinction, recall that the successive object modification test identifies COS because an object cannot usually be in the same state again once the state has changed. Applying the test to the 2-place, namely causative alternates of *work*,

¹⁷ It is possible to imagine contextual scales. For instance, the degree of *work* at t could be the amount of money paid for it, or the degree of *worry* at t could be the number of people offering you a hug. Hence, an inequality relation between degrees (and hereby, a scale) for *work* or *worry* is imaginable if a sufficiently strong context is supplied (Horn 1972; Gazdar 1979). Crucially, these scales are not lexically assigned at the level of the verb. That is, the meaning of the verb does not provide scalar structure. Nonetheless, it is possible to force a scalar structure compositionally. The relevant question is whether contextual scales pattern with verbal scales with respect to argument realization. I do not have the room to expand on this here, but see section 4.2 for implications for representations.

worry and *wash*, the presence of states of their objects may not be inferred. Consider the contrast between (42) and (43):

- (42) a. *John broke the window (too) right after Mary had done it.¹⁸
b. *John emptied the pool (too) right after Mary had done it.
c. *John killed the woman (too) right after Mary had done it.
- (43) a. John worked Mary hard (too) right after David had done it.
b. John worried Mary (too) right after David had done it.
c. John washed Mary (too) right after David had done it.

We have already taken the ungrammaticality of (42) as evidence that states may be defined for *break*, *empty* and *kill*. By contrast, the grammaticality of (43) shows that the objects of the transitive alternates of *work*, *worry* and *wash* are insensitive to COS detection. That is, either they do not have states, or they denote an unchanged state. I reject here the notion that they denote an unchanged state because it is derived trivially across the board for any agentive predicate: if John performs the activity of X, then John might be said to be in the "state" of X (replace X by *working*, *washing*, *worrying*, *running*, *laughing*, etc): nothing can be learned from such a trivial line of inquiry as it has no predictive power. Instead, if states require scales, the consequent that *work*, *worry* or *wash* do not have states naturally follows. I emphasize that I do not address here the sources of transitive-unergative alternation (see Horvath & Siloni 2011a). Rather, my purpose is to point out that verbs such as *worry*, *run* or *work* are not on a par with verbs such as *break*, *empty* and *kill* with respect to state detection.

¹⁸ A counterexample has been pointed out to me by Fred Landman: *John broke the fence after Mary had done it*. The sentence is felicitous because a fence can be broken in more than one place.

To summarize, I define state of an object d in world w at time t to be a point in n -dimensional space of its relevant measurements: $\text{state}_{\Delta P, w, t}(d) = \langle \mu_{\Delta P1, w, t}(d), \mu_{\Delta P2, w, t}(d), \dots, \mu_{\Delta Pn, w, t}(d) \rangle$.

2.3.2.3 States and recoverability

Having defined states (of objects), let us consider the possible relations between states of objects and the events in which they participate. We can immediately define two disjoint classes of relevant events: (i) events which depend only on states of their objects, and (ii) other events: those which do not depend only on the states of their objects or those which do not depend on them at all. In what follows, my goal is to show that the former class is theoretically expected to show the COS constraint.

Consider the class of events which depend only on the states of their objects. By "depending only on states" I mean the following: it is enough to look only at the states of the object during an event in order to judge whether it occurred. I name this property **recoverability** (of events from states of objects). For instance, *die* is recoverable from the states "alive" and "dead" of the argument:¹⁹ if the person is in state "alive" and then is in state "dead", you know *die* occurred, no matter the exact circumstances: whether the person passed away naturally, was murdered, or died in a freak accident. On the other hand, events such as *strangled* cannot be inferred from looking at the states "alive" or "dead" of the argument; they depend on more than these states (for instance, marks of the

¹⁹ I write the formal states $\langle \dots, \text{animacy: alive}, \dots \rangle$ and $\langle \dots, \text{animacy: not-alive}, \dots \rangle$ as "alive" and "dead" for the sake of brevity. Clearly, states which do not contain the intrinsic property of animacy are not states on which "die" depends (for instance, the state $\langle \text{color: red} \rangle$).

hands of a killer, or a rope, are required).²⁰ In the same vein, *move* events can be inferred from locations of the argument alone, but *run*, *walk*, or *crawl* cannot (see result/manner complementarity in Rappaport Hovav & Levin 2010). Recoverability is defined as follows:

(44) Event Recoverability

An event *e* is recoverable from the states in (t_1, t_n) if the ordered list of states in (t_1, t_n) is sufficient to decide whether *e* occurred or did not occur.

It is easy to see that if event *e* is recoverable, it depends only on the states specified in the state function. If the truth conditions of *e* had depended on information orthogonal to these states, it would have been impossible to decide, based on them, whether *e* occurred or not. The ordering of the states is relevant since they are function of time (e.g. ordered). Henceforth, I will use the terms "depending only on states" and "recoverable" interchangeably.

2.3.3 Causation as a counterfactual dependence

The last milestone before addressing the source of the COS constraint in the alternation is the definition of causation itself. I shall use the traditional model of causation as a counterfactual dependence between two events (Lewis 1973):²¹

²⁰ The claim that *strangle* cannot be recovered from any choice of states (of objects) is not made here. Indeed, I do believe that the claim is true, but it merits a discussion beyond the scope of this chapter (as a preliminary step, note that the marks of a rope or of a killer are not intrinsic properties of the deceased and cannot be used to define its state). However, I do make here the claim that *strangle* cannot be recovered from the states "alive" and "dead", from which *die* is recoverable.

²¹ It is known that a counterfactual model of causation does not work in the general case, due to problems of late/trumping preemption or double prevention (see Collins, Hall, & Paul 2004). Nonetheless, scenarios in which those problems arise require contextual information whose representation is uncalled for in the domain of argument realization. To see why it is so, consider a late preemption scenario (taken from Collins, Hall, & Paul 2004): Billy and Suzy both throw rocks at a bottle. Suzy's rock gets there first, hitting the bottle and breaking it. Billy's rock flies through the now empty space where the bottle was standing.

(45) **Causation:** e_1 causes e_2 when both counterfactual conditions hold in the set of worlds participating in the cause relation: (Lewis 73)

a. For every world, if e_1 occurs, then e_2 occurs: $e_1 \Box \rightarrow e_2$.²²

b. For every world, if e_1 had not occurred, e_2 would not have occurred either:

$\neg e_1 \Box \rightarrow \neg e_2$.

With respect to (transitive) causatives, I assume neo-Davidsonian event semantics: I take e_2 to be the caused event associated with the object of the transitive and e_1 to be the causing event associated with its subject (Dowty 1979; Levin & Rappaport-Hovav 1995; Parsons 1990; Piñón 2001; Chierchia 2004). It is important to mention at this point that whether e_1 or e_2 are grammatically realized is a question orthogonal to the model. In *John broke the window*, e_1 may conveniently be taken as the subpart of John in *break*; e_2 may be taken as the window's subpart. e_1 and e_2 are entities in a semantic representation of the event and do not necessarily (though possibly) reflect equivalent detectable syntactic counterparts. Moreover, if the semantic representation is a part of lexical information about the event, there is no reason to assume strong compositionality (or even compositionality), because syntactic structure has not yet emerged. The question of which lexical information is mapped or realized in syntax concerns mapping systems, which are an independent topic in their own right.

The problem here is that the breaking of the bottle fails to counterfactually depend on either of the two throwing events. However, for this scenario to pose a problem for a counterfactual analysis of *break* in the domain of argument realization, the relevant representation would include, upon emergence of syntactic structure, not only the cause for the breaking event, but also the potential alternative cause and the order of competition between the two. Worse, the example above extends to include countably many potential breakers (all throwing rocks at the same time) who must be represented in the correct order of their competition. Undoubtedly one could construct these elaborate contexts, but to assume that such lists of fail-safe causes are represented at the level of the verb is unwarranted. Such an assumption further predicts there are sentences such as **Suzy [conj] Billy broke the bottle* that describe the scenario above, contrary to facts.

²² $e_1 \Box \rightarrow e_2$ is a counterfactual statement and means: "if e_1 were true, e_2 would be true". It is written in such a form in order to distinguish it from other kinds of conditional statements.

2.3.4 Accounting for the COS constraint

2.3.4.1 Lack of causative alternates

Let us remind ourselves that I seek to prove the following claim ((39) repeated):

(46) Lemma: Interaction of recoverable events and causation:

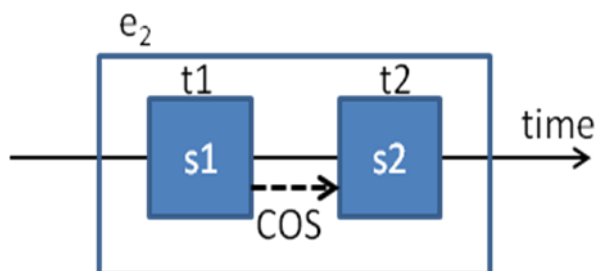
if an event (of an intransitive verb) depends only on the states of its argument, d ,
then causation of that event entails COS of d .

In other words, a causative alternate of a recoverable event must denote COS. In what follows I present a formal derivation of the logic involved, accompanied by graphical representations and some examples.

Consider an event e_2 , which depends only on the states of its argument, d . I set out to show that in each possible case of the states of e_2 , if there exists e_1 such that e_1 causes e_2 , then COS of d is entailed.

If d has more than one state during e_2 , trivially e_2 entails COS of d . Consequently, causation of e_2 also entails COS of d . For instance, if a soup cools, causing it to cool also entails a change in its temperature. This is shown in the diagram below (s_1, s_2 are states of d):

Diagram (3): e_2 is recoverable from more than one state of the argument

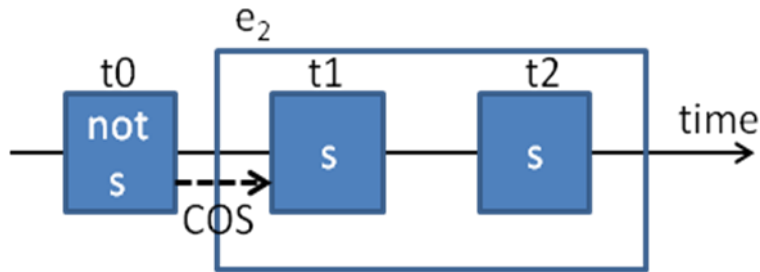


Alternatively, the state of d is unchanged during e_2 : d has the same state, s , for all times of e_2 . We know that e_2 depends **only** on s : if the argument d has the state s , then e_2

occurs; if d does not have the state s , then e_2 does not occur (e_2 occurs at t if and only if d has the state s at t).

Let us examine the state of d at the earliest moment, t_0 , prior to the caused event, e_2 . There are two options for the state of d in t_0 : (i) d has a state other than s , or (ii) d has the state s . The former option directly means that causation of e_2 entails COS of d (since e_2 occurs and d has the state s after t_0). For instance, if a John is alive at t_0 , then causing him to be dead (e_2) entails a change in his animacy. This is shown in the diagram below.

Diagram (4): e_2 is recoverable from one state of the argument (s);



Note that the diagram (4) above, unlike diagram (3), shows that COS does not occur between two time points both in e_2 . The event e_2 may also be punctual, having a single time point in which d has the state s ($t_1=t_2$). The diagram demonstrates that causing e_2 entails COS of d even if e_2 itself does not.

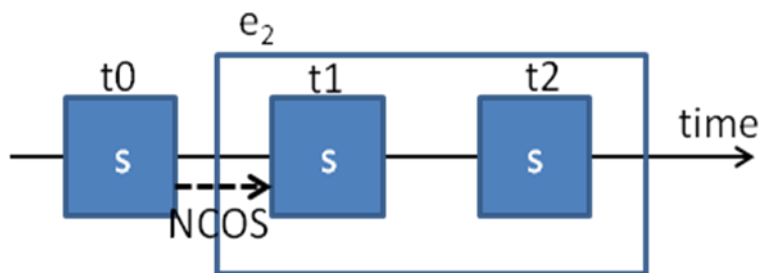
Now, we turn to examine the second option: (ii) d has the state s in t_0 . Crucially, e_2 occurs at t_0 , but is not caused by e_1 at **that** time, because t_0 was defined to be the earliest moment prior to the caused event. We ask ourselves: for all causally related worlds in which the state is s at t_0 , what could have been the state afterwards if e_1 had not occurred?

If the state would have remained s in every world, a contradiction to the definition of causation arises because the caused event occurs in absence of the causing

event.²³ For example, John cannot be said to cause the door to be open if the door was already open and would still be open without John's actions; John cannot be said to cause Mary to die if she was previously dead, etc. In other words, the scenario of a constant state of the argument before and during the caused event (across worlds) is impossible.

It follows that the state of *d* after t_0 must be different than *s* in some counterfactual world. COS in that world equals to a prevention, or a negation, of COS (henceforth NCOS) in the actual world. NCOS verbs and COS verbs are symmetric from a causation perspective (replace events with their negation).²⁴ That said, NCOS verbs constitute a far smaller set than COS verbs and their causatives alternates are uncommon. For example, if John is in the room, then causing him to remain there means that he would have changed his location:

Diagram (5): e_2 is recoverable from one state of the argument (*s*); the state at t_0 is *s*.



The diagrams (3)-(5) above list all the three of causing a recoverable event. In each case, causation entails COS (in the last and rarest case, the change is in a causally related world). The crux of the derivation is: one cannot cause an object to occupy a state it

²³ I assume non-reduced causality: events are not necessary. It is not necessary that e_2 happens after t_0 . For instance, if a vase broke, it is not necessary that it had to break in all causally related worlds.

²⁴ For instance, if John stabs Mary with a knife, causing her death, then in another causally related world, John prevents Mary's death by not stabbing her with a knife (Mary continues to live). However, the negation of an event is usually not lexicalized as an event. This is why NCOS verbs are scarce (e.g. the existence of *break*, *open* and *melt*, vs. the absence of *not-break*, *not-open* and *not-melt*).

occupies anyway. Thus, even if a recoverable event lacks, of itself, a COS interpretation, causation of that event entails COS nonetheless.

2.3.4.2 Lack of intransitive alternates

Before I advance to the fully-fledged COS constraint immediately below (section 2.3.4.3), let us examine whether causatives without intransitive alternates pose a problem for my account. Can there be a corresponding intransitive for a causative whose direct object has a single unchanged state, such that the intransitive alternate depends only on that state? The answer is negative: the existence of such intransitive would violate lemma (46). To demonstrate it, consider, as a mental exercise, the contrast in meaning between *break* and a hypothetical verb *HIT*. Suppose *HIT* is taken to refer to the same scale as *break*, but minimally differs from it in the number of states the object occupies. *The window HIT* means that the window is in one piece during the event. *John HIT the window* would mean that John caused the window to be in one piece. This is a contradiction because the window is in one piece even if John would not have done anything (barring contextual information, not at the level of argument realization, see footnote 21). This is not to say that there cannot be an event such as *HIT* (something like "be intact"). Rather, if a causative alternate exists, it must have a COS interpretation.

What does the actual verb *hit* mean then? Does the fact that it does not have an intransitive alternate show us that it is not a causative verb? Lemma (46) places a constraint on causatives of recoverable events, but does not constrain causatives across the board: there is no guarantee that there is a corresponding recoverable event for the object of *hit*. Recall that for an event *e* to be causative, we require events e_1 and e_2 such

that e_1 causes e_2 . Unlike COS verbs, the caused event in *hit*, e_2 , is not an intransitive event but e itself: the hitting of the window by the external argument. In other words, *hit* is a relational verb: one cannot imagine the window being hit without the hitter.²⁵ This is perfectly expected because I have just shown above that *hit* cannot alternate with an intransitive verb which depends only on states of its object.

Consider this point in more depth. What does it mean that there is no such intransitive? Since states are generated by a certain choice of relevant intrinsic (scalar) properties, it means that one cannot find any intrinsic property of the object of *hit* such that the event of hitting depends on that intrinsic property (e.g. color, location, temperature, width, opacity...). To give a few more examples, return to the relational verbs presented in section 2.2.1.1 (e.g. *attack*, *cross*, *surround*...). It is perfectly possible to define states of their objects as we please, but crucially, for any choice of states, the event does not depend on them:

- (48) a. The armies / the water / the walls surrounded the city.
b. John / the river / the airplane crossed the desert.
c. The army / heat wave / the crisis attacked Japan.

In other words, since the verb does not project the direct object on a scale, the events of surrounding, crossing or attacking cannot be recovered from the state of the city, desert, or Japan in (48) above. Hence, the result that these causatives do not have corresponding (recoverable) intransitive alternates is fully expected.

²⁵ Identifying the caused sub-event, e_2 with the complex causative event is consistent (because the causative verb, e , is not the causing sub-event, e_1 , nor does e cause e_2 (i.e. itself).

2.3.4.3 A wider view and a proposal for mapping

In light of the above, analyzing unaccusatives as denoting events which depend only on the states of their argument gives us the consequent that the corresponding transitive must have COS interpretation in their objects (assuming the transitive alternates to be causatives of unaccusatives).

However, the possibility of a stative unaccusative, and a corresponding transitive that productively adds a COS component to its direct object is theoretically viable. Yet, the data does not manifest it. In order to arrive from the lemma obtained above to the COS constraint a single assumption must be added to my account: the entailments of the internal argument are invariant under the alternation.

If the transitive productively adds a new COS interpretation to the internal argument, then the argument undergoes a certain sequence of states in the transitive and a different one in the unaccusative: the entailments involving the same argument are quite different. I therefore assume that the alternation keeps the entailments of the internal argument intact. Why it should be a property of a verbal alternation is a question which I will not explore here (it follows from neo-Davidsonian semantics, but also from decausativization approaches). I do not have, at present, a theoretical motivation for it, but the same result surfaces in most argument realization theories and educates us about the nature of verbal alternations.

Now, if the transitive entails COS in its direct object (lemma (46)), the unaccusative also entails COS in its subject (entailments are preserved). The option, that the unaccusative does not entail COS but the transitive does, is thus ruled out (unless the unaccusative has both COS and non-COS interpretations). Formally:

(49) **The COS constraint**

No COS → No transitive-unaccusative alternation.

Identifying unaccusatives with the class of verbs which depend only on the states of their argument explains not only the COS property of the transitive-unaccusative alternation, but also why existence verbs, measure verbs and spatial configuration verbs are mapped internally: these non-alternating unaccusatives describe an unchanged state of their object (i.e. the measure function is constant). Knowing the relevant state allows us to judge that the corresponding event indeed occurred. For instance, existence verbs (section 2.1.2.1) map their argument into the state where the relevant measurement is specified in spatio-temporal coordinates of their subject (often expressed in a PP). Measure verbs (section 2.1.2.2) map their argument into the state where the relevant measurement is specified in the measure phrase. Spatial configuration verbs, in their simple location sense (section 2.1.2.3), map their argument into the state where the relevant measurement is specified in the locative PP. *Fill*-verbs (section 2.1.3) map their internal argument into the state(s) where the relevant measurement(s) are specified by the degree to which the argument is filled, etc. These verbs denote states of their arguments because we have inequality relations between different spatio-temporal locations, between different weights, between different degrees of fullness, and so forth.

Hence, the hypothesis that the property of being recoverable from states (scalar measurements) of the subject is a defining property of unaccusativity has merits, which is the topic of chapter 3.

2.4 Summary

2.4.1 Revisiting the main points

Fillmore (1970) showed that surface contact verbs such as *hit* do not show the transitive-unaccusative alternation. This chapter showed that the class of non-alternating verbs is not limited to surface contact verbs, but extends to other classes which bear no semantic resemblance to contact verbs or to each other. I offered some (typological) classification in the empirical part (section 2.1): *cross* verbs, *attack* verbs, *surround* verbs, *guarantee* verbs, *description* verbs, *fill* verbs, and many others (see (21) for a complete list).

Intuitively, they all share the meaning of an object which does not change its state; this intuition may be probed by my COS detection tests presented in section 2.2.2. Moreover, it was shown that those transitives exemplify but one side of the coin. The other side consisted of unaccusatives which do not show transitive alternates: *existence* verbs, *measure* verbs, spatial configuration verbs, *bloom* verbs, and so forth: all share the meaning of a subject which does not change its state. In light of the above, there is a generalization to be abstracted from the data:

(51) **The COS constraint**

No COS → No transitive-unaccusative alternation.

Naturally, a question springs to mind: why? What is the linguistic motivation for the constraint? Even if one accepts a shift from surface contact verbs to an abstract class, why would the unaccusative-causative alternation depend on such a pre-condition? Is this constraint arbitrarily fixed and the state of affairs could have been otherwise, and perhaps actually is otherwise in languages unexplored here? My belief is that in order to answer

this question one must carefully examine what is being asserted in the generalization. Namely, one must explicitly define states and of changes of states.

Under my account, the state of an argument in world w at time t is a point in n -dimensional space of its relevant measurements located along a scale generated by intrinsic properties of the argument (where Intrinsicity is defined by Lewis (1986): a property P is intrinsic if a lonely object can have P). A state function maps an object d (relative to contextually relevant dimensions) to its state: the tuple that consists of d and the measure values that the scales assign to d in w at t . State $\Delta_{P, w, t}(d) = \langle \mu_{\Delta P1, w, t}(d), \mu_{\Delta P2, w, t}(d), \dots, \mu_{\Delta Pn, w, t}(d) \rangle$ (see section 2.3.2.2 for a full discussion). Since the measurements on each scale stand in the inequality relation, an inequality relation between states also follows.

In order to account for the constraint, two further definitions have been necessary: of recoverability and of causation. I define recoverability (of events from states of objects) such that, given states of an object in a given period of time, it is possible to decide whether an event depending on these states occurred or did not occur. Recoverability entails that the verb depends only on the states of the argument and on no other information. Lastly, I assume a standard analysis of causation à la Lewis (1973) as a counterfactual dependence between two events.

I have shown in section 2.3.4 how the COS constraint is formally derived from these definitions. In a nutshell, if an event depends only on its states, it cannot be caused to occupy the same states it would occupy anyhow (i.e. if the causing event has not occurred). Therefore, a COS interpretation is obligatory for a causative alternate. For instance, if a person is dead at a certain time, one cannot cause him/her to be dead

afterwards. The above reasoning may almost sound trivial, but the formal derivation of the constraint crucially hinges on the presence of states and on the relation between the verbal event and the states of the object. If no states are present, causation is not restricted in the same way.

2.4.2 Implications on representations

The account is based on semantic grounds alone: it does not necessitate syntactic information. Whether states of objects are grammatically realized (RESULT state, Tenny & Pustejovsky 2000; Embick 2004; Folli & Harley 2005; Ramchand 2008, among others) is irrelevant for the present account.²⁶ I also remain silent on the issue of directionality of derivation. Whether the causative is derived from the unaccusative or vice versa, or whether both are derived from a common stem, is orthogonal to this chapter: the semantic relations between the alternates are enough to predict the set of alternating verbs (the exclusion of agentive verbs from the alternation is an independent fact beyond the scope of this chapter but does not detract from my point).

As to the question whether the alternation is derived in the lexical component or syntactically, I request that the reader hold on for the relevant discussion until chapter 4, in which I show the alternation to be lexical.

My account makes clear that it is perfectly possible to keep causation and alternation theoretically separable, without assuming pre-conditions on the alternation

²⁶ It is possible to postulate that the presence of states is determined by a RESULT state syntactic unit (see extensive discussion in chapter 4). I will not make this additional postulate because my argument minimally stands without making it. Furthermore, quoting Beavers (2011): "*However, such approaches run the risk of circularity if the heads themselves are not also identifiable by independent semantic diagnostics; otherwise they are what Koenig and Davis (2006) call "syntactic diacritics"*". Furthermore, not every COS verb entails a RESULT state (e.g. *widen, cool, roll...*).

and without assuming specific (ad-hoc) syntactic structures for the participating alternates. Rather, given an event which depends only on the states (scalar measurements) of its argument, the semantic presence of causation inevitably leads to the COS constraint.

3 Scalarity and Mapping

3.1 Introduction

In chapter 2, I argued that the COS constraint imposed on alternating unaccusatives can straightforwardly be accounted for if we take unaccusatives to have an underlying scalar structure. Naturally, the next step is to hypothesize that the correlation between unaccusatives and scalar structure is not accidental. If unaccusatives, unlike unergatives, show the COS constraint and this constraint is shown to stem from scalarity, then the hypothesis that scalar structure is relevant to mapping is plausible. The task of this chapter is to explore the following hypothesis:

(1) **Scalarity Mapping Rule:**

An argument projected on a verbal scale is mapped to the direct object position.

The chapter is structured as follows: section 3.2 shows that the interpretational differences between unaccusatives and unergatives correlate with the presence of a scalar structure; section 3.3 addresses two phenomena of variable unaccusativity: Locative Inversion (LI) and Directed Manner-of-Motion Construction(s) (DMMC), terminology borrowed from Son & Svenonius (2008). I investigate whether the mapping results are derived from mapping rule (1). My answer is different for each phenomenon. I argue that whereas unaccusativity of LI derives from scalarity (section 3.3.2), unaccusativity of DMMC derives from a compositional mechanism (section 3.3.3). Section 3.4 summarizes the findings and tackles the question of the locus of the mapping rule. My conclusion is that the rule operates at the lexicon-syntax interface.

Before proceeding, a well-known relevant restriction must be made explicit:

- (2) One scale per event restriction (Tenny 1994; Goldberg 1995; Levin & Rappaport-Hovav 1995; Mittwoch 2013)

An event can express only one scale / one measure.

Such a generalization was suggested, based on examples that demonstrated that when the scales of the verb and a resultative AP clashed, ungrammaticality arises (Levin & Rappaport-Hovav 1995, 2010):

- (3) a. *Willa arrived breathless (verbal scale = location, AP scale = breathlessness).
b. *We dimmed the room empty (verbal scale = light power, AP scale=emptiness)
c. *We froze the people out of the room (verbal scale = solid state, AP scale=location)

The examples above show that an event cannot express a complex scale. For instance, (3c) shows that one rejects an event that expresses progression on both the temperature scale and the x-axis. The restriction does not follow from my theory of scalarity, but is an empirical finding concerning the limitedness of our linguistic expressions; changes along two orthogonal scales cannot be expressed in a single event.

3.2 The Scalarity Mapping rule and the unergative-unaccusative split

3.2.1 Unaccusatives show scalar structure

In this section I examine the domains of unaccusatives and unergatives each in turn, in order to evaluate whether the Scalarity Mapping rule can be applied to the various verbs which those domains comprise. I will show that scalarity is a defining property of unaccusativity.

Below is a partial list of unaccusative sets of verbs, from a scalar viewpoint.

Typologically speaking, there are three principal sets of unaccusatives: (a) change-of-property verbs, (b) change-of-location verbs, and (c) spatio-temporal verbs.

(4) Table 1

Unaccusatives	
a. Change-of-property verbs	
i. two-point property scale <i>break, die...</i>	
ii. bounded property scale <i>“externally caused” open, melt...</i> <i>“internally caused” blossom, decay...</i>	iii. unbounded property scale <i>widen, harden, dim, cool...</i>
b. Change-of-location verbs	
iv. bounded location scale <i>come, arrive, leave...</i>	v. unbounded location scale <i>rise, fall, descend...</i>
c. Spatio-temporal verbs	
vi. verbs of existence / appearance <i>exist, live, appear...</i>	vii. verbs of spatial configuration <i>hang, stand, lie..</i>

Drawing upon Levin & Rappaport-Hovav's (1995) influential work, I show that the Scalarity Mapping rule applies to the above subsets i-vii. To begin with, **subsets i-v**, namely change-of-property and change-of-location verbs, are prototypical unaccusatives. L&RH argue that these verbs are unaccusatives due to the following rule (they propose a different rule for spatio-temporal verbs, which I consider later):

(5) Directed Change Linking Rule (1995:146)

The argument of a verb that corresponds to the entity undergoing the directed change described by that verb is its direct internal argument.

The directed change rule captures a parallel between verbs of change-of-property (*break, open...*) and what has been termed verbs of inherently directed motion (*fall, come...*).

However, this suffers from a certain degree of unfalsifiability as it is formally unclear what “directed change” means. For instance, the subject of the sentence *John consumed*

the entire bottle of milk may be considered as undergoing a directed change which is expressed by the (increasing) amount of milk he consumed. Falsifiable conditions as to what constitutes directed change were not supplied at that time. Indeed, Rappaport Hovav & Levin were not oblivious to this drawback: their theory of manner/result complementarity (2010) accords these subsets a scalar analysis.

By replacing a loosely-defined notion of directed change with a theory of scalarity, a formal description of the involved kind of change is achieved: the argument has a measurable degree – either a value of a property or a spatial location – which changes during the course of the event. I suggest, then, that the directed change linking rule can safely be subsumed under the Scalarity Mapping Rule for subsets i-v. A few examples are provided below to demonstrate the scalarity encoded by these verbs (for more examples, see L&RH 2010):

(6) Table 2²⁷

Sentence	Scale / dimension	Measurable degree 1	Measurable degree 2
<i>The vase broke</i>	number of pieces	1	n, such that n > 1
<i>John died</i>	Animacy	Alive	Dead
<i>The door opened</i>	Orientation of door wrt to axis	0 degrees	n, such that n > 45 degrees
<i>The plants decayed</i>	Greenness	100%	0%
<i>The lights dimmed</i>	Power	60 watts	20 watts
<i>John arrived</i>	location <x,y>	<x ₁ ,y ₁ >, not deictic center	<x ₂ ,y ₂ >, the deictic center
<i>The ball fell</i>	Location <y>	<y>, such that y > 0	0 (ground level)

Beyond the theoretical feasibility, there is also some empirical evidence supporting a scalar analysis. Recall that in chapter 2, I used the successive object modification test as a

²⁷ The scales, degrees and units in the examples serve to demonstrate that there is an obligatory scalar change involved, not that we encode the change with these specific scales and units.

diagnostic of scalarity. Briefly, an ungrammatical result indicates that the object is no longer in its original state. Some examples are reiterated here (for a detailed discussion, see chapter 2 section 2.2.1):

- (7) a. *John broke the window (too) right after Mary had done it / right after it had been broken.
b. *John emptied the pool (too) right after Mary had done it.
c. *John opened the door (too) right after Mary had done it.
d. *John melted the ice (too) right after Mary had done it.

Another piece of evidence for the scalarity of unaccusatives comes from the observation that scalar change verbs appear with a restricted set of predicative XPs: the XPs must specify a degree on the same scale lexicalized by the verb. This is so because, according to the one-scale-per-event constraint (see (2)), the verb cannot express two scales simultaneously (R&L 2010):

- (8) a. We froze the ice cream solid.
b. The biologist dimmed the room to the level of starlight.
c. We arrived at the airport.
d. The leaves fell to the ground.
- (9) a. *We dimmed the room empty.
b. *We froze the people out of the room.
c. *We broke the vases worthless.
d. *The vase fell broken.

Therefore, examples (8) and (9) are taken as evidence that such verbs lexicalize a specific scale.

With respect to the last subsets (vi-vii), L&RH argue that subjects of spatio-temporal verbs (e.g. verbs of existence and appearance, verbs of spatial configuration), merge internally due to the following rule:

(10) Existence Linking Rule (1995:152)

The argument of a verb whose existence is asserted is its direct internal argument. I believe that there is no need to posit an independent rule for these verbs, as the asserted properties – time and location – are scalar. Since I have already established a scalar approach for change-of-location verbs, there is no reason to assume that the same scalar structure disappears when there is no change of location: the measurement function is identical. The existence of the scale does not depend on whether the subject receives single or multiple degrees upon it.

There are two sets of unaccusative verbs which I will not discuss here: (i) manner of motion verbs (e.g. roll, move, bounce...) which are not scalar, and (ii) two-place unaccusatives (e.g. appeal). The mapping of their subjects internally by a different rule does not detract from my point that scalarity is a property that characterizes unaccusatives exclusively.

3.2.2 Unergatives do not show scalar structure

So far, we have seen that unaccusatives are compatible with a scalar interpretation. My claim (in line with RH&L 2010) is that unergatives lack scalar structure.

Typologically speaking, there are three major sets of unergative verbs: (i) agentive verbs, (ii) experiencer verbs, and (iii) emission verbs, as seen below:

(11)

Table 3

Unergatives	
a. agentive verbs	
i. human activities	<i>work, laugh, sing...</i>
ii. manner-of-motion verbs	<i>run, walk, swim...</i>
b. experiencer verbs	
iii. object-experiencers	<i>worry, amuse ...</i>
c. emission verbs	
iv. light	<i>beam, flash, shine ...</i>
v. sound	<i>ring, roar, whistle...</i>
vi. smell	<i>reek, smell, stink...</i>
vii. substance	<i>bleed, gush, radiate...</i>

To understand why none of these verbs contains scalar structure, recall that in chapter 2, I argued one of the defining properties of states to be their comparability. From this follows that the question whether an object that has the same state at two times is **decidable**. As a constructive example, consider whether one can decide whether the subjects in the following examples have or do not have the same state at two different times (I discuss the class of manner-of-motion verbs separately below):

- (12) a. John worked on his thesis for a week. (subject = agent)
b. Sara sang to her children.
c. Eve worried about her health. (subject = experiencer)
d. The bells rang on and on. (subject = emitter)
e. The stream roared.
f. The sun shone brightly.

The answer is a resounding no. There is no felicitous way to speak about the state of the subject of unergatives. A possible but wrong claim is to suggest that the subject is in the same state throughout the event (e.g. the state of *working*, *worrying*, *shining...*). Such analysis is semantically vacuous: if the subject engages in V, it is but a restatement to

argue that it is “the state of doing V”. Therefore such claim holds across the board (so indeed it is true of unaccusatives as well, e.g. if *the ball fell*, it was in the state of falling).

Another reinforcement of a nonscalar analysis of unergatives comes from the successive object modification test. As I have discussed (see chapter 2, examples (42)-(43)), grammaticality suggests that the verbs are not scalar. Applying the test to the 2-place, namely causative alternates of *work*, *worry*, *ring*, *wash* and *gallop*, the presence of states of their objects is undetectable:

- (13) a. Sue worked Mary hard (too) right after David had done it.
b. John worried Mary (too) right after David had done it.
c. John rang the bells (too) right after David had done it.
d. John washed Mary (too) right after David had done it.
e. John galloped the horse (too) right after David had done it.²⁸

Let us investigate an example in more detail. *John worried Mary* does not mean that Mary had, or had not, worried previously (say, about the weather). The comparison of *Mary was worried for a long time, and now John worries her too* with *#the door was opened for a long time and now John opens it too* shows us that John does not necessarily change the intrinsic mental properties of Mary. The unergative *Mary worried*, unlike the unaccusative *the door opened*, does not imply a change either. This is expected because *worry* is not scalar, hence no state is derivable. It emerges that experiencers evince neither the COS constraint nor scalar structure.

²⁸ One may propose that the verbs in examples (13) have an atelic change-of-state scale. This is incorrect, because it entails that objects in (13) are in a more “worked”, more “worried”, or more “rung” states after the first event, contrary to conventional interpretation. Furthermore, an implication of a more “worked” secretary is defeasible and thus not a part of the truth conditions. For instance, (13a) may describe a scenario in which Mary works equally as hard for her bosses. This scenario contradicts atelic change.

Manner-of-motion verbs show a more complex behavior. To begin with, they do not show a scalar structure when followed by locational PPs. The lack of scalarity is supported by the observation that the question whether the subject has the same state during the course of the event is undecidable:

- (14) a. John swam in the pool yesterday.
b. David wandered aimlessly in the rooms.
c. Sara ran (three kilometers) in the park every day.

However, a quite different picture emerges when the verbs are modified with directional PPs. It seems that in such a case, a scalar structure is present:

- (15) a. John ran to the store.
b. The soldiers marched to their tents.

In the cases above, there is a measurable property which serves as a basis to compare states: the subjects are in different distances with respect to the goal (e.g. *the store* or *the tents*). The fact that scalar structure is induced is also shown by the successive object modification test. Since the state (e.g. the location) has changed, re-application of the event leads to contradiction:

- (16) *The general marched the soldiers to their tents (too) right after the sergeant had done it.

It seems, then, that motion verbs with directional PPs show scalar structure. Naturally, a question arises: if a scale is present given the directional PP, is there any relation to the verb's unaccusativity? From a generalized viewpoint, the question is: are phenomena of variable unaccusativity tied with variable scalarity?

3.3 Variable Unaccusativity

3.3.1 Can unaccusativity be variable?

I have shown in the previous section that scalarity is strictly a property of what I shall call absolute unaccusatives. By saying absolute, I refer to verbs which are argued to be unaccusatives regardless of the syntactic environment.

Beyond these unaccusatives, there are cases in which the syntactic environment is said to play a role in the merging results of the subject. In this context, I examine two constructions which I argue to have scalar structure: (i) Locative Inversion (henceforth LI) and (ii) Directed Manner-of-Motion Construction(s) (henceforth DMMC). The investigation of each phenomenon proceeds in an identical manner:

- (17) Examination of the Scalarity Mapping rule:
- (i) Evaluate whether the construction is unaccusative.
 - (ii) Evaluate whether the construction is scalar.
 - (iii) If the construction is scalar, can the Scalarity Mapping rule be a feasible hypothesis to explain that it is unaccusative?

I show below that both LI and DMMC are unaccusatives and scalar. However, the reader can easily verify that the argumentation above cannot guarantee that the Scalarity Mapping rule is responsible for the merging results: it only increases the probability of the hypothesis being the correct explanation. I argue that the unaccusativity of LI, but not of DMMC, is derived from the Scalarity Mapping rule.

3.3.2 Locative Inversion

3.3.2.1 Distributional patterns

The claim that LI is an unaccusativity diagnostic seems, *prima facie*, to be supported by two distributional patterns. First, passives, verbs of existence and appearance, verbs of directed motion, and verbs of spatial configuration all license LI (see (18)). Second, unergatives and transitives seem to resist LI (see (19), examples from L&RH 1995):

- (18) a. From the dining room now could be heard the sounds of Hoovering.
b. Over his shoulder appeared the head of Jenny's mother.
c. Out of the house came a tiny old lady and three or four enormous people.
d. Above the bed hang two faded prints of men playing polo.
- (19) a. *At the supermarket of Main St. shop local residents.
b. *On the corner smoked a woman.
c. *On the house roof mounted a copper lightning rod an electrician.

However, further evidence shows a more complex picture, as there are two equally opposing patterns of distribution: unaccusative change-of-state verbs, as well as some passives, resist LI (see (20)). Worse: unergatives, under certain restrictions, productively show LI: (see (21)):

- (20) a. *On the streets of Chicago melted a lot of snow.
b. *In the kitchen were chopped pounds and pounds of mushrooms.
- (21) a. Inside swam fish from an iridescent spectrum of colors.
b. On the folds of his spotless white clothing glittered an enormous jewel.

That not all unaccusatives show LI is not necessarily problematic since their exclusion can be maintained on the basis of their incompatibility with an existential analysis of LI

constructions (a direction adopted by Bolinger 1977, Penhallurick 1984 and Mendikoetxea 2006). A far more serious challenge to such an approach is the fact that unergatives show LI. This kind of evidence has led L&RH to abandon LI as an unaccusativity diagnostic and propose a “pure” discourse-based account. I present their account and argue that it faces crucial syntactic and contextual problems (section 3.3.2.2). I then go on to defend a scalarity-based unaccusative analysis which eliminates the problems (section 3.3.2.3). I also review possible objections to my analysis (section 3.3.2.4).

3.3.2.2 The discourse function of LI, and L&RH’s account

3.3.2.2.1 Presentational focus

The observed correlation between verbs appearing in LI constructions and verbs of existence and appearance has been linked by various researchers to the discourse function of the construction (Bolinger 1977; Penhallurick 1984; Coopmans 1989; Hoekstra & Mulder 1990; Bresnan 1994; Levin & Rappaport-Hovav 1995; Mendikoetxea 2006, among others). As a departure point, Bresnan (1994) suggests that the relevant discourse function is “presentational focus”, whose purpose is to introduce the referent of the postverbal NP on the scene. Based on this definition, she argues that “in the core cases, a scene is naturally expressed as a location, and the referent as something of which location is predicated”. In other words, the discourse function foregrounds the information that the postverbal NP exists in that location. I argue below that in scalarity terms, the verb selects a spatial scale on which the NP is projected. In the absence of the presentational

function (i.e. in canonical SV orders), the NP is not projected on the verbal scale (detailed discussion follows in section 3.3.2.3).

However, Birner (1994) argues that “presentational focus” has a broader sense: the postverbal NP need not always be discourse-new. Instead, she proposes that the function of all inversions is to link “relatively unfamiliar information to the proper context via clause-initial placement of information that is relatively familiar in discourse”. Given this analysis, in order for the postverbal NP to contribute newer discourse information than the previous two constituents, two pragmatic restrictions are placed on LI orders (e.g. PP V NP):

(22) Restrictions on LI orders (based on Birner 1994, L&RH 1995):

- a. The postverbal NP must be newer than the preverbal PP.
- b. V is “informationally light”: “the verbs appearing in the construction represent evoked or inferrable information in context and therefore contribute no new information to the discourse” (Birner 1994)

Presumably, (22b) follows from the discourse function of the construction: “if a verb in the LI construction did contribute information that was not predictable from context, it would detract from the newness conveyed by the postverbal NP” (L&RH 1995:230).

According to L&RH, the restriction that the verbs are informationally light means that unergative verbs could appear in LI if the context is appropriately manipulated. This line of thought leads them to suggest that LI is not an unaccusativity diagnostic. Rather, they propose that in LI constructions, subjects of unergatives are still projected externally in Spec,VP position and subsequently right-move to a VP-final position, which L&RH argue to be the focus position, required by the discourse function:

(23) L&RH syntactic analysis of LI:

The subject moves to a VP-final adjoined focus position (extraposition).

I show that their account cannot be maintained and faces two types of critical problems:

(i) if we wish to hold to the notion of information linking in discourse, then a context-based approach such as theirs is expected to show a greater degree of freedom than that actually observed (subsections 3.3.2.2.2-4). (ii) There is solid empirical counterevidence against the extraposition rule (subsections 3.3.2.2.5-6). Later I show that an unaccusative analysis solves all these problems.

3.3.2.2.2 Problem 1: Exclusion of transitives from LI constructions.

Since the subject may be right-adjoined to the VP, there are no syntactic means to exclude transitives from appearing in LI. L&RH then resort to the following explanation:

“typically, in a sentence with transitive verbs new information about the subject is conveyed by the verb and the object together. It is **unlikely** (emphasis mine) that the subject of such a sentence will represent the least familiar information, as the discourse function of the construction requires”. According to such a view, the expectation is that the licensing of transitives should be sensitive to context manipulation. Consider below three different phenomena which show that the expectation is not borne out.

First, LI can serve as an answer to a wh-question about the subject. The felicitousness of LI in such a context is fully derivable from the discourse function since it is used to introduce a discourse-new referent to a previously established context, supplied in the question. For instance (verified by Gila Blits, personal communication):

- (24) a. A: Which animal ran into the house?
 B: Into the house ran a mouse.²⁹
- b. A: What hung on the wall?
 B: On the wall hung a beautiful picture.
- c. A: What was written on the gravestone?
 B: On the gravestone was written an epitaph for a dead poet.

Thus, the expectation is that in these contexts, transitives would be grammatical since the subject is the only thing which is unfamiliar in the discourse; both the verb and the direct object are given. This is not borne out:

- (25) a. A: who put the book on the shelf?
 B: *On the shelf put the book a stranger.
- b. A: who hung the picture on the wall?
 B: *On the wall hung the picture a neighbor.

Hence, the fact that grammaticality of transitives is not sensitive to discourse manipulation casts serious doubts on L&RH's proposal.

A second type of example is observed by Bresnan (1994). She notices that LI is not licensed with cognate objects of unergatives:

- (26) a. Around the fire danced the women.
 b. *Around the fire danced dances the women.

L&RH argue that the ungrammaticality of (26b) is unproblematic. Allegedly the cognate object lessens the “informational lightness” of the verb because it gives rise to an iterative interpretation which is lacking in (26a). I do not find this argument compelling; it renders

²⁹ That the wh-element is a variable that the referent satisfies in the answer is consistent with a familiarity account. The set of referents may be discourse-old (though not necessarily), but the choice of referent is always new. Compare: A: *Where did John walk into?* B: **Into the building walked John.*

the definition of informational lightness impossible to falsify, since for any continuation we can find “heavier” information than the existence of the NP (for instance, *into the room strode Robin boldly*, adds the information that robin acted in a bold manner). Recall that “the verbs appearing in the construction represent evoked or inferrable information in context and therefore contribute no new information to the discourse”. In light of this, it can hardly be said that the addition of *dances* to the verb *dance* represents unpredictable or unferrable information. As Bresnan notes, it is difficult to see why a cognate object should lessen the informational lightness to such a degree as to prohibit LI. I return to the problem of fuzzy informational lightness again below.

A last phenomenon demonstrating the inadequacy of a purely contextual account is a scenario that places the hearers in the deictic center of the locative inversion. Recall L&RH’s argument that “typically, in a sentence with transitive verbs new information about the subject is conveyed by the verb and the object together. It is unlikely that the subject of such a sentence will represent the least familiar information”. However, when the hearers are located in the deictic center of the linguistic event, the verb and the object can actually represent old information. Consider a speech of a tourist guide to his group on a top of a tower:

(27) [the guide gestures, the tourists observe] You can see the beautiful valley below.

This tower was built as a prison but since then long abandoned. *From the top of the tower / from here could see the valley children who came to play.

In the example above, the speaker and the hearers share not only the linguistic referents (objects and predicates) in previous discourse, but also their deictic center (except the

postverbal NP). Nevertheless, the established access of the hearers to the linguistic and actual-world referents does not affect the ungrammaticality of the LI.

In light of the above, a prominent problem for L&RH's analysis is that the exclusion of transitives from LI does not seem to correlate with contextual information in any way.

3.3.2.3.3 Problem 2: Exclusion of predictable changes from LI constructions

A subset of verbs classified as internally caused change-of-state verbs such as *grow* and *bloom*, shows two possible interpretations: stative, and change-of-state. For instance, *grow* can mean either "increase in size" or "live rootedly". Only the latter interpretation is compatible with LI constructions:

- (28) a. In our garden grew a very hardy and pest-resistant variety of corn (live rootedly)
- b. *In Massachusetts grows corn very slowly (COS, L&RH 1995)

L&RH (1995) propose that the COS interpretation is excluded because "by contributing the information that the corn is getting taller and maturing the COS sense of the verb is not informationally light. On the other hand, like other internally caused verbs of change of state, this verb has an existence sense, and it is found in the locative inversion in this sense".

Let us reiterate the definition of informational lightness: "the verbs appearing in the construction represent evoked or inferrable information in context" (Birner 1994). Is the information that corn grows unpredictable or uninferrable, with or without context?

That claim that corn grows is very informationally light indeed. The opposite claim, that corn grows is not informationally light, is weak.

Furthermore, it seems to me that a certain self-contradiction arises in L&RH's account. They suggest, when examining emission verbs in LI environments, following Bolinger (1977), that "the informational lightness requirement can be satisfied if the activity or process that the verb describes is characteristic of the entity the verb is predicated of". Since growing is characteristic of corn, informational lightness should be satisfied.

What L&RH implicitly do is to **equate informational lightness with existence**. If I am correct, the line of thought behind that reasoning is as follows: any information is heavier than asserting existence, so apparently only an existential interpretation can be said to be truly informationally light with respect to any other information we can deduce. Thus, only existential interpretation is licensed in LI. In such a case, there is absolutely no need to define informational lightness in the first place – existence will do.

3.3.2.2.4 Problem 3: Thematic properties of the notional subject

It is known that agent oriented adverbials as well as purpose clauses are ungrammatical in locative inversion. If the subject merges externally (in agentive unergatives that show LI) and then right-moves to a VP-final position, then the demotion of the agentive thematic role is surprising:

- (29) a. In this office works the President's personal secretary *[(in order) to take notes on everything which is discussed] (Kempchinsky 2002).
- b. In this house are sleeping guests *[(in order) to get some rest].

c. Around the fire danced the women *(stubbornly/voluntarily).

The incompatibility of purpose clauses and agent-oriented adverbials with LI thus casts doubts on the validity of analyzing the argument as retaining the external (Agent) role of the verb of the non-LI version of the clause. L&RH 1995 acknowledge the data, claiming that “we attribute the restrictions on such adverbs to their being incompatible with the discourse function of the construction: they typically assert information about the postverbal NP that is incompatible with the relative newness of this NP”. In other words, L&RH say that agentivity is not informationally light. This seems to me a weak argument, since any thematic information can be argued to be “new”. Once more, we are led to the understanding that the notion of informational lightness is fuzzy and unfalsifiable. Under my account, I show later (section 3.3.2.4) that there is a formal requirement for LI constructions, **with testable truth-conditions**, in lieu of informational-lightness.

3.3.2.2.5 Problem 4: Unaccusatives do not have to undergo a right-adjunction rule

Apart from problems on the information-based front, a right-adjunction rule also encounters syntactic problems in the face of evidence. Mendikoetxea (2006) observes that if we assume that it is the presentational function which is responsible for the movement to the VP-final position, the fact that the subjects of unaccusatives may remain in situ is suspicious:

- (30) a. Out of the mud-brick ruins of temples and ziggurats have emerged *over the last century* the traces of cities whose names evoke the rise of human civilization.

b. From one cottage emerged Ian with a spade, rubber boots and an enthusiastic expression.

Tests for VP-constituency show indeed that the PP in (30b) is inside the VP (since the PP cannot be excluded from constituents that substitute the VP):

- (31) a. ??Ian emerged from the cottage with a spade and Phil did so with a rake.
b. ??Ian said that he would emerge from the cottage with a spade and emerge he did with a spade.

L&RH suggest that the extraposition rule required by the discourse function is not necessary because this verb is “trivially compatible” with it since it is a verb of appearance. Even if such a stipulation were true (for unknown reasons), it cannot account for the **optionality** of movement. L&RH go on to argue that “whatever the ultimate explanation for this example might be, ...there are no comparable examples with verbs that are independently known to be unergative” (L&RH 1995:226-7). This statement is incorrect. As I now show, subjects of seemingly-unergative verbs can appear inside the VP, and the optional movement depends on the heaviness of the material.

3.3.2.2.6 Problem 5: The subject of seemingly unergative verbs appears inside VPs

There is compelling evidence against right-adjunction of subjects of verbs that are unergatives in the canonical order. Most of the examples of L&RH’s corpora take heavy-NPs as their subjects, but once we control for heaviness of material, we observe that both unaccusatives and seemingly-unergative verbs exhibit a strict adjacency condition. Using VP-adverbials (in the examples below, manner adverbials) to detect the right edge of the VP, we observe that light NPs in LI constructions cannot be adjoined to the VP:

- (32) a. Into the room strode Robin boldly.
 b. In front of us walked Dana proudly.
 c. Outside the door sat a young man uncomfortably. (Kathol & Levine 1992)
- (33) a. *Into the room strode boldly Robin.
 b. *In front of us walked proudly Dana.
 c. *Outside the door sat uncomfortably a young man. (Kathol & Levine 1992)

Furthermore, in an empirical study, Holler & Hartmann (2012) show that the verb class (unaccusative or unergative) has no influence on the acceptability of LI: inversions with light subjects were acceptable when both unaccusatives and seemingly unergatives precede a VP-adverbial (and hence are inside the VP). For instance:

- (34) Under the stars danced / existed numerous trolls quite cheerfully.

Holler & Hartmann (2012)

Thus, a right-adjunction rule cannot be correct since there is solid evidence that it is not the position occupied by (light) postverbal NPs. By contrast, if we were to treat the verbs in LI uniformly as unaccusatives, an adjacency condition would arise, as well as the possibility of a heavy NP-shift (Culicover & Levine 2001).

Having this in mind, I proceed to advance my account for LI and why it solves the problems for L&RH's account discussed above:

- (i) Transitives cannot be excluded from LI on the basis of context.
- (ii) Predictable changes cannot be excluded from LI on the basis of context.
- (iii) The argument does not show the thematic properties of an agent.
- (iv) Movement to a right-adjointed position in unaccusatives is optional.

- (v) Subjects of unaccusatives and apparent unergatives appear inside the VP in LI.

3.3.2.3 Revisiting Locative Inversion as an unaccusativity diagnostic

First and foremost, it is indisputable that LI orders have a different interpretation than the canonical order. I continue to adhere to the definition of the discourse function involved in LI, with a slight modification:

- (35) The discourse function of LI: presentational focus

LI construction is used to place *a relatively unfamiliar referent of the postverbal NP on the scene*.

Given this definition of the discourse function of LI, there are two components involved in my analysis:

- (36) a. the presentational function introduces a new(er) argument (italics in (35))
b. the argument is measured on a specific time and place (bold in (35))

Discussion of the relevant implications of (36a) will be provided in section 3.3.2.4 below.

First, I would like to show how (36b) accounts for the particular merging position of the argument.

In my analysis, the interpretation of LI has syntactic consequences: (36b) means that LI forces the verb to project its argument on a spatio-temporal scale (e.g. the relevant state is the argument's location). That is, verbs in LI constructions share the same measurement function with verbs of existence and appearance, verbs of spatial configuration and verbs of directed motion (see section 3.2.1).

If this line of reasoning is true, then the subject is expected to fall under the Scalarity Mapping rule, which was argued for independently in section 3.2 ((1), repeated as (37)):

(37) Scalarity Mapping rule:

An argument projected on a verbal scale is mapped to the direct object position.

I show how the problems raised by L&RH's account are resolved by my account.

The first problem, exclusion of transitives from LI, immediately receives a natural explanation under a scalar account. Since an LI construction requires the subject to be in the direct object position (by the Scalarity Mapping rule), the derivation crashes as it is already occupied by the direct object of the transitive (merged there by a separate, independent application of some mapping rule).

The second problem, exclusion of predictable changes, also follows from a scalar viewpoint, given the one scale per event restriction (see (2)). Since an LI order forces the verb to project its argument on a spatio-temporal scale, other property scales that are compatible with the verb (e.g. "increase in size" in *grow*) cannot be expressed simultaneously.

The third problem, "deagentivization" of the subject, follows from the analysis because the argument is not projected externally in any phase of the derivation. Since agent-oriented adverbials and purpose clauses are always compatible with an external argument, there is no expectation that LI will allow them.

The fourth problem, that unaccusatives do not have to move to the VP-final position, is trivial: the requirement of movement to the VP-final position is incorrect.

Rather, the notional subject is projected as a complement to the verb. Like any other direct object, it may optionally move rightwards given that its material is heavy.

Lastly, seemingly unergative verbs in LI constructions are in fact unaccusatives. Because the notional subject is the direct object, it shows a strict adjacency condition as is expected in English. Nothing can intervene between the verb and the direct object unless a heavy NP-shift occurs. Compare (38)-(39):

- (38) a. Mary ate her dinner quickly.
b. *Mary ate quickly her dinner.
c. Mary ate quickly the dinner which John had prepared for her.
- (39) a. Into the room walked Robin carefully.
b. *Into the room walked carefully Robin.
c. Remember Robin? Well, into the room walked carefully... ROBIN!
d. Into the room walked carefully the students in the class who had heard about the social psych experiment that we were about to perpetrate. (Culicover & Levine 2001)

In light of the above, we see that the syntactic behavior points to a uniform unaccusative analysis of LI: transitives are excluded, and seemingly unergative verbs behave exactly as unaccusatives with respect to their VP-internal or extraposed position as a function of heaviness.

Recapitulating, there are no syntactic, thematic, or contextual grounds to believe that the argument of the verb participating in LI is projected externally in any point of the derivation. On the contrary: the battery of tests above provides strong support for the

opposite claim: the argument is internal. Having this in mind, there are still some remaining gaps that must be explained in order to achieve a satisfactory theory of LI.

3.3.2.4 Possible objections to a scalar analysis

3.3.2.4.1. Case and agreement of the postverbal NP

There appear to be three potential objections to the analysis outlined above: (i) case and agreement considerations, (ii) the impossibility of presentational functions in canonical verb orders, and (iii) the limited range of intransitives showing LI. I address each of these potential problems in turn below.

In English LI constructions, the postverbal NP agrees with the verb in ϕ -features and shows apparently nominative case:

- (40) a. In the garden stand/*stands two fountains.
b. Down through the hills and into the forest flows/*flow the little brook. (Levine 1989)

The pattern in which postverbal NPs show a nominative case and agreement is not unique to LI and is found in other unaccusatives. There-insertion with verbs of existence and appearance exhibits the same behavior:

- (41) There appears/*appear a star in the sky.

The question here is whether it is only the argument in SpecIP that can receive the nominative case (and agree in ϕ -features). It turns out that the answer is negative. Recent work in the Minimalist Program has divorced the Extended Projection Principle from abstract nominative Case assignment (Chomsky 1995; Harley 1995; McCloskey 1996; Goldshlag 2005). The satisfaction of the EPP and case assignment is therefore separate:

(i) the process of nominative case checking is performed in-situ via Agree, rather than via movement (widely assumed today, see Chomsky 2000, 2001; Bobaljik & Wurmbrand 2003; Goldshlag 2005) (ii) EPP must be independently satisfied, hence the locative PP raises to the specIP position.³⁰ In light of the above, the case data are not evidence against an unaccusative analysis of LI.

3.3.2.4.2 The incompatibility of presentational functions with canonical SV orders

Given that the presentational function projects the argument internally, why can the argument not raise to the subject position, retaining the presentational reading?

(42) #the women_i danced t_i around the fire (presentational reading)

In order to answer this question, let us repeat the definition of the discourse function of LI (repeated from (36)):

- (43) a. the presentational function introduces a new(er) argument.
b. the argument is projected (measured) on a specific time and place.

It turns out that (43a) has syntactic consequences as well. From a general perspective, the presentational function affects two interfaces: a discourse-syntax interface that determines in which syntactic positions old and new information may appear, and a lexicon-syntax interface that determines which semantic information is relevant for merging. Together, the rules of these two interfaces restrict the set of grammatical syntactic structures of LI constructions.

³⁰ I am agnostic on whether the locative constituent raises to satisfy the EPP or is base-generated in Spec,IP position, since my account of LI does not depend on a movement analysis of the locative. Den Dikken (2006) proposes that the locative is a base-generated topic related to a silent syntactic element.

What will be relevant here regarding the discourse-syntax interface is that in the unmarked case, the subject position is barred from introducing discourse-new information (in information-structure terms, the subject is not a focus position, see Cinque 1990; Costa 1998; Neeleman & Reinhart 1998; Erteschik-Shir 2007).³¹

Given that discourse-new referents cannot appear in subject positions in English, the presentational function is restricted to syntactic environments where the new argument appears post-verbally, and derivations such as (42) are excluded.

3.3.2.4.3 The range of verbs found in LI constructions

The greatest challenge to my account is that it seems that LI should hold uniformly. If LI forces the argument to be projected on the spatio-temporal scale, why is it not allowed by all predicates? That would be a desirable result, yet it is not borne out.

I claim this problem can get resolved by attributing the limited distribution in English to a factor orthogonal to the mapping results of the argument: the topicalization of the preverbal PP. There is clear evidence that the locative constituent occupies a topic position. First, LI is ungrammatical in structures which disallow embedded topicalization, structures such as sentential subjects. Compare (Stowell 1981; Rizzi & Shlonsky 2006):

- (44) a. *That in the chair was sitting my old brother is obvious.
b. *That this book, you should read is obvious.

A second piece of evidence is that the locative constituent behaves on a par with a topic creates an island for a wh-extraction of the internal argument. Compare (Stowell 1981):

³¹ In the marked case, contrastive foci may appear in the subject position.

A: Who danced around the fire, the men or the women?

B: THE WOMEN danced around the fire.

Since a presentational function introduces a (relatively) new discourse referent, the case of the contrastive foci is irrelevant to our discussion.

(45) a. John says that near his house lies a buried treasure.

*What does John say that near his house lies t?

b. Bill says that such books he only reads at home.

*Who does Bill say that such books t only reads at home?

Taking the topichood of the preverbal PP to be established, I argue that its interaction with the presentational function yields the following requirement:

(46) LI requirement

For a topic location y and an argument x of a verb, it is given/presupposed that x is in y .

The derivation of the requirement is as follows:

1) The presentational function projects the argument on the spatio-temporal scale: the argument x of a verb (denoting an event e) is measured in a location y (see 43b), i.e. if e occurs, **argument x is in location y** .³²

2) y is presupposed since it is a topic (topicalization).

3) if e occurs, then x must be in y , because for a different location z , a contradiction arises (x would be in z and not in y although e occurred). So if $\text{location}(x) = y$ (see (1)) and y is presupposed (see (2)), then $\text{location}(x)$ is presupposed. That is, if e occurs, then, that x is in y is presupposed.

4) The sentence asserts that e occurs. Hence, from this and (3) follows:

(47) LI requirement

For a topic y and an argument x , it is given/presupposed that x is in y .

³² For most verbs, there is just one location for the event e . In the case of change-of-location verbs, the argument is projected on the spatio-temporal scale in y_1, y_2, \dots, y_n places at times t_1, t_2, \dots, t_n (e.g. *Down the hill rolled the carriage*). For the sake of clarity I use only a single location in the derivation of the requirement above. The reader can verify that it holds equally for a set of locations.

The reader may notice at this point that the formal requirement above is exactly what Birner (1994) and L&RH (1995) were attempting to with “informational-lightness”. The “lightness” intuition formally means that we already know that the e (and x) are in y.

Unlike presentationals, in canonical SV orders (of non-locative verbs), the verb does not project its argument on a spatial scale. For instance, in the sentence *two women worked on the third floor*, the verb does not measure its argument in the specified location; the locative adjunct merely specifies the arbitrary location of the event. In presentationals, on the other hand, it is asserted (via a measurement function) that the argument is in a specific location of the verbal event. Hence, a subsequent topicalization of the locative constituent in presentationals triggers the presupposition that the argument must have been in that location, but not so for canonical orders.

Let us ask ourselves, under what conditions does the LI requirement hold? As far as I can tell, there are **three kinds** of verbal events that satisfy it.

The first kind: the verb whose argument is x also takes a locative argument y (two roles in the verb’s grid). Trivially, the concept of the verb itself dictates that x is in/not in y. Such is the case for verbs of existence and appearance, verbs of spatial configuration and verbs of directed motion, all of which meet the requirement and freely show LI:

- (48) a. Among the guests was sitting Rose.
b. Over his shoulder appeared the head of Jenny’s mother.
c. Out of the house came an old lady.

The second kind: the verb need not take a locative argument, but a location, y, of an argument x is nevertheless entailed by the semantics of the specific verb. For instance,

perception verbs (e.g. *hear, see...*), verbs of image impression (e.g. *engrave, stamp...*) and verbs of creation (e.g. *build, carve*), entail that their objects are in given locations. Thus, LI is expected for their passives since they meet the requirement (data from L&RH 1995:250, transitives are excluded from LI independently):

(49) From the dining room now could be heard the sounds of Hoovering.

Through the gap could be seen a section of the flower garden beyond.

By contrast, many transitives do not have the entailment that their objects are in a given location, (e.g. *chop, sell, frighten, admire...*), so it is expected that their passivization will not license LI since they do not meet the requirement (data from L&RH 1995:250, but see a reservation below):

(50) *In that museum were admired many impressionist paintings.

*In the kitchen were chopped pounds and pounds of mushrooms.

A similar phenomenon can be demonstrated for intransitives that do not take a locative argument. Observe that the requirement is expected to be sensitive to the likelihood of finding x in y, given the event. The greater the likelihood, the easier the presupposition. Consider (data from L&RH 255-7):

(51) a. Above her flew an eagle.

b. On one hand glittered a 14-carat diamond.

c. In the hall ticked the long-case clock.

d. In this lacy leafage fluttered a number of grey birds.

e. Inside (the tank) swam fish from an iridescent spectrum of colours.

In the examples above, that an eagle is above, a diamond ring on a hand, a long-case clock in a hall, birds in leafage or fish in a tank, are all well within likely presuppositions.

So, although the verb does not take a locative argument, certain subjects are found in characteristic locations for these events, thus fulfilling the requirement for LI.

The third kind: Unlike the previous kinds, there is no obvious relation between *x* and *y* and we are forced to accommodate that relation ourselves. We evaluate whether the statement “when *e* occurs, *e* occurs in *y*” is acceptable. For intransitive events, the LI requirement is satisfied because $\text{location}(e) = \text{location}(x)$. Differently, LI is grammatical when one is willing to accommodate that *y* is a characteristic location of an intransitive *e* (discussion regarding accommodation of passives follows).

A simple way to check if the locative is acceptable as a characteristic location would be to rephrase an LI sentence to: “when NP V, NP do so PP”. For instance:

- (52) a. On the third floor worked two young women called Maryanne and Ava.
When M and A work, they do so on the third floor.
- c. *On the third floor smiled/laughed two young women called M.and A.
??When M and A smile/laugh, they do so on the third floor.

From the example above, it appears that we are prepared to accept that working has a characteristic location, but not so for smiling or laughing. Let us consider a few more examples:

- (53) a. Around the fire danced the women.
When the women dance, they do so on around the fire.
- b. At one end, in crude bunks, slept Jed and Henry.
When Jed and Henry sleep, they do so at one end, in crude bunks.
- c. *In the café talked many artists.
??When the artists talk, they do so in the café.

d. *In government offices complain many disgruntled people.

??When the people complain, they do so in government offices.

e. *On the top floor of the skyscraper broke many windows

??When the windows break, they do so on the top floor of the skyscraper

f. *On the streets of Chicago melted a lot of snow

??When the snow melts, it does so on the streets of Chicago.

The reader can observe that some predicates have no characteristic locations at all. For instance, verbs of change-of-state (e.g. 53e,f) are ungrammatical, precisely because the change that the theme undergoes is orthogonal to its location, and it is difficult to accommodate that the event of change of state has some characteristic location.

Predicates such as *talk* (e.g. 53c-d) seem to me a more gray area. They do not usually denote characteristic locations, but when given strong contextual support and a plausible scene, they can be coerced into such an interpretation (see L&RH 1995:256 for examples with *chatter*, *sing*, and *doze*). As to events of *sleep* and *dance*, they can easily be accommodated to have characteristic locations, as (53a-b) show.

The picture is more complex with passives. Unlike intransitives, the assumption $\text{location}(e) = \text{location}(\text{obj})$ does not hold across the board. In a case where the assumption holds for a specific verb, the LI requirement may be satisfied. Unfortunately for my theory, the evidence suggests otherwise:

(54) *In the kitchen were chopped pounds and pounds of mushrooms.

Although kitchens are characteristic locations for chopping of food, and $\text{location}(\text{chopping}) = \text{location}(\text{food})$, the LI order is ungrammatical, contrary to my expectation. At the moment, I admit I have no explanation for the problem (54) raises.

Since an accommodation process is involved with predicates of the third kind (i.e., that do not entail a relation between *x* and *y*), there is an expectation that the hearer's willingness will vary among predicates and among scenes.

Summarizing my theory of the distribution of LI, the account made here:

- (i) provides a formal and testable derivation of a requirement for LI;
- (ii) shows the distribution of LI predicates to follow from this requirement;
- (iii) obviates the need to resort to unfalsifiable information-lightness, replacing it with the LI requirement.

In greater detail: in LI constructions, topicalization interacts with the presentational function to introduce an additional presupposition in which it is known that the argument is on the scene. Such a presupposition is not expected to hold across the board, but only when the event (i) takes a locative argument, (ii) entails that its argument is in a presupposed location, or (iii) can be accommodated to have a characteristic location. In the last case, it depends on the willingness of the hearer to perceive the event as such. In this regard, there are clear-cut judgments (e.g. *work*, *sleep* and *dance* vs. *melt* and *break*).

There are two matters that I leave for future research. First, the fine-grained interactions between scenes and predicates of the third kind are beyond the scope of this dissertation and may profitably be pursued in future judgment experiments. Second, I also leave open the question “why is the presentational function in English accompanied by topicalization?”. I venture to suggest, preliminarily, that it might be due to the lack of productivity / defectiveness of expletives in English (since EPP must be satisfied).³³ My prediction is that in languages that allow the expression of presentationals without

³³ In fact, English does have a presentational “there” construction that does not require topicalization (Aissen 1975; Culicover & Rochemont 1990; Ward & Birner 1996). It is less productive than LI constructions.

topicalization of the locative PP, they will be found with any intransitive – a prediction which can be tested cross-linguistically. Some corroboration of this prediction may be found in the productivity of impersonal constructions in French/Norwegian (Heriau 1980; Legendre 1990; Bresnan 1994; Cummins 2000; Egebakken 2005; Legendre & Smolensky 2009), which possibly correlates with the productivity of the expletive *il/det*.

3.3.2.5 Comparison with Predicate Inversion approaches, and the locus of LI

So far, we have seen that my analysis performs better than a competing purely discourse-based approach in the face of evidence. I now evaluate it also with respect to a competing unaccusative analysis. Predicate Inversion approaches (Hoekstra & Mulder 1990; Den Dikken 2006; Broekhuis 2008) argue that in LI constructions, the NP and the PP form a small clause, which is itself the internal argument of the verb. Raising of the PP to the subject position yields:

(55) $PP_i [_{VP} V [_{SC} NP t_i]]$

In light of the construction above, H&M propose that the verb should not exert selectional restrictions on the postverbal NP since the latter is not directly selected by it. They also suggest that the appearance of certain unergatives in LI is not due to a lexical meaning shift rule, but rather that such verbs are inherently polysemic, carrying an activity meaning that is associated with an unergative construction and an additional existential meaning that is associated with an unaccusative construction.

This analysis has several drawbacks. First, as L&RH 1995:273 comment, positing two meanings does not help us to define the set which shows LI. That is, the assumption

that it so happens that certain unergatives have two meanings is a form of begging the question.

Second, L&RH also note that H&M's prediction that the verb does not impose selectional restrictions on the postverbal NP is wrong (repeated from (51)):

- (56)
- a. Above her flew an eagle.
 - b. On one hand glittered a 14-carat diamond.
 - c. In the hall ticked the long-case clock.
 - d. In this lacey leafage fluttered a number of grey birds.
 - e. Inside (the tank) swam fish from an iridescent spectrum of colours.

Either the verb selects a very limited range of arguments (e.g. *glitter, tick, flutter*), or it is found only with specific kinds of arguments in LI (e.g. *swim, fly*).

A third problem for predicate inversion analysis is that LI can be found with adjuncts as well as arguments (Salzmann 2013):

- (57)
- a. [Next door, to the east] decays Ablett Village (L&RH 1995:235)
 - b. [Besides it] sparkles the community pool (Chen 2003:56)

Since adjuncts are not a part of a verb's grid, it is difficult to see how they found their way to the subject position, given (55).

Let us see how my analysis addresses these issues. First, I do not posit two meanings for certain verbs. Rather, I argue that trivially, any verb that denotes some actual eventuality is compatible with the spatio-temporal scale. Thus, in addition to whatever scales it has (if any), it can always project the subject on a specific location with the constant spatio-temporal measurement function. The restrictions in English, I argued, arise from a distinct component: the topicalization of the PP. My expectation is

that in languages which do not necessitate topicalization, the projection of the subject in an internal position is unconstrained. That is, it is not the case that a certain set of unergatives are polysemic, contra H&M, but rather, any verb is equipped with the constant spatio-temporal measurement function in a trivial way.

Second, I have already shown the motivation for the selectional restrictions imposed on the postverbal NP. Certain subjects are found in characteristic locations given the event, thus fulfilling the LI requirement.

Lastly, the LI requirement does not require the locative PP to be an argument, only that it is presupposed that the subject is in that location. Hence, adjuncts are not barred from appearing in LI, in accordance with the facts.

In light of the above, my account seems to be better suited to handle the set of problems associated with an SC analysis of LI.

3.3.2.6 Locative inversion: summary

Several claims have been made in this section (section 3.3.2): first, a purely discourse-based account for LI cannot be maintained since the argument of the verb shows clear syntactic behavior of a direct object. I reviewed L&RH's account and showed that there are no contextual, thematic or syntactic grounds to assume a requirement of rightward-movement to a VP-final position. On the contrary, all evidence point to the conclusion that the argument is merged in the direct object position, with the additional possibility of a heavy NP-shift. Thus, at least under particular syntactic circumstances, namely in the presence of a topicalized locative, LI can indeed be considered an unaccusativity

diagnostic (Bresnan & Kanerva 1989; Coopmans 1989; Hoekstra & Mulder 1990; Bresnan 1994; Culicover & Levine 2001; Mendikoetxea 2006, among others).

Second, I argued that the presentational function involved in LI invokes the Scalarity Mapping rule, which merges the argument in the direct object position. This rule is consistent with the empirical evidence, and is independently attested for unaccusatives.

Third, I addressed possible drawbacks of the analysis. The main challenge was to explain why LI's distribution is limited. I propose that apart from the mapping rule of the argument, independent contextual factors are also at work: the discourse-syntax interface and contextual effects of topicalization introduce additional constraints. My account provides, through the integration of distinct semantic and contextual contributions, a coherent and falsifiable theory of LI. I also wish to emphasize that the successful derivation of the distribution of LI from the interaction of topicalization and the Scalarity Mapping Rule, strengthens the hypothesis that such a rule indeed exists in our grammar (taking the topic status of the preverbal PP to be uncontroversial).

Finally, although LI constructions are true unaccusatives, to actually try to use LI as an unaccusativity diagnostic is futile because it cannot educate us about the unaccusativity of the uninverted orders: there is no connection between the mapping rules that are applied to the subject in the canonical and in inverted orders.

3.3.3 Motion Verbs with directional PPs

3.3.3.1 Unaccusativity diagnostics of motion verbs

The second phenomenon cited in discussions of variable unaccusativity regards the behavior of manner-of-motion verbs in the presence of goal PPs (directed manner of motion construction(s): DMMC, terminology borrowed from Son & Svenonius 2008).

My exploration of DMMC is conducted as follows: first, I demonstrate that there is evidence for the unaccusativity of DMMC in Germanic languages, but not in Romance languages or in Hebrew. Second, I show that these constructions also involve scalar predicates. I then go on to evaluate the question whether the Scalarity Mapping Rule is responsible for their unaccusativity. My answer is negative: a syntactic analysis of DMMC predicts unaccusativity without recourse to re-activation of the mapping system.

To begin with, two tests show DMMC to pattern with unaccusatives: (i) auxiliary selection, and (ii) the unaccusative resultative pattern. Two other tests were alleged to also show the unaccusativity of DMMC, but I argue these are untenable: (iii) the presence of transitive alternates, and (iv) LI constructions.

It is well known that in Germanic languages, DMMC trigger an auxiliary shift from HAVE to BE (see (58)-(59)). Given that only unaccusatives select BE (see (60)), it is direct evidence in favor of an unaccusative analysis of DMMC (examples from Randall 2006):

- (58) a. Marie heeft uren in het rond gerend. (Dutch)
Mary HAS run around for hours
- b. Paul & Rita haben in dem Saal getanzt. (German)
Paul & Rita HAVE danced in the room

- (59) a. Marie is in 5 minuten naar huis gerent. (Dutch)
 Mary IS run home in 5 minutes
- b. Paul & Rita sind in den Saal getanzt.³⁴ (German)
 Paul & Rita ARE danced into the room
- (60) a. Ik ben vertrokken (Dutch)
- b. Ich bin weggegangen (German)
 ‘I am left’

What should be mentioned here is that in the unaccusative reading, the PP behavior is obligatorily that of an argument: it cannot be omitted (see (61a)), and it cannot appear outside the VP (see (61b), Hoekstra & Mulder 1990, van Dooren, Hendriks & Matushansky 2013):

- (61) a. dat Jan *(in de sloot) gesprongen is.
 that Jan *(in the ditch) jumped is
- b. *dat Jan gesprongen is in de sloot.
 that Jan jumped is in the ditch

A second piece of evidence concerns the pattern of agentive motion verbs with secondary predication of adjectives (or particles) that denotes locations. In such a case, the verbs do not show the “fake reflexive” pattern that is associated with secondary predication of unergatives (see (62)). Rather, they show an unaccusative pattern ((63)-(64), data from L&RH 1995:186-7, see also Hoekstra 1988):

³⁴ In German, BE is selected for both telic and atelic PPs, whereas Dutch shows only the former case: (Randall 2006)

(a) John heeft urenlang door de zaal rondgedanst (Dutch)
 (b) John ist stundenlang durch den Saal herumgetanzt (German)

John AUX been dancing around the room for hours

I remain mum on the cross-linguistic correlation between aspectual structure and auxiliary (but see Hoekstra & Mulder 1990; Rothstein 2000; Sorace 2000; Randall 2006).

- (62) a. She cried *(herself) hoarse/asleep. Unergative pattern
 b. The officers laughed *(themselves) helpless.
- (63) a. The river froze (*itself) solid. Unaccusative pattern
 b. The bottle broke (*itself) open.
- (64) a. They slowly swam (*themselves) apart. DMMC
 b. You must jump (*yourself) clear of the vehicle.

The examples corroborate the claim that unaccusativity of DMMC is consistent with a general pattern of manner-of-motion verbs with secondary predication (of either locational AP or locational PP).

An alleged third piece of evidence is the presence of transitive alternates for DMMC. Since English unergatives do not generally show transitive alternates, L&RH 1995 have taken it as evidence that DMMC are unaccusatives. Consider for instance (65):

- (65) a. John marched the soldiers to their tents.
 b. John ran the mouse through the maze.
 c. John jumped the horse over the fence.

However, it turns out that the causative alternate is not productive (examples from Narasimhan et al 1996):

- (66) a. *John swam/ran/danced the children apart.
 b. *She jumped/leapt the dog clear of the oncoming vehicle.
 c. *The general trudged/ambled the tired soldiers to their tents.
 d. *We sashayed/swaggered the models along the catwalk.

Furthermore, when such verbs sporadically show transitive alternates, the external argument does not correspond to the canonical, underspecified cause role that characterizes the unaccusative alternation; the transitive is strictly agentive:

- (67) a. John / *the rain / *the hunger marched the soldiers to their tents.
b. John / *the trap / *the hunger ran the mouse through the maze.
c. John / *the stick / *the fright jumped the horse over the fence.

Hence, the occasional transitive alternates of DMMC are not positive evidence for their unaccusativity. This finding, of itself, is not evidence against their unaccusativity either. In chapter 4 I show that their lack of alternation can be reconciled under a view that separates the alternation from the formation of DMMC.

Lastly, although LI is compatible with DMMC, we have come to understand (in section 3.2) that it does not guarantee that the canonical (i.e., non-LI) order is unaccusative as well.

It emerges that auxiliary selection and secondary predication patterns support the unaccusative analysis of DMMC in Germanic languages. However, the picture is more complex than it initially seems: DMMC do not show unaccusative patterns in Romance languages or in Hebrew. Generally speaking, DMMC are possible in Romance only with atelic PP goals (see Aske 1989; Slobin 1997; data is from Acedo-Matellán 2012):

- (68) a. Nadaron hacia la isla durante cinco minutos. (Spanish)
swim.PST.3.PL towards the island during five minutes
'They swam towards the island for five minutes.'
b. *Nadaron a la isla (en cinco minutos).
swim.PST.3.PL to the island in five minutes

‘They swam to the island in five minutes.’

Abstracting away from the question whether the PP in (68a) is an argument (Folli & Harley 2006; Son 2007) or an adjunct (Zubizarreta & Oh 2007), DMMC in Romance generally do not select BE. Consider Italian data:³⁵

(69) a. Maria a camminato \ *è camminata fino a casa. (Zubizarreta & Oh 2007)

Maria has walked \ is walked (to the house)

‘Maria has walked (to the house).’

b. Paola ha nuotato \ *è nuotata a riva. (Sorace 2000)

Paola has swum \ is swum to the shore

‘Paola swum to the shore.’

It should be noted that (69a) cannot be unaccusative, because atelic unaccusatives select BE freely in Italian (Italian, Mateu 2002):

(70) a. La temperatura è salita.

the temperature is risen

b. La palla è rotolata.

the ball is rolled

In light of the above, although DMMC is observed in Romance, it does not behave on a par with Germanic languages with respect to auxiliary selection. The same picture emerges in Hebrew: although Hebrew allows DMMC, there is no evidence that they are unaccusatives. 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,

³⁵ In Italian only a small sub-set of agentive manner-of-motion verbs selects BE with goal PPs, including *correre* ‘run’ and *saltare* ‘jump’ (Sorace 2000; Zubizarreta & Oh 2007; Beavers, Levin & Tham 2010).

possessive dative: a dative constituent can serve as a possessor for the subject only if the subject is an internal argument (Borer & Grodzinsky 1986). Applying internal-argument tests to manner-of-motion verbs yields degraded results (see (72)) in comparison with their unaccusative counterparts (see (71)):

- (71) a. higiu le-bet hasefer kama yeladim. (Untriggered Inversion)
 Arrived to-house the-book several children
 ‘Several children came to school.’
- b. ba’u la-binyan harbe šotrim.
 Come to-the-building many cops
 ‘Many cops came to the building.’
- c. ha-kelev barax le-yonatan ha-xuca / la-xacer. (Possessive Dative)
 the-dog escaped to-yonatan the-outside / to-the-yard
 ‘Yonatan’s dog escaped outside / to the yard.’
- d. ha-xatul nafal le-ruti la-bor.
 the-cat fell to-Ruti to-the-ditch
 ‘Ruti’s cat fell (in)to the ditch.’
- (72) a. ??racu le-bet ha-sefer kama yeladim. (Untriggered Inversion)
 ran to-house the-book several children
- b. ?racu la-binyan harbe šotrim.³⁶
 ran to-the-building many cops
- c. ??ha-kelev rac le-yonatan ha-xuca / la-xacer. (Possessive Dative)
 the-dog ran to-yonatan the-outside / to-the-yard

³⁶ (72b) is acceptable under a presentational, event-reporting interpretation, but not under a directed-motion one. The acceptability of the former interpretation is consistent with an unaccusative analysis of presentationals (see discussion of Locative Inversion, section 3.3.2).

d. ?ha-xatul kafac le-ruti la-bor.

The-cat jumped to-ruti to-the-ditch

In light of the Italian and Hebrew data, it seems that evidence for unaccusativity of DMMC is restricted to Germanic languages. In what follows, I offer an account that correlates the organization of predicates in a language with variable unaccusativity.

3.3.3.2 Scalarity of DMMC

3.3.3.2.1 The interpretation of complex predicates of manner

In a nutshell, I propose that the manner verb is interpreted as an adverbial, or a modifier, of the PP. If this line of reasoning is correct, then the syntactic expectation is that the verb attaches at a v-bar level of a VP (the exact structure is specified in the next section, example (87)). I show the resultant syntax to be unaccusative.

The investigation of DMMC, then, proceeds in two steps:

- (i) Semantics: Explain how DMMCs are interpreted.
- (ii) Syntax: Explain the corresponding syntactic structure.

Semantically, it is easy to see that the goal PP introduces a change-of-location along a spatio-temporal scale. In (73b), but not in (73a), a change-of-location is entailed.

- (73) a. John danced (in the room / slowly / to drive away his fears)
b. John danced out of the room

Thus, if we accept that the manner verb, in itself, does not evince scalar structure (as discussed in section 3.2.2), its modification by a goal PP exhibits characteristic scalar structure on a par with unaccusatives such as *come* or *rise*.

My theory of scalarity must be extended to answer the following question, which I present in both compositional and lexical formulations:

(74) What is the interpretation of DMMC predicates?

(i) Compositional formulation: Let there be a manner (i.e. nonscalar) predicate p_1 and a scalar predicate p_2 . Under what conditions can p_1 and p_2 form a complex predicate? What will be its interpretation?

(ii) Lexical formulation: Let V be a manner verb with the following grid $V(\theta_1)$ and let there be a PP predicate. Under what conditions can there be a second distinct verbal grid $V(\theta_1, \theta_2)$ such that the PP receives θ_2 ? What will be its interpretation?

I elect to propose my solution in terms of the compositional formulation, because I suggest that such a formulation offers a solution for both DMMC and the behavior of unergatives under secondary predication. The assessment of a lexical account will be put off until the end of this section.

A precondition for a compositional account is that the scalar and manner components of an event have independent syntactic realizations. The availability of that option depends on the lexicalization patterns of events in a language. In his influential work, Talmy (1991, 2000) has proposed two major typological groups with respect to the way events of change are realized. There are satellite-framed (or manner) languages which lexicalize the manner of motion in the verb; the path is expressed in a complement ('satellite'). On the other hand, there are verb-framed (or path) languages that lexicalize the path of motion in the verb; the manner, if specified, must be expressed outside the verb. Satellite-framed languages include Germanic, Slavic, and Finno-Ugric. Verb-framed

languages are mostly Semitic, Romance, and Bantu. Compare the expression of the following event in English (a satellite-framed language) and Catalan (a verb-framed language):

- (75) a. The boy danced into the room.
b. *El noi ballà a l'habitació (directional reading, Catalan, Mateu 2002)
the boy danced PREP the room
c. El noi entrà a l'habitació ballant.
the boy entered PREP the room dancing

Today, we understand that the categorization of satellite-framed and verb-framed is too simplistic; DMMC are witnessed in both types. The reason why DMMC are found in verb-framed languages is along the following lines: because the burden of encoding directionality typically falls on the verb (in verb-framed languages), prepositions are often neutral, compatible with both directional and locative interpretations:

- (76) a. Je suis à Paris (French)
I am in Paris
b. Je vais à Paris
I went to Paris

However, once one uses a preposition that entails directionality, the verb may (in that context) unambiguously denote pure manner, yielding a satellite-framed pattern (for discussion see Beavers, Levin & Tham 2010):

- (77) a. La fille a dansé le long de la rivière. (French)
The girl has danced the long of the river
'The river danced along the river.'

b. La fille a dansé vers le garçon.

The girl has danced towards the boy

‘The girl danced towards the boy’.

In light of the above, we understand that although DMMC are witnessed in both types of languages, there is a crucial difference in their lexicalization patterns. In Germanic languages, the expression of manner is productively separated from the expression of path. In Romance languages, the separation isn’t lexicalized for verbal events across the board: it depends on contextual factors and on the choice of an independent preposition.

In what follows, I make several claims:

- (i) The combination of manner and scalar components has a specific interpretation ((78), see below).
- (ii) Given that in satellite-framed languages manner and scalar predicates are lexicalized separately, they stand in some syntactic relation. In verb-framed languages, the manner and scalar predicates are lexicalized in the same syntactic entity (e.g. the verb).
- (iii) I argue that the syntactic relation (in satellite-framed languages) between the manner and scalar predicates reflects their specific interpretation, which yields an unaccusative structure.

Let us therefore address the analysis of the unaccusativity shift by examining the interpretation of a complex manner-scalar predicate in satellite-framed languages:

(78) Interpretation of a complex manner-scalar predicate

- (i) p , the complex predicate, retains the scalar structure of p_2 , the basic scalar predicate.

(ii) The manner predicate p_1 serves as a manner adverbial of p_2 (e.g.

$\text{MANNER}(p_2) = p_1$). p_1 describes whatever is happening when p_2 occurs.

Explanation: (i) since the manner predicate is nonscalar, it cannot interact with the scalar structure of the scalar predicate p_2 in any way. The scalar structures of the complex predicate and of p_2 are therefore identical. (ii) I also suggest that the role of the manner predicate within the complex predicate is to serve as the manner of the basic scalar predicate (i.e. it functions as an adverb). For instance, *John run to the store* means that *running* describes the manner of John's arrival at the store.

There are two important implications for an adverbial analysis of p_1 . First, an **accompaniment** property holds: when the scalar event occurs, it is carried out in a certain manner which is expressed by the manner event. When the scalar event ends, the manner event ends as well, because its function in the complex predicate is to describe the way the scalar event unfolds.³⁷ Differently put, the manner accompanies the scalar change. Note that the manner predicate serves as a modifier of the basic scalar predicate, not of the complex predicate or of the Davidsonian event variable.

A second implication of an adverbial analysis is that the manner predicate is not grasped as a cause of the scalar change, but as its adverb. The distinction between correlation and causation is a profound epistemological question which I cannot possibly hope to resolve here. I appeal to the reader's intuition that in predicates such as *running to the store*, *running* is taken not to be the cause of the locomotion, but its description.

Recall that in Germanic languages, verbs are systematically divorced from their paths.

A few examples are in order. Let us begin with canonical DMMC:

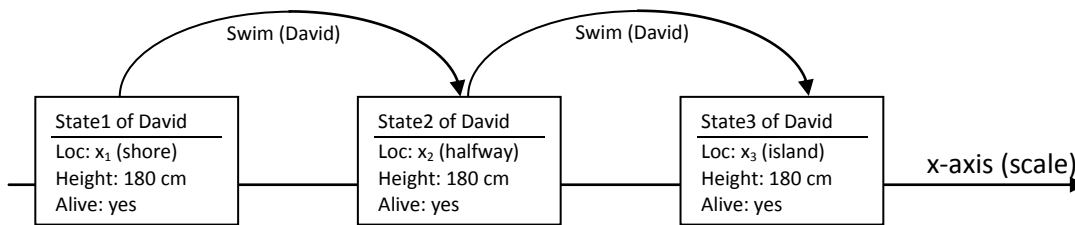
³⁷ Accompaniment closely resembles causal semantics. In both instances, if e_1 occurs, e_2 occurs; if e_1 does not occur, e_2 does not occur either. However, accompaniment must not be confused with causation. The tail accompanies the head but is not caused by it.

- (79) a. David swam to the island.
 b. John danced out of the room.
 c. Mary ran to the store.

Let us go over the interpretation of (79a). There are two semantic components: (i) scalar: David arrives at the island. (ii) manner: David swims. Let us test the accompaniment property: If David goes to the island, he swims. When David arrives at the island, he stops swimming. The interpretation that swimming modifies (accompanies) David's locomotion but does not cause it, is coherent.

(80) Interpretation of (79a)

Diagram 1: *David swam to the island*



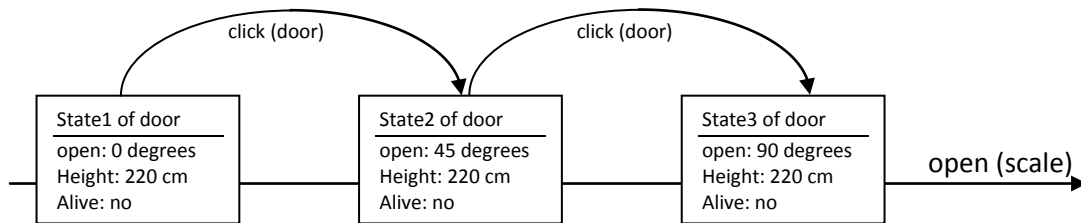
The interpretation rule (78) also accounts for the interpretability of a secondary predication of some emission verbs (which are unergatives):

- (81) a. The refrigerator door clicked open.
 b. The train whistled into the station.

The interpretation of (81) above is that clicking sounds accompany the transition of the door from a closed state to an open state, and that the whistling sounds accompany the transition of the train. If the door or the train were to stop, so would the sounds. Once more, clicking or whistling are not interpreted as the cause of the scalar change.

(82) Diagram 3: Interpretation of (81a)

Diagram 3: *The door clicked open*



The theory also has predictive power as to why agentive manner verbs that do not describe motion are uninterpretable with goal PPs:

(83) *John worked/yelled/laughed out of the room.

The failure here is that the accompaniment property does not hold. Since the activity of volitional unergatives is orthogonal to their motion, the activity cannot be guaranteed to end upon the goal's attainment; the agent may elect to continue the action independently.³⁸ It is illuminating to contrast (83) with:

(84) John went to the store dancing/laughing/yelling.

In (84), the manner adjunct is not expected to show accompaniment (of the locomotion). Since adjuncts do not fall under the relevant interpretation rule, (78), there is no entailment that the activity terminates. The manner modifies the Davidsonian event variable in a standard way.

The above reasoning extends to account for the uninterpretability of volitional agents with property APs as well as goal PPs. Consider:

(85) *John worked tired (intended meaning: John became tired as a result of working)

³⁸ I found an agentive verb which can be coerced into accompaniment: *David bowed out of the room*. Here, unlike *work* or *laugh*, *bowing* is understood to stop when David is out of the room. I suspect that there is a small class of verbs such as *bow* which are compatible with the interpretation that their activity is terminated upon path completion.

Similarly to **John worked out of the room*, working cannot be guaranteed to accompany tiredness. If John reaches a tired state, it is not guaranteed that he would stop working, since working depends on John alone. In fact, quite a different relation now holds between the predicates: working is not the adverb of tiredness but its cause. That means that (85) does not obey the interpretation rule (78).

To summarize the semantics side, we reviewed the interpretation of the sentences such as in (86) (for brevity's sake, I give a single instance of each set):

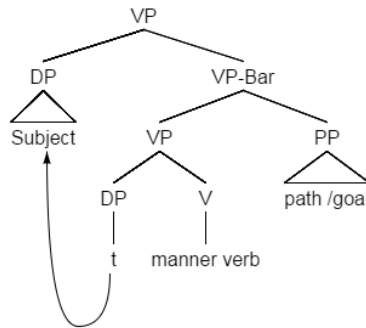
- (86)
- a. David swam to the island.
 - b. The refrigerator door clicked open.
 - c. **John worked/yelled/laughed out of the room.*
 - d. **John worked/danced tired.*

We learned that (86a-b), but not (86c-d) obey the interpretation rule (78).

3.3.3.2.2 The syntactic structure of DMMCs

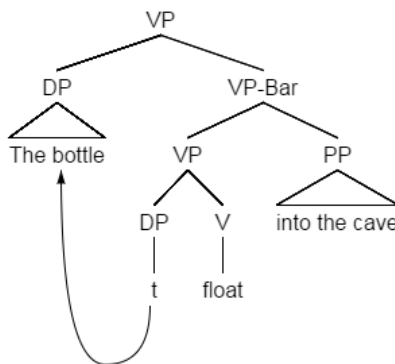
I propose a syntactic analysis that reflects the interpretation of DMMC as discussed above. Since I argued that the manner verb is interpreted as a modifier/adverbial of the scalar predicate, the expectation is that the manner VP attaches at a bar level above the PP, in a VP which contains both. Differently put, it means that the PP is attached as the lowest argument in a VP-shell structure:

(87) Syntactic Representation of Directed Manner of Motion Constructions:



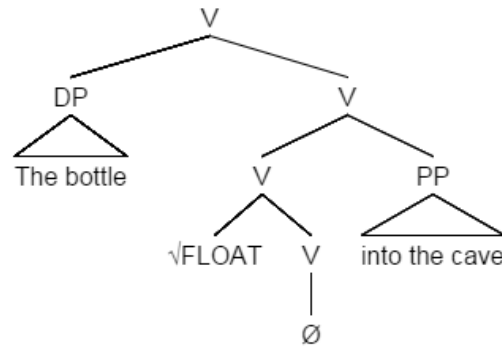
In more detail, the lower VP is a segment of the entire VP, such that the lower VP is attached in a modifier/attributive position (of the PP argument). I assume that there is a no head projecting the entire VP. An exemplification of the above representation is given in (88):

(88) The bottle floated into the cave.



(88) is intended to syntactically convey the following ideas: (i) *the bottle floated* is the same VP as *the bottle floated into the cave*. (ii) the PP is an argument, and (iii), the lower VP modifies the PP. This structure in (88) is similar to Mateu's (2000:86), Mateu & Rigau's (2002:219) and Zubizarreta and Oh's (2007) derivation of "conflation events" in Germanic languages:

(89) The bottle floated into the cave (Mateu 2000)



There are two main differences between (88) and (89). The first is that whereas Mateu & Rigau build on Hale & Keyser’s l-syntax (1993; 1997:229; 2002), I do not assume syntactic structures in the lexicon. Instead, the structure follows from the interpretational relations between the manner and scalar predicates. The result, from an abstract structural perspective, looks largely the same.

The second difference is that Mateu & Rigau assume a null unaccusative head that is conflated / compounded with the root \sqrt{FLOAT} (see (89)). I do not make this assumption (although my proposed structure is optionally compatible with a null head which projects the entire VP-shell). Rather, the subject of the manner verb originates in a standard way as an external argument of the lower manner predicate, and moves to the spec position of the VP-shell (on its way to satisfy the EPP). An apparent unaccusativity shift occurs because the argument that was merged externally in the VP of the lower manner predicate, now finds itself in an internal (i.e. complement) position of a VP-shell. More elaborately, I argue here that *the bottle* is an external argument of the predicate *float*, but an internal argument of the predicate *float into the cave*. This is not a contradiction since externality of arguments is syntactically evaluated with respect to the predicates they are arguments of. In fact, the term “unaccusativity shift” is **misleading**

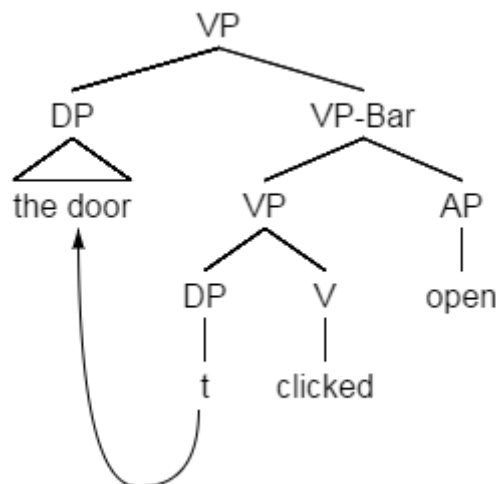
here because subjects of DMMC are always generated in an internal position of their predicates (in satellite-framed languages). In sum, unaccusativity of DMMC under my approach is derivable from the structural relations (which reflect interpretational relations) that hold between the manner and path predicates –thus, originates in the syntax.

My account also covers secondary predication patterns of emission verbs:

- (90) a. The refrigerator door clicked open.
 b. The train whistled into the station.

Since in Germanic languages, the manner and the scalar predicates are divorced, there is flexibility in choosing either of them. In (90), emission verbs enter unaccusative secondary predication patterns just like DMMC (see (63)-(64)). In the previous section, I explained how their semantics parallels those of DMMC's. Hence, the structural relations I suggest are identical:

- (91) The door clicked open.



In the context of (91) above, it is important to remember that the sentence, although superficially resembling a resultative, is in fact not one. Namely, it is not true that the

door became open as a result of clicking. The SC analysis which resultatives traditionally receive (Stowell 1981; Hoekstra 1988; Levin & Rappaport-Hovav 1995) is not the obvious solution here.

There are some issues which I leave open. First, I do not address so-called subject-oriented resultatives (data from Verspoor 1997; Wechsler 1997; Rappaport Hovav & Levin 2001):

- (92) a. The men followed the star out of Bethlehem.
b. The children played leapfrog across the park.
c. The sailors rode a breeze clear of the rocks.

There is evidence that the examples in (92) are not resultatives; the PP in (92) is not an argument but an adjunct (Neeleman & van de Koot 2002; van Dooren, Hendriks & Matushansky 2013). Thus, they do not fall under my proposed structure. I do not have an answer at present why transitive manner verbs should be excluded from forming VP-shells in the presence of a goal PP.

Second, I leave a comparative meta-discussion of my approach vs. Mateu's l-syntax analysis for future research. Which empirical evidence or what predictions are expected to differentiate between the two analyses? As a departure point, I believe that syntactic representation of events in the lexicon is undesirable, since it duplicates computational hierarchy (see Horvath & Sioni 2010).

Also beyond the scope of this work is the cross-linguistic examination of the prediction that DMMC in satellite-framed languages, but not in verb-framed languages, show productive unaccusative behavior. In addition to data from Hebrew, Germanic and

Romance languages, the discussion will be enriched by looking at the unaccusative/unergative behavior of DMMC in diverse language families.

3.4.3.3 Interim summary

It emerges, then, that the proposed syntactic structure for DMMC with either PP or AP is feasible, and correlates with the syntactic facts. Recapitulating the discussion of semantics and syntax of DMMC, I showed the following:

- (i) A complex manner-scalar predicate is predicted to have a specific interpretation in which the manner predicate serves as the adverbial of the scalar (see (78)).
- (ii) The interpretation of DMMC conforms to the one predicted by my theory.
- (iii) The interpretation corresponds to a VP-shell structure in which the manner event is attached at a VP' level as a modifier.
- (iv) An apparent “unaccusativity shift” occurs because the argument that was merged externally in the VP of the manner predicate, now finds itself in an internal position of a VP-shell. Subjects of DMMC are always generated in an internal position of their (complex) predicates.
- (v) Unaccusativity of DMMC is productive in languages that lexicalize the manner and the scalar path as two separate syntactic entities. Namely, in satellite-framed languages. In verb-framed languages, the interpretational relations between the manner and scalar component are not syntactically reflected (both components are lexicalized by the verb). Hence, DMMC in these languages do not show productive unaccusative behavior.

3.4.3.4 Can a lexical meaning shift rule account for DMMC?

Let us come full circle to the purpose of my investigation: (repeated from (17)):

- (i) DMMC is unaccusative. (fact)
- (ii) DMMC is scalar. (fact)
- (iii) Given that the Scalarity Mapping rule applies, DMMC's unaccusativity is predicted.

If my analysis is correct, then (iii) is actually **not** the reason for DMMC's unaccusativity.

Although (iii) is a theoretical possibility, there is a way to account for the merging results of DMMC with a syntactic analysis. Let us evaluate it against a competing lexical analysis, which indeed uses (iii) to derive unaccusativity of DMMC ((74) repeated as (93)):

- (93) What is the interpretation of DMMC predicates?

Lexical formulation: Let V be a manner verb with the following grid $V(\theta_1)$ and let there be a PP predicate. Under what conditions can there be a second distinct verbal grid $V(\theta_1, \theta_2)$ such that the PP receives θ_2 ? What will be its interpretation?

L&RH 1995 argue that there is a lexical meaning shift rule which changes the meaning of the manner verb to a directed-change interpretation, thus a directed-change linking rule (in my terms, the Scalarity Mapping Rule) applies to the new verbal entry, resulting in the internal mapping of the subject. In other words, L&RH propose a lexical reanalysis while I propose a syntactic one.

First and foremost, I argued that the unaccusativity of DMMC follows from the compositional interpretational relations between the PP and the manner verb. Therefore, coding an additional lexical rule that forces that interpretation would be superfluous.

A second argument in favor of a syntactic analysis is the lack of causative alternates of DMMC. Recall that their transitive alternates are sporadic (see (94a-b)) and strictly agentive (see (94c-d)):

- (94) a. *The general trudged/ambled the tired soldiers to their tents.
b. *We sashayed/swaggered the models along the catwalk.
c. John / *the rain / *the hunger marched the soldiers to their tents.
d. John / *the trap / *the hunger ran the mouse through the maze.

Under a lexical meaning shift rule, DMMC are a priori candidates to participate in the unaccusative alternation, contrary to fact.³⁹ By contrast, if the causative-unaccusative alternation is determined lexically but the unaccusativity of DMMC is due to the syntax, they are not expected to show the alternation. I explore the locus of the unaccusative alternation in depth in the next chapter, where evidence such as the examples above is used to advocate the view that the unaccusative alternation is lexically derived.

A third argument against a lexical rule is that in verb-framed languages, DMMC do not seem to be unaccusatives. For instance, we observed that in Italian, although canonical atelic unaccusatives freely allow BE, the majority of manner verbs with atelic directional prepositions resist the auxiliary change (see (69)-(70)). Therefore, it does not seem likely that Italian encodes the meaning shift in the same way Dutch does. Rather, the null hypothesis would be that the small set of manner verbs which allow BE is the lexicalized exception in Italian. In other words, a lexical meaning shift rule for such languages would overgenerate.

³⁹ The expectation for a causative alternate depends on the theory of choice. Causativization approaches cannot account for the data. By contrast, Reinhart (2002) argues that 2-place unaccusatives (i.e. DMMC) are base-generated and are not formed via a reduction operation.

3.5 Conclusion: the Scalarity Mapping rule applies at the lexicon-syntax interface

Let us summarize briefly the evidence for the Scalarity Mapping rule:

In chapter 2, I showed the change-of-state restriction associated with the unaccusative alternation to be derivable from scalar structure. The fact that the causative-unergative alternation does not show the same restriction also supports such a scalar distinction between unergatives and unaccusatives.

We have also seen that in the case of what I called absolute unaccusatives (verbs which are argued to be unaccusatives regardless of the syntactic environment), the Scalarity Mapping Rule correlates with the interpretational differences between unergatives and unaccusatives (section 3.2).

The main task of this chapter has been to investigate whether there is a basis to tie scalarity with phenomena of variable unaccusativity: (i) LI, and (ii) DMMC. For the sake of continuity, let me address DMMC first. I have shown above that there is no need to re-invoke a mapping rule in order to derive the syntax of DMMC. Thus, it is more parsimonious to avoid the assumption that the mapping system is operative also in the syntactic component (section 3.3.3).

Regarding LI, I argued that their subject is mapped in the direct object position due to the Scalarity Mapping Rule (section 3.3.2). So the question is reduced to: is there any evidence to assume an alternative purely syntactic derivation of LI?

Under my proposal, any verb is trivially equipped with the constant spatio-temporal measurement function. Due to the one-scale-per event restriction (see (2)), it may opt to express the regular scale that it is associated with (if it has any), or to use the

constant function. The restriction on the distribution of LI in English was derived from independent discourse factors.

A purely syntactic approach to LI will ultimately fail because the constraints placed on LI cannot be reduced to syntax alone: theoretically, any intransitive can enter the construction, contrary to fact. Thus, it is not true that the construction itself bestows upon the verb the appropriate interpretation. If the construction is a priori limited only to verbs that are compatible with an appearance/existential interpretation, the relevant set cannot be determined in the syntactic component, since such information (the compatibility with an existential interpretation) must be listed lexically from the outset. Thus, the set of LI verbs is not derived syntactically.

Summarizing, this chapter argues for the following claims:

- (i) Since the Scalarity Mapping Rule merges an argument internally, only unaccusatives, and no unergatives, are expected to show a scalar structure (section 3.2).
- (ii) LI constructions are unaccusative due to the Scalarity Mapping Rule. There is a plethora of evidence that the subject is merged in the direct object position. Further restrictions on the distribution of LI arise from the syntax-discourse interfaces and from topicalization of the PP. Moreover, the successful derivation of the distribution of LI from the interaction of topicalization and the Scalarity Mapping rule, strengthens the hypothesis that such a rule exists (section 3.3.2).
- (iii) DMMC are also unaccusatives, but that result is not derived by the Scalarity Mapping Rule. Rather, the unaccusativity of DMMC is accounted for by a

syntactic derivation that merges the subject of the manner verb in a complement position of a VP shell, forming a complex predicate. (section 3.3.2).

- (iv) The investigation of phenomena of variable unaccusativity in LI and in DMMC leads us to the conclusion that the mapping system considers arguments only once during the course of the derivation. When an argument is merged internally or externally with respect to a certain verb, it is not the case that the argument is re-mapped to the opposite position, given more syntactic data. Thus, I adopt the null hypothesis that the mapping system operates at the lexicon-syntax interface (section 3.4).

4 The locus of the causative-unaccusative alternation: lexicon or syntax?

4.1 Introduction

Previous chapters explored the semantic properties of unaccusatives and the implications of such properties on the unaccusative alternation. A representative example is reiterated below:

- (1) a. John / the wind / the keys opened the door.
b. The door opened.

Two properties of alternating verbs were detailed so far: (i) the COS constraint is derivable from scalar structure (chapter 2), and (ii) scalarity is a defining property of unaccusatives (chapter 3). Having firmly established the relevant semantic foundation of the alternating verbs, the investigation now turns to the task of identifying the means employed by our grammar to implement the alternation. A detailed theory must provide a specific mechanism which generates the alternation. In this regard, there are two main syntactic research questions about such a generative mechanism. First, what is the directionality of the operation involved? is the output of the operation (i) the causative (ii) the unaccusative (iii) or they share a common input but are not directly related. The second question that has been asked is: In which component of the grammar is the alternation represented? (i) the lexicon (ii) the syntax. In table (1) below, I categorize representative theories according to the stand they make with respect to the aforementioned two questions.

Table (1): Types of theories

Locus of Alternation / Direction of Operation	Lexical	Syntax
Intransitive -> Causative	Hale & Keyser 1993	Pesetsky 1995; Harley 2008; Ramchand 2008;
Causative -> intransitive	Chierchia 2004; Koontz-Garboden 2009 (reflexivization); Levin & Rappaport-Hovav 1995; Reinhart 2002; Horvath & Sioni 2011b (decausativization)	
Undirected		Alexiadou, et al 2006, Pylkkänen 2008 (common-stem) Borer 2005, Arad 2006, Harley 2012

The purpose of this chapter is to shed further light on the latter question: what module is responsible for the alternation? My hypothesis is that the alternation is derived lexically.

(2) **Main Hypothesis:**

The causative-unaccusative alternation is derived in the lexicon.

In order to establish my claim, I pursue two complementing tracks of argumentation. The first track, which corresponds to the first part of the chapter, surveys the predictions made by syntactic decompositional accounts of English causatives (Dowty 1979; Beck 2005; Borer 2005; Pylkkänen 2008; Ramchand 2008 and Harley 2012 among others). I will show that these predictions are not borne out, most notably, by the centerpiece of the decompositional hypothesis: the predictions regarding the restitutive reading of *again*. Briefly, the availability of a restitutive reading (in addition to a distinct repetitive one) is commonly taken to be a diagnostic of constituency, supporting syntactic decomposition. I show that a restitutive reading is found with non-constituents and therefore it must be

accounted for on semantic grounds alone. As such, theories of syntactic decomposition are effectively left with no positive evidence.

In the second part of the paper I turn to the second track of argumentation and show that a lexical theory of English causatives makes specific predictions regarding the availability of the alternation, and that these are borne out. That is, not only is there no positive evidence for syntactic decomposition theories, there is evidence that the alternation is insensitive to compositionality. The argument I employ relies on the observation that no compositional introduction of RESULT STATES into a causative or an intransitive structure gives rise to the alternation. It necessarily shows that the alternation cannot be derived from a structural relation alone, because syntactic decomposition theories explicitly argue that alternating verbs are represented by their decomposition into a RESULT STATE constituent (contained in a structure headed by a causative head in the case of the causative alternate). Therefore, such approaches would be untenable (Borer 2005; Folli & Harley 2005; Alexiadou et al 2006; Schäfer 2008 and Pylkkänen, 2008 for the case of English zero-causatives). The findings presented below constitute robust evidence in favor of the hypothesis that the causative-unaccusative alternation is determined prior to the emergence of syntactic structure.

4.2 Predictions of decompositional accounts

4.2.1 Two representative syntactic accounts

In this section I present and carefully examine evidence for syntactic decomposition in English. First, in section 4.2.1, I review two representative accounts: Pylkkänen (2008) and Ramchand (2008). I show that they do not provide any positive evidence and do not

perform better than competing lexical theories. Second, and more importantly, in section 4.2.2 I zero in on the common denominator of all decompositional accounts: the presence of a constituent of RESULT STATE (see Dowty 1979; von Stechow 1996 and Beck 2005, among others). This result state constituent is allegedly detected by the restitutive reading of *again*. I will show that restitutive readings are also available for non-constituents and thus arise from semantics alone. Thus, I argue that the availability of a restitutive reading is not an evidence for syntactic constituency. Lastly, in section 4.2.3, I also tackle alleged evidence from temporal adverbials (e.g. *for x minutes*) and show that they do not support decompositional analysis. All in all, I believe that decompositional accounts are left with no positive evidence for the structure they postulate for English causatives.

To begin with, Pylkkänen's (2008) proposal will be challenged in the following way: she argues that the alternation is a relation between two syntactic structures that share a common syntactic unit: the *root* (Halle & Marantz 1993; Marantz 1997; Chomsky 1998, among others). I show that, contrary to her proposal, there is no evidence supporting the existence of such a syntactic unit in alternating verbs. Hence, derivation of the alternation based on the notion of roots cannot be maintained.

Pylkkänen (2008) proposes that the causative counterparts of unaccusatives in English are root-selecting causatives: a V_{Cause} functional head takes a category neutral root as its complement. She brings two empirically testable predictions to test this structure, one of which concerns sites of adverbial modifications and the other, verbal morphology. I examine each prediction in turn.

Regarding adverbial modifications, the fact that the English zero-causative does not generally allow VP-modifiers to attach below the causative head, has been often taken as an argument for a lexicalist analysis of those causatives, since an inner syntactic structure cannot be detected by adverbial modification (see Fodor 1970; Fodor & Lepore 1997). However, Pylkkänen (2008:111) suggests that degree-adverbs modify a resultant state, and hence attach below the causative head. Her prediction is that since the causative head takes a category neutral root, the adverb can likewise be combined with the root in a nonverbal environment (e.g. in adjectives). For instance (taken from Pylkkänen 2008:111):

- (3) a. John closed the door partway.
 b. a partway closed door.
 c. Roger filled the glass halfway.
 d. a half-full glass. (Pylkkänen's examples (66-67))

In contrast, *grumpily* cannot attach to a resultant state, and hence is unable to modify the corresponding adjective:

- (4) a. John awoke Bill grumpily. (false if John was not grumpy)
 b. *a grumpily awake boy. (Pylkkänen's examples (45),(68))

According to Pylkkänen, “whenever an adverb can attach below Cause in a root-selecting causative, it should be able to modify the root in a nonverbal environment as well”, and “If *grumpily* is a VP modifier, it should not be able to modify the bare root under the causative” (2008:11).

Pylkkänen's predictions are incorrect. I provide below a range of VP-adverbials which cannot attach below Cause, and yet they freely appear in adjectival environments.

That is, there are many counterexamples to Pylkkänen's argumentation based on example (4). I will show below that both alleged above-Cause and below-Cause modifiers are able to appear in adjectival environments. If so, then Pylkkänen's conclusions do not follow from the data, and (4b) is ungrammatical for independent reasons which I also explain below.

(5) **Relation-in-time adverbs:** *already, recently, previously...*

(6) a. John had opened the door already / recently / previously.

b. An already / recently / previously open door. (see Embick 2004:357)

c. John had filled the glass already / recently / previously.

d. An already / recently / previously full glass.

The examples in (6) above show that adverbs such as *previously* or *recently* do not attach below VP. If they were able to attach below-Cause, the examples in (6) would have a reading where John caused a state in which the door had already been open, which is an unacceptable one (since the result state would precede the causing event). Despite the fact that *previously* and *recently* are VP-modifiers, they freely attach to adjectives, as shown in (6b,d).

Next, consider evidence from the case of frequency adverbials:

(7) **Frequency adverbs** *always, often, frequently, rarely ...*

(8) a. John always / often / frequently / rarely opened the gates.

b. The always / often / frequently / rarely open gates.

c. John always / often / frequently / rarely filled the glass.

d. The always / often / frequently / rarely full glass.

The examples in (8) above show that adverbs such as *always* or *often* do not attach below VP. A reading of (8a) where the gates are often open but John did not open them often is unacceptable. This means that frequency adverbials cannot attach below Cause.⁴⁰ Despite the fact that *always* and *often* do not attach below VP, they freely attach to adjectives, as shown in (8b,d).

An additional case showing the inadequacy of Pylkkänen's arguments is provided by manner adverbials:

(9) **Manner adverbs:** *suspiciously, inadvertently, carelessly...*

(10) a. John opened the door suspiciously / carelessly / inadvertently.

b. A suspiciously / carelessly / inadvertently open door.

Note that in (10b), the adverb does not imply the presence of an agent, but rather, the nature of the state of the door. By contrast, in (10a), a reading in which the door came to be suspiciously open without a suspicious agent is an unacceptable one. Also, if John opens the door in a suspicious manner, the door is not necessarily suspiciously open. Hence, the adverb must scope above-Cause. The same carries over to *inadvertently*. Despite the fact that *suspiciously* and *inadvertently* do not attach below VP, they freely attach to adjectives, as shown in (10b).

In light of the above, VP-modifiers such as relation-in-time (see (5)), frequency (see (7)) and manner (see (9)) adverbials are not exempt from appearing in adjectival environments, contrary to (4). Thus, Pylkkänen's argument does not stand since the availability of adverbials in adjectival environments does not correlate with their alleged below-Cause status in English zero-causatives.

⁴⁰ The only known exception in English is the adverb *again*, which will be discussed extensively in section 4.2.2.

So why is (4b) out? I suggest an aspectual explanation. It is safe to say that if an adverb is obligatorily interpreted as involving an event, it may not appear in a stative adjectival environment (i.e. an *open* door vs. an *opened* door). Hence, whereas *grumpily* must be interpreted as involving an event (e.g. **John saw the horse grumpily* vs. *John rode the horse grumpily*), many others need not (see (5) through (10)). Consequently, the distribution of adverbial modifiers does not constitute any positive evidence for a root-selecting causative hypothesis. In turn, it undermines a syntactic derivation of the alternation that is based on that hypothesis.

Turning to Pylkkänen's second prediction: there would be no intervening verbal morphology between the root and the Cause head in a root-selecting causative. Assessing the empirical validity of her prediction is relevant here since it corroborates (or weakens) her proposed decomposed syntactic architecture, and consequently, a syntactic treatment of the alternation. This prediction is particularly hard to test in English due to its zero morphology nature. When examining overt suffixation of *-en*, Pylkkänen proposes that the causative is not formed by an unpronounced cause head (in such a case, the unpronounced causative head would take a complement which already contains verbal morphology and not a category-neutral root, contrary to her proposed structure for English causatives). Rather, *-en* is allegedly homophonous between causative and intransitive morphology (e.g. [[hard] en_{Intr}] for intransitives and [[hard] en_{Cause}] for causatives). To support this analysis, she claims that, under the assumption of an unpronounced cause head, an *en*-causative structure fully contains the intransitive one. Hence, we would expect to find an intransitive alternate for every *en*-causative.

According to Pylkkänen, this expectation is not borne out: a specific verb, *fatten*, has allegedly a causative but not an intransitive alternate (see 2008:113 for more details):

- (11) a. We fattened the pig over the summer.
b. *The pig fattened over the summer. (Pylkkänen's example (74))

Pylkkänen therefore takes the ungrammaticality of (11b) to support a root-selecting causative analysis. However, I beg to differ: I am not certain that (11b) is downright ungrammatical. *Fatten* is perfectly acceptable for other intransitive uses, as is expected of a deadjectival verb. Below are some naturally occurring examples taken from the Corpus of Contemporary American (COCA). Note that the grammatical (12c) and (12f) share with (11) the animal husbandry context:

- (12) a. As Ma has dwindled, Barbara has fattened. She wonders if her body knows something she doesn't, like famine is coming or the Big One is going to hit.
b. She called for the bartender's attention. "Another dry martini for me and an Irish coffee for my friend over here." She fattened avidly on the light of hope that kindled in Bixby's eyes, then extinguished with a quick, cruel: "Hold the coffee".
c. Grazing lands in Chile weren't fenced off, so herds from neighboring ranches mingled and were separated only after they had fattened enough for slaughter.
d. Four or five months after we arrived in Africa, my children looked better than I think I ever saw them; they were so fond of palm oil and rice, and ate so much of it, that they fattened very fast.
e. They both watched the tablecloth soak up the wine; the lace and the stitching fattened and swelled.

f. The steers fattened and grew sleek, the apple trees had been pruned, the fencing stood stout and impenetrable.

Clearly, the examples in (12) show that the ungrammaticality of (11b) does not entail that *fatten* does not have intransitive uses. Hence, the argument based on this example is untenable. To further weaken Pylkkänen's argument, there is an opposite pattern: *scintillate* (*-ate* is a causative morpheme, e.g. *accelerate*, *attenuate*, *deteriorate*...).

- (13) a. *I scintillated the diamond ring.
b. The diamond ring scintillated in the sunlight.

In example (13) above, we observe a pattern opposite to (11): the intransitive is grammatical while the causative is not, because diamond rings do not typically take an external cause with respect to scintillation. On a par with (12), the causative becomes grammatical with a different choice of objects. Here are some examples from a Google search:

- (14) a. The young woman was a jewel that scintillated the parlor room.
b. The acrylic has a bright finish so it really scintillated the light.
c. One day my sister and I sat on a rock gazing out as the sun scintillated the waters over beautiful Bright Lake.

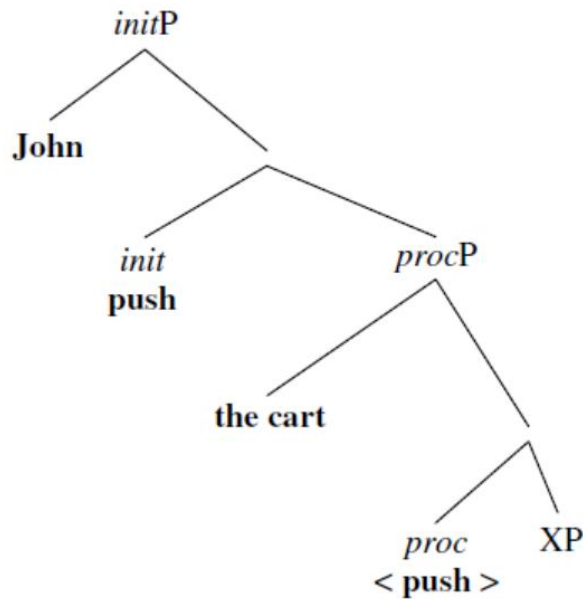
Therefore, if Pylkkänen's theory were right, the fact that *scintill-ate* has an intransitive instance would seem unexpected, on a par with her argument that *fatt-en* has a causative instance.

Recapitulating the discussion of Pylkkänen's predictions, there is no positive evidence motivating a syntactic decomposition analysis for English causatives. First, evidence from distribution of VP-modifiers is inconclusive since both wide and narrow

scope adverbials may appear in adjectival environments. Second, lack of a specific intransitive use of a given verb (e.g. *fatten*) has been shown to be a misanalysis of an incidental example; other intransitive uses of the same verb are acceptable, as well as a verb showing the opposite pattern (e.g. *scintillate*). If the syntactic existence of the root cannot be verified by the data, it clearly cannot serve as a basis for a syntactic derivation of the unaccusative alternation. Further cross-linguistic challenges for Pylkkänen's causative architecture are beyond the scope of this chapter (but see Horvath & Siloni 2011a).

Another decompositional analysis of argument realization is put forth by Ramchand (2008). She proposes a two-tiered architecture. On the first tier, the semantics is generated compositionally from a pure labeled syntax, independently of lexical-encyclopedic information. Unlike radically constructionalist views (e.g. Marantz 1997; Borer 2005), Ramchand adds a second tier: the lexical item carries syntactically relevant features, which perform 'selectional' work. In more detail, the syntactic verbal projection is internally composed from three basic ones: *init* (for initiator), *proc* (process) and *res* (resultee) projections, which are projected according to specifications on the lexical item. In her words, "[A] lexical item with a *res* feature can project the *res* feature to form a *resP* predication, but it also carries lexical-encyclopedic content which can identify the content of the state in question... lexical item with an *init* feature can Merge as *init* and identify the nature of initiational conditions involved." (2008:58). Below I provide an illustration from Ramchand (2008:66):

(15) Lexical entry for *push*: [init, proc]. Syntax:



In Ramchand's system, a causative alternate is formed by adding a new argument to the specifier of an *init* projection. Causativization may be carried out in two different strategies. The first strategy adds an *init* head on top of an existing structure that lacks it, which is the case for unaccusatives (examples follow immediately in (16)). For unergatives, the structure already contains an *init* projection. Causativization then employs the second strategy: it unassociates the *init* feature from the category root features and adds a new distinct initiator. In English, the causative morpheme (which spells out the *init* head) is phonetically null, but in Hindi/Urdu it is *-aa* (among other morphemes, see Ramchand 2008:171; 191). When examining the verbal projections, the operation may be schematically written as follows:

(16) Causativization in Ramchand 2008:

1. Unaccusatives: Break-intransitive: [*proc*_i , *res*_i] -> Break-transitive: [*init*_j , *proc*_i , *res*_i].

2. Unergatives: Run- intransitive: [init_i , proc_i] -> Run-transitive [init_j , proc_i].
3. Causative morpheme: English: zero morpheme /, Hindi/Urdu: -aa: [init].

The main issue, in my opinion, is that one never gets to see the true generative power of syntax here; the eligible structures are in 1-to-1 relation to the actual verb classes, which are themselves constrained by lexical-encyclopedic information and do not have compositional power: it is not possible to obtain different interpretations for a single lexical item by assigning it different projections. For instance, one could mean that, in a specific context, the subjects of intransitive *melt*, *break* or *fall* are not only undergoers, but also initiators of the process in question. Namely, they are not [proc] verbs in that use, but rather [init_i , proc_i] ones (e.g. *run* verbs). In the same vein, it is unclear why we cannot have a context of *run* in which the runner is not grasped as the initiator of the process but only as undergoing the running, on a par with intransitive *break*?

It is not the case that the syntax is unable to express the desired meaning of *run* or of *break* in these contexts: it is so because the verbs are encyclopedically constrained. Given this rigidity, what actual evidence do we have for the underlying existence of a flexible architecture of verbal heads? The eligible structures are mapped from the proposed verb classes, and these verb classes are not generated compositionally: they are a given list of features, specifying rigid lexical-encyclopedic content. Thus, Ramchand's two-tiered architecture is reducible to a lexical mapping system.

Let us now consider the syntactic causativization Ramchand advocates. A careful inspection of the rules as written in (16) reveals that there is nothing inherently structural about them. What is written in (16) is extensionally the following: a new verb class (set of features) is produced from a given verb class (another set of features). If the

representations of verb classes are predetermined sets of features, there are two possible mechanisms ahead of us: (i) a lexical rule, which applies to the features of the verb, then the result is mapped to syntax. (ii) the verb is mapped to syntax, then a syntactic rule applies.

It has been convincingly argued in linguistic literature that both lexical and syntactic causativization mechanisms are available and differ considerably in their properties (Horvath & Siloni 2011a). What is relevant here is that various causative morphemes show different syntactic behaviours cross-linguistically. In particular, when probing for the number of syntactic predicates, one finds out that the (productive) Japanese -(s)ase causatives and Hungarian -(t)et causatives yield different results. Due to lack of space, I shall limit myself to two diagnostics identifying multiple predicates. First, Agent oriented adverbials scope only over the causative in Hungarian, but can scope either over the base or the causative verb in the Japanese counterpart (Shibatani 1972, see example (17) below). Similarly, VP-ellipsis is unambiguous in Hungarian, scoping obligatorily over the causative, whereas Japanese allows also the base verb to be elided (See (18), Shibatani 1972, examples are from Horvath & Siloni 2011a):

- (17) a. Az ügyvéd {készség-gel/ habozás nélkül}
 The lawyer.NOM {readiness-INSTR/ hesitation without}
 alá-ír-at-ta János-sal a szerz"odés-t.
 under-write-CAUS-PAST.DEF.DO János-INSTR the contract-ACC
 ‘The lawyer made [János sign the contract] {readily/without hesitation}’
 (unambiguous)

- b. sono bengosi-wa {tyuuchonaku/ yorokonde} John-ni
the lawyer-TOP {without hesitation/with pleasure} John-DAT
keiyakusyo-ni sain s-ase-ta.
contract-DAT sign do-CAUS-PAST
‘The lawyer made John sign the contract {without hesitation/with pleasure}.’
(ambiguous)
- (18) a. Fel-olvas-tat-t-am Mari-val egy vers-et, mert János is az-t csinálta.
up-read-CAUS Mari-INSTR a poem-acc because János too that-ACC did
(i) ‘I made Mari read out a poem because János made Mari read out a poem too.’
(ii) Impossible: ‘I made Mari read out a poem because János read out a poem too.’
- b. Yoko-wa [musuko-ni [huku-o ki]-sase]-ru to Junko mo soo si-ta.
Yoko-TOP son-DAT clothes-ACC wear-CAUS and Junko also so do-PAST
(i) ‘Yoko made her son wear clothes, and Junko made her son wear clothes, too.’
(ii) ‘Yoko made her son wear clothes, and Junko wore clothes, too.’

In light of the above, it cannot be true that both Japanese –(s)ase and Hungarian –(t)et causative morphemes fit identically into the same structural position in Ramchand’s architecture (i.e. the spell-out of the init head).

Summarizing the discussion regarding Ramchand (2008), the following points were made: first, the surface syntax ends up reflecting the encyclopedic constraints of the verb classes and not the range of compositional meanings one could have expected. That is, there is no evidence for the existence of hidden compositional mechanisms in the representation. Second, causativization in Ramchand’s theory does not provide any empirical evidence that it is a syntactic operation since it is extensionally equivalent to a

lexical rule: its representation could be potentially lexical, syntactic, or both. Moreover, cross-linguistic evidence shows that various causative morphemes exhibit different syntactic behaviors. Thus, they cannot fit uniformly into the same position of a complex verbal projection.

4.2.2 Nondecompositionality, again

4.2.2.1 *Again* in decompositional accounts

Another potential piece of evidence for a structural theory of English causatives is widely claimed to identify a RESULT STATE constituent. The motivation for the existence of such constituent arises from observing the contrast between repetitive and restitutive interpretations of the adverb *again* (see Dowty 1979; von Stechow 1996; Beck 2005 and Pylkkänen 2008, among others). The argument is as follows: the causative verb *open*, in the presence of *again*, has two readings (see (19)).

(19) John opened the door again.

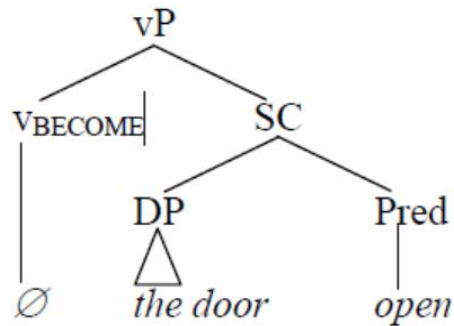
(i) John did it again — he had done it before. (repetitive)

(ii) The door is in an open state again — it had been open before. (restitutive)

The claim advanced by proponents of syntactic decomposition is that these different readings are due to a structural ambiguity that results from the different structural positions that *again* (possessing a single constant meaning) occupies in the decomposed syntactic structure. In particular, the restitutive reading is obtained by having *again* modify the RESULT STATE, a constituent. Specific details vary among accounts. For instance, Folli & Harley (2005), Schäfer (2008) and Harley (2012) maintain that the relevant constituent is a small clause (henceforth SC) which contains a Pred head as a

sister to the object (representative example in (20) below), whereas von Stechow 1996 and Beck 2005 assume that the SC is headed by PRO. The precise representation of the RESULT STATE constituent will be irrelevant here, since I am going to reject the validity of *again* as a diagnostic of syntactic constituency altogether. It suffices for my discussion to focus on the fact that *again*, under these theories, modifies a syntactically visible result state. A representative analysis of decompositional account for *open* appears in (20) below (Harley 2012, example (11b))

(20)



From a theoretical perspective, a structural analysis comes with a high price tag: the behavior of *again* stands in sharp contrast to the rest of similar adverbs (e.g. *repeatedly*, *never...* see also (7)).⁴¹ As Beck (2005) acknowledges, ambiguous readings do not arise for the latter adverbials. To remedy this, a visibility parameter has been suggested in Beck (2005), which controls whether a given adverb can modify an SC. The choice is somewhat puzzling: the syntactic structure is masked for adverbs in general, with the

⁴¹ Contrary to assumptions of generative semanticists, the case of *almost* has already been convincingly argued in subsequent literature not to provide relevant evidence. The variation in its interpretation arises from vagueness, not from scope ambiguity (see Sevi 1998; Tenny, 2000; Horvath & Siloni 2011a).

exception of *again*. But beyond this observation, a structural analysis faces not only theoretical, but also empirical, challenges that cast doubts on the validity of *again* as a diagnostic of syntactic structure. In what follows, I present compelling evidence from several empirical domains that *again* may target a state which is not a constituent: possessors (section 4.2.2.2), VP-ellipsis (section 4.2.2.3), inference of results (section 4.2.2.4) and deadejctival verbs (section 4.2.2.5).

4.2.2.2 *Again* with possessors

4.2.2.2.1 Restituted states of possessors

If the presence of *again* is no evidence for constituency, then it follows that there are good reasons to believe that restitutive readings cannot be explained by a scopal analysis (for an alternative syntactic/pragmatic account, Maienborn 2003, refer to Appendix A).

More specifically, I show that there is a systematic way to create sentences where the direct object is predicated of the external argument (examples follow immediately).

Although the external argument and the direct object, to the exclusion of the verb, are not a constituent, all these cases show clear restitutive readings with *again*. My discussion is structured in the following way: In section 4.2.2.2.1, I present a wide range of verbs showing non-compositional restituted states. Hence, a decompositional theory of *again* must respond to the data by advancing an analysis which derives the restitutive reading by postulating a covert constituent. In section 4.2.2.2.2, I review the possible analyses and show that they cannot be maintained, thus establishing my claim that restitutive readings are available also in non-compositional environments.

Let us restate what is being repeated in a restitutive reading: a presupposed state of a given DP. This state is composed of that DP and an XP predicate. The XP can be either another argument (DP), a location phrase (DP/PP) or an adjective (AP). The XP is predicated of the DP such that the interpretation is that the DP has, once more, the argument (21a), the location (21b-c), or the property denoted by the adjective (21d-e):

- (21) a. John gave **Mary the car** again. (Harely 2012)
 b. Suresh_i walked **t_i to the village** again.⁴² (Beck 2005)
 c. John threw **the cat out** again.
 d. John painted **the walls white** again.
 e. John hammered **the metal flat** again. (Beavers & Koontz-Garboden 2012)

Recall that from a syntactic decomposition point of view, *again* modifies a constituent. Therefore, the state of the given DP is a constituent (e.g. the DP *Mary* is in a state in which she has the car). Unquestionably, the restituted state in (21) above, and in many similar examples, can correspond to a constituent. In light of these data, a syntactic account for alternating verbs along the lines of (20) would seem to be very appealing.

However, I present below empirical findings (below) that constituency is not a necessary condition to create the restitutive reading and thus a purely decompositional analysis is untenable. As to the semantics of *again* itself, it will suffice for my purpose to adopt the null hypothesis: *again* possesses a fixed meaning (see von Stechow, 1996; Klein 2001; refer to Appendix A for further discussion).

$$(22) \text{[[again]]}(P_{\langle i, \triangleright \rangle})(e) \quad = \quad \begin{aligned} & 1 \text{ iff } P(e) \ \& \ \exists e' [e' < e \ \& \ P(e')] \\ & 0 \text{ iff } \sim P(e) \ \& \ \exists e' [e' < e \ \& \ P(e')] \end{aligned}$$

⁴² Beck (2005) analyzes (21b) slightly differently, but the relevant fact is that she proposes a VP-internal constituent which contains *Suresh* and *the village*.

undefined otherwise.

In words, *again* expresses a relation between a property of events and an event. It presupposes that there was a previous event that has that property, and asserts that the property is true of the event. In my terms, the state of the given DP is the relevant property of events (e.g. in (21d), walls have the state in which they are white; white walls can be viewed as a property of events).

Let us begin with an example of a change-of-possession double object construction:⁴³

- (23) a. Thilo gave Satoshi the map again. (Beck & Johnson, 2004), example (48))
b. John threw [Sandy the ball] again. (Beavers & Koontz-Garboden 2012),
example (76))

Beck & Johnson (2004) argue that the result state of double object constructions is uniformly a state of possession of the theme by the goal; a state which is syntactically represented as an SC. Specifically, the structure of (23a) is

- (24) [_{VP} Thilo [_{v ϵ} v [_{VP} give [_{HAVEP} Satoshi [_{HAVE} the map]]]]] (example (53)).⁴⁴

The verb combines with the SC through application of von Stechow's (1995) principle of semantic composition.⁴⁵ By contrast, Pylkkänen (2008) argues that an SC analysis is

⁴³ I will discuss only change-of-possession verbs, but not change-of-location ones for a simple reason. Change-of-location verbs, as well as verbs of motion, when predicated of a resultant location, are argued to be unaccusatives. They are not suited for my purpose since their arguments are VP-internal, and hence, constituency is observed.

⁴⁴ Beck & Johnson develop the structure in (24) to include a BECOME operator. Harley (2012) argues that this treatment makes the an incorrect prediction. Whether or not there is a BECOME operator would be irrelevant here.

⁴⁵ The principle, as reformulated by Beck (2005), is:

If α [_{v γ SC β}] and β' is of type $\langle i, t \rangle$ and γ' is of type $\langle e, \dots \langle e, \langle i, t \rangle \rangle \rangle$ (an n-place predicate), then $\alpha' = \lambda x_1 \dots \lambda x_n \lambda e. \gamma'_e(x_1) \dots (x_n) \ \& \ \exists e' [\text{BECOME}_e(\beta') \ \& \ \text{CAUSE}(e')(e)]$

incorrect for English double object constructions, and suggests a low applicative analysis in which the indirect object is the intended recipient (see 2008:14-16 for more details).

Now, consider the semantic inverses of *giving* and *throwing*, for which the goal/recipient is the external argument:

- (25) a. [Satoshi] acquired [the map] again.
b. [Sandy] grabbed/captured/caught [the ball] again.

Clearly, a restitutive reading is available for (25) on a par with (23). (25a) means that Satoshi got back a map that was originally his. (25b) means that Sandy has the ball again.

Here is another naturally occurring example (from

http://tabletennis.about.com/od/questionsanswers/Questions_Answers.htm)

- (26) In table tennis, is the server allowed to throw the ball up and catch it again without a penalty?

The examples above show that it does not matter whether the recipient is projected internally or externally, the restitutive reading is available.⁴⁶

Now that we have understood that a restitutive reading may be obtained by restoring an argument, be it external or internal, to a previous possession (or dis-possession), let us compile a short preliminary list of types of things that an agent may have, and the related verbs for coming to have them or to remove them. I show below in (27) through (31) that these verbs have restitutive readings.

⁴⁶ A third interpretation, an intermediate between repetitive and restitutive reading, also exists: Mary threw the ball to John, who caught it. John threw the ball to David, who caught it again. Here, the catching event itself is repeated to the exclusion of the agent. This is not a restitutive reading, which entails no event repetition. I will not be concerned with the intermediate reading here.

Table (2): possessions types and their related verbs

Possessed type	Adding	Removing
Knowledge	<i>remember, learn</i>	<i>forget</i>
Money	<i>earn, gain</i>	<i>lose</i>
Clothes	<i>wear, put on</i>	<i>Remove, take off</i>
Physical objects	<i>catch, capture, grab, retrieve..</i>	<i>lose</i>
Non-physical objects	<i>accept, seize...</i>	<i>lose</i>

Below are representative examples for each class. The subject in each sentence is a genuinely external argument since the verbs may be passivized (as will be demonstrated in (34) below).

(27) **Restitutive verbs of knowledge**

- a. [Mary] remembered [John's name] again.
- b. A moment after the test was over, [John] forgot [the material] again.

(28) **Restitutive verbs of money**

- a. John was born rich and never worked a day in his life. By the age of 30, he had squandered his entire fortune. Luckily, [He] earned [the money] again by gambling.
- b. Hardworking and determined, a penniless Max managed to accumulate a large sum of money. Unfortunately, [He] lost [the money] again after a single visit to the casino.

(29) **Restitutive verbs of clothes**

- a. [John] put on [the shirt] again (after the medical examination).
- b. [John] removed [the shirt] again (deciding to stay at home after his workday has been cancelled).

(30) **Restitutive verbs of physical possession**

a. [John] grabbed / captured / caught [the ball] again.

b. [The museum] acquired [the painting] again.

(31) **Restitutive verbs of non-physical possession:**

a. [George] accepted [the kingship] again.

b. I think I found God, but now [I]'ve lost [him] again.

c. After a debilitating crisis of faith, [John] found [God] again.

In light of the above, the easily accessible restitutive readings in examples (27) through (31) show that it is possible to have a restituted state in which the direct object is predicated of the external argument (both appearing in brackets), to the exclusion of a repetition of the event denoted by the verb.

4.2.2.2.2 Decompositional analyses of external possessors cannot be defended

In light of the data above, we face the question whether the restitutive reading may be attributed to syntactic constituency. For a syntactic hypothesis to be tenable, there needs to be a corresponding VP-internal constituent which denotes the possession relation between the theme and the recipient. Thus, in order to preserve constituency, verbs such as *catch*, *put on*, *remember*, *grab*, *accept* and *earn*, among others, must be analyzed in one of the following ways (I use P_{HAVE} head for convenience, but also address a low applicative head analysis when necessary):

(32) a. adjunction analysis: John_i caught [PRO_i P_{HAVE} the ball]. (constituent as adjunct)

b. raising analysis: John_i caught [t P_{HAVE} the ball]. (constituent as complement)

c. covert double object analysis: John_i caught [PRO_i P_{HAVE} the ball].

I will now show that none of the analyses above is possible.

Under the adjunction analysis, (32a), the possessed DP (e.g. *the ball*) is not an argument of the verb (e.g. *catch*). Clearly, this is incorrect, as can be shown by the ungrammaticality of (33a), in which the constituent is omitted, and a *do-so* test (33b), in which the constituent patterns with arguments, but not with adjuncts:

- (33) a. John caught *(the ball).
b. *John caught the ball and Bill did so the stick.⁴⁷

Alternatively, adjunction of a constituent with a low applicative head (instead of an SC) is not a possible solution under Pylkkänen's account. In detail, low applicatives in English are not licensed with unergatives, since they impose a relation between the indirect and direct object of the verb:

- (34) a. I baked a cake
b. I baked him a cake (i.e., I baked a cake for him)
c. I ran.
d. *I ran him (i.e., I ran for him). (Pylkkänen 2008: example (11))

Since an adjunction analysis entails that *catch* is unergative, a low applicative head is not expected to be licensed.

The second analysis, (32b), raising an internal argument to the subject position, also cannot be defended. The recipient is a truly an external argument, as can be seen from the fact that these verbs trivially allow passivization (35):

⁴⁷ Recall that *do-so* may be substituted for a VP, hence one can make a distinction between arguments below the VP and modifiers above it. For instance:
i. *John broke the glass ball and Bill did so the stick
ii. John buys toys in ToysRUs and Bill does so in Big Toys.

- (35) a. The ball was caught.
 b. The shirt was put on.
 c. The material was forgotten.
 d. The money was earned.

Lastly, a covert double object construction, (32c), is also untenable. If double object constructions were allowed to realize the goal as a PRO, it would immediately raise the question: what blocks run-of-the-mill double object constructions from showing reflexive readings with a PRO? In other words, suppose the following two sentences are accorded the same structure:

- (36) a. [_{VP} John [_{v ϕ} v [_{VP} **give** [_{HAVEP} Mary [_{HAVE} the ball]]]]].
 b. [_{VP} John_i [_{v ϕ} v [_{VP} **catch** [_{HAVEP} PRO_i [_{HAVE} the ball]]]]].

It would then be unclear why ordinary double object constructions do not allow PRO, such that the following sentences are interpreted reflexively:

- (37) a. *John_i gave [PRO_i the present] -> John gave the present to himself.
 b. *John_i threw [PRO_i the ball] -> John threw the ball to himself.
 c. *John_i sent [PRO_i the letter] -> John sent the letter to himself.

In light of the above, the analysis that *catch*-verbs are a covert double object construction would define a hitherto unobserved class of double object verbs, which is, of itself, stipulative and creates more problems than the ones it purports to solve.

It emerges that neither adjunction, nor raising, nor double object construction analyses are tenable. Crucially, observe that in the evaluation of the analyses above nothing hinges on the presence of an SC, a P_{HAVE} head or an applicative head: my argument is independent of theory-specific details because it shows that verbs such as

catch, put on, remember, grab, accept and *earn*, among others, do not pattern with unergatives, with raising verbs, or with double object constructions. Rather, all empirical evidence suggests that these verbs are run-of-the-mill transitives: they realize an external possessor argument and an internal argument (possessed direct object). Since a possession relation holds between them, this demonstrates that it is enough to create a semantic state which serves as an input to *again* modification. Thus, the null hypothesis now is represented by the semantic approach to restituted states.

4.2.2.3 *Again* with VP-ellipsis

Another relevant argument is put forth by Horvath & Siloni (2010) and Siloni (2014): the behavior of *again* in VP-ellipsis constructions suggests that its interpretation is not reducible to constituency. In particular, an elided VP is interpreted as having a repetitive reading whereas its syntactic antecedent is interpreted as having a restitutive one, or vice versa. Consider a scenario, (38) in which Paul, a nosy neighbor of John and Bill, reports their movements this morning to the police:

- (38) a. Paul: "This morning I saw John closing his door, which was installed wide open yesterday and left open since. When closing it, he must've heard that Bill, his neighbor next door, opened his door briefly to pick up the newspaper. Afterwards John opened the door again and so did Bill."
b. "... afterwards Bill opened the door again and so did John". (Siloni 2014, example (22))

Given a constituent parallelism requirement for a VP-ellipsis (Sag 1976; Williams 1977; Fox 2000), sentences (38) are predicted to be infelicitous under a decompositional

account since the alleged attachment sites of *again* in the antecedent and the elided VPs are different. This prediction is not borne out.

4.2.2.4 *Again* with inference of results

A second observation of Horvath & Siloni is that accomplishment verbs such as *dig* show a reading in which a restituted state is not one which obtains as a result of the activity.

Rather, the state only indicates the existence of the object (see Siloni 2014). Consider:

(39) They dug the cave again.

i. They did it again. (repetitive)

ii. There was a cave again (restitutive)

(40) Story tellers used to meet every year in a huge natural cave in mount Ida for a story telling festival. Ten years ago the cave collapsed. The locals dug it again and intend to renew the tradition. (Horvath & Siloni 2010, example (34))

Since the restitutive reading in (40) does not refer to a previous state in which the cave was dug, but only to a state in which there existed a natural cavity, *again* cannot be said to modify a syntactic RESULT STATE of the root *dig*.

In the same vein, I suggest that parallel behavior is exhibited by *slam* or *abandon*. These verbs encode both the state and the manner of activity in which the state is brought about (e.g. “to close in a forceful way that makes a loud noise” and “to leave with the intention of never coming back”, respectively) They also show restitutive readings that exclude the manner of activity (google):

(41) a. Perplexed, just a bit awestruck by now, I cautiously and quietly followed the trucker to the back of his trailer. There, he threw open the rear door and hauled all

of his flab into the opening. I could see inside for only a moment before he turned back, looked me square in the face, and slammed the door again.

b. But as suddenly as they appeared, the visitors abandoned the zoo again. By midweek there was no soul in sight.

Since the restitutive readings in (41) do not refer to a previous state in which the object was slammed or abandoned, but only to a closed or an unoccupied state, *again* does not correspond to the expected RESULT STATE of the root (i.e. *a slammed door, an abandoned village*). It emerges that verbs such as *dig, slam* and *abandon* allow the **inference** of a weaker restituted state. Admittedly, this is not a process that applies productively to verbs across the board, but there are cases in which *again* can probe semantically-derived antecedents, thus it is more parsimonious to hypothesize that legible antecedents are evaluated in the semantic level of interpretation. Since Montague's seminal work, we know that units of interpretation are largely constrained by compositionality, but the data proves that the behavior of *again* cannot be reduced to it.

4.2.2.5 *Again* with deadjectival verbs

Verbs which do not entail RESULT STATES yet show restitutive readings pose a serious challenge to a purely syntactic analysis (arguments made in Fabricius-Hansen 2001, Pedersen 2014):

(42) The river widened again

(i) Repetitive: the river has undergone a second widening.

(ii) Restitutive: the river has undergone widening, following a previous narrowing.

Hence, a scopal analysis of the restitutive reading of (43) cannot be derived by scoping over a nonexistent RESULT STATE constituent (i.e. the river is not necessarily wide). Instead, von Stechow (1996) reverts to proposing a distinct syntactic decomposition which includes an abstract comparative morpheme:

(43) [the river [_v BECOME [_A wide -ER]]]

This proposal is problematic for two reasons. First, as far as I can tell, von Stechow does not establish the syntactic existence of the abstract morpheme with independently attested evidence. Hebrew, for instance, accords both telic and atelic change-of-state verbs the same morphological pattern (e.g. *hit-yabeš* ‘dry’, *hit-raxeṽ* ‘widen’; both show restitutive readings). The abstract comparative morpheme therefore seems to be speculative.

Second, and more importantly, as Pedersen (2014) notes, there is a correlation between the inferences of adjectives and their corresponding deadjectival verbs. Gradable adjectives have been recognized as falling into two descriptive classes: relative adjectives, which require a contextually provided standard or comparison-class (e.g. *narrow*, *strong*), and absolute adjectives, which are not context sensitive in the same way (e.g. *straight*, *pure*. see Yoon 1996; Rotstein & Winter 2004; Kennedy & McNally 2005; Winter 2006). The same classification is carried over to the verbal domain: a deadjectival verb that is based on a relative adjective will not show an absolute, contextually-independent result states:

- (44) a. The tree straightened ⇒ The tree became straight (absolute)
b. John purified the water ⇒ The water became pure (absolute)
c. The gap narrowed !⇒ The gap became narrow. (relative)
d. The muscle strengthened !⇒ The muscle became strong (relative)

In light of the above, the inferential patterns found with verbs are the same ones found with their corresponding adjectives. Under von Stechow's account, this generalization cannot be expressed in a non-stipulative way (since the adjective does not contain an abstract comparative morpheme). By contrast, if the observable patterns stem from the (scalar) semantics that are already present at the adjectival level, there is no need to stipulate syntax with an additional, abstract morpheme for the subset of verbs derived from relative adjectives.

4.2.2.6 Interim summary of *again*

Summarizing my discussion of *again*, I have shown that syntactic decomposition theories fail to account for data from the following domains:

- (i) A restitutive reading may be obtained easily for external possessors. The restituted state does not correspond to a constituent (section 4.2.2.2).
- (ii) VP-ellipsis allows the elided constituent to target an antecedent which contains *again* with a different reading. This is unexpected if the reading is dictated by the properties of the syntactic constituent (section 4.2.2.3).
- (iii) Verbs such as *dig*, *slam* and *abandon* demonstrate that a restitutive reading may be inferred from an entailment of the activity rather than the alleged syntactic RESULT STATE (section 4.2.2.4).
- (iv) The syntactic structure accorded to Degree Achievements such as *widen* or *rise* in the presence of *again* seems to be purely stipulative (section 4.2.2.5).

In all domains above, since the restituted state is not a constituent, it supports the view that *again* operates at the semantic level of representation: syntactic constituency is not a necessary condition. Of course, the restituted state coincides with a constituent in many cases, which is only to be expected, but it can also clearly fail to do so.

4.2.3 Temporal adverbials in decompositional accounts

A last potential piece of evidence for a structural theory of English causatives comes from the behavior of temporal adverbials. The argument is as follows: the durative phrase *for x minutes* may modify the RESULT STATE constituent, such that the interpretation is that the state holds for that period of time:

- (45) a. John opened the door for 5 minutes → the door was open for 5 minutes.
b. John gave Mary the car for 5 days → Mary has the car for 5 days.

First and foremost, the set of verbs that project an external possessor (discussed extensively in section 4.2.2.2) allows the same adverbial interpretation:

- (46) a. John put on his shirt for 5 minutes → John had his shirt on for 5 minutes.
b. John caught the ball for 10 seconds → John had the ball for 10 seconds.
c. John remembered Mary's name for 5 minutes (and then he forgot).
d. John earned 10K dollars for an hour (and then he lost them all).

The enduring state here, as before, is composed from an external possessor and a possessed direct object, to the exclusion of the verb. Thus, the adverbial fails to modify a constituent in the same way *again* does. Observe that the stipulation that the state modified by the temporal adverbial is the entire VP (or *vP*) is wrong. Under such a stipulation, both the agent and its associated verbal head would fall under the scope of the

adverbial; this is quite wrong. (46a) does not mean that John engaged in a five-minute activity of putting on his shirt, or else that he was causing, for five minutes, a state where he is dressed. Rather, he put on the shirt once, which resulted in five minutes of being dressed.

I continue to draw from Horvath & Siloni (2010) arguments. Their central argument against the durative phrase as a diagnostic of constituency is that it is felicitous only under the interpretation that the external argument controls the termination of the result. If such interpretation is blocked, the durative phrase is infelicitous. Consider (47-48), Horvath & Siloni example (43)):

(47) Danny found the big wrapped box that contained the present his parents bought for his birthday. He immediately wanted to see what he was getting, so he opened the box. He took a look at the present, and intended to close the box and wrap it up right away, before anybody noticed. But then he was called to dinner, and later forgot about the open box and went to sleep. He remembered to close it only the following afternoon.

- (48) a. *Due to his forgetfulness, Danny opened the box for a whole day.
b. Due to Danny's forgetfulness, the box was open for a whole day

The examples above demonstrate that in the case where the agent did not intend the result state to terminate, (48a) cannot be uttered. This kind of evidence suggests that the durative adverbial is contingent upon the interpretation of the external argument.

Generally, the durative adverbial is unconstrained by volitionality and depends only on aspectual information:

- (49) a. The sun shone for 5 hours.
b. The horrible news worried David for the whole day.
c. This glacier has been melting for 5,000 years.

Horvath & Siloni's account is further strengthened by the observation that when a RESULT STATE is understood to have no natural termination, unintentional causers are infelicitous with the durative phrase:

- (50) #The wind opened the door for five minutes (Siloni 2014, example (34)).

The example in (50) casts doubts on adverbial modification as a tool of detecting a constituent since it clearly depends on information that is external to it.

In light of the above, we have seen clear evidence that the durative phrase may target a state which is not a constituent (see (46)), and is contingent upon the interpretation of the external argument (see (48),(49)). These data cannot be reconciled with a syntactic decomposition approach.

Recapitulating section 2 entirely, having reviewed representative accounts of Pylkkänen 2008 and Ramchand 2008 (section 4.2.1), and having shown that neither *again* nor temporal adverbials are reliable as diagnostics of constituency (sections 4.2.2 and 4.2.3), decompositional theories of English causatives are effectively left with no positive evidence.

4.3 Predictions of lexical accounts

4.3.1 The causative-unaccusative alternation is independent of compositionality

Now it is time to turn to the second theoretical track and consider the alternative. What would constitute positive evidence for a lexical theory of English causatives? What specific predictions would such a theory make for the causative-unaccusative alternation?

First, let us recall what the properties of the alternation are. The pairs of alternating verbs are characterized by the following semantic criteria:

- (51) Semantic criteria for causative-unaccusative pairs:
- i. The external argument corresponds to a cause role and shows thematic underspecification; the subject position may be occupied by agents, natural forces, instruments and eventualities (Levin & Rappaport-Hovav 1995; Van Valin & Wilkins 1996; Reinhart 2002). Under decompositional views, it entails the presence of a causative event.
 - ii. The internal argument has a change-of-state interpretation (Fillmore 1970; see chapter 2). Under decompositional views, it entails the presence of a RESULT STATE constituent.⁴⁸

If the relation between the pairs is lexically determined, it means that no post-lexical operation would affect the availability of the alternation. Specifically, lexical theories predict that syntactic operations applied to structures of non-alternating verbs do not give rise to a corresponding alternate. Decompositional theories make the opposite prediction.

- (52) Prediction of a lexical theory of the causative-unaccusative alternation:

Syntactic operations cannot give rise to the alternation.

In what follows, I survey different mechanisms to induce a syntactic structure which contains a causative event and a result state. As we will see, none of these structures exhibits the alternation (see Table (3) below). That is, there are good reasons to suspect that the alternation is insensitive to syntactic structure.

⁴⁸ Recall that proponents of decompositional theories use the restitutive reading of *again* in verbs such as *open* as evidence for the presence of a RESULT STATE constituent. That is, verbs showing causative alternations are resultatives.

Table (3): Lack of alternation for compositional causatives

	Causative event?	Syntactic Result state?	Decompositional prediction: alternates?	Alternates?
Unergatives with resultative predication <i>The clock ticked the baby awake</i> (section 4.3.2.1)	Yes	Yes	Yes	No
Causative-transitives with resultative predication <i>The storm swept the beach clean</i> (section 4.3.2.2)	Yes	Yes	Yes	No
Causative-transitives with particles <i>The sea ate the beach away</i> (section 4.3.2.3)	Yes	Yes	Yes	No
Causative-transitives with goal PPs <i>The wind pushed the cart across the parking lot</i> (section 4.3.2.4)	Yes	Yes	Yes	No

4.3.2 Non-alternating resultative constructions

4.3.2.1 Resultatives with unergatives

I shall discuss the observations in table (3) below. Let us begin the review of empirical findings by considering a fact I believe has not received much attention: there are no unaccusative alternates for unergatives with a secondary resultative predication, as is seen in (53) and (54):

- (53) a. The clock ticked the baby awake. (Randall 1982)
- b. The phone rang me out of my slumber. (Levin & Rappaport-Hovav 1995)
- c. The plane flew the ozone layer thin. (Washio 1999)
- d. The jackhammer pounded us deaf. (Randall 1982)
- (54) a. *The baby ticked awake.
- b. *I rang out of my slumber.
- c. *The ozone later flew thin.
- d. *We pounded deaf.

From the viewpoint of a decompositional approach, the data are not straightforward. The structures in (53) relate a causative argument in one predicate to a change-of-state

argument in another. If the causative event and the result state are two decomposable parts, then a priori the absence of the unaccusative is surprising. Observe that the change-of-state argument may be raised to the subject position via A-movement in passives, the same movement witnessed in unaccusatives and possible also with examples (53):

- (55) a. The baby was barked awake. (Goldberg 1995)
b. The baby was ticked awake (by the clock).
c. We were pounded deaf (by the jackhammer)

Thus, while other syntactic operations apply to these predicates, it is not so for the causative-unaccusative alternation. On the other hand, if the alternation were determined prior to the emergence of syntactic structure, the ungrammaticality of (54) would be fully expected, since these change-of-state verbs are not formed in the lexicon (e.g. **the baby ticked*). A decompositional analysis may account for the data in (53)-(54) by adding a stipulation which would rule out unergatives with resultative adjuncts:

- (56) The alternation is exhibited only if the root selects a complement.

If the decision whether a verb takes a complement is based solely on lexical information carried by the root (e.g. relevant θ -roles / θ -features), then the availability of the alternation is decided by the lexicon. In such a case, there is no theoretical justification to derive the availability of the alternation from the presence of characteristic syntactic heads since that derivation is reducible to the lexical information which licensed them.

Hence, a decompositional theory must assume that the decision whether a verb takes a complement is not determined lexically. Rather, the merging of a constituent in a complement position must also be affected by compositional, syntactic factors. Under that view, a compositional theory of the alternation encounters a problem: why are there

no unaccusatives like those in (54)? They are composed predicates with a RESULT STATE constituent (e.g. *the baby ticked-awake, we pounded-deaf*). As we will see, the same problem resurfaces in the following sections.

4.3.2.2 Resultatives of transitives

Confining ourselves to transitives, consider a further condition on alternating predicates: a change-of-state interpretation. Suppose that the alternation is syntactically governed. In such a case, the addition of a syntactic RESULT STATE to transitives, via secondary predication, should give rise to the alternation even in case of verbs that do not denote a result state. This is not borne out:

- (57) a. The winter storms swept [the beach (clean)].
b. *The beach_i swept [t_i (clean)].

Since the syntax of (57a) is the same syntax postulated for alternating verbs, the ungrammaticality of (57b) cannot be predicted from structure alone. Rather, *sweep* does not denote a change of state in its argument. Thus, the evidence in (57) strengthens the hypothesis that the alternation is independent of syntactic structure.⁴⁹

More data collected from Corpus of Contemporary American (COCA) is presented in (58) below. The ungrammatical corresponding unaccusatives follow in (59).

- (58) a. A woman lies down on a sandbank, the waves fall over her, push, lift, carry, throw, and the sand buffs [the body smooth].
b. Overhead the sky lapses into rain, pelting [the pavement clean].
c. The fierce waves of the Pacific have pounded [the old wood here smooth].

⁴⁹ Under a manner/result perspective (see Beavers & Koontz-Garboden 2012; Rappaport Hovav & Levin 2010), *sweep* is a manner verb. (57) shows that the compositional addition of a result state does not remove manner. Thus, only verbs lexicalized as result verbs alternate.

- d. You can see where these points have rubbed [the steel smooth].
- e. This, they presumed, was often enough to scour [the land clean] without disturbing the deep sea bottoms where proper red-yellow algae still survived.
- f. Once that dies down, the ice will scrape [the island clean] again.
- g. Clouds of ash, gas, and rock that scrape [the landscape bare] for miles around.
- h. Months ago, a realtor left the back door unlocked, and tonight it comes unstuck when a hard wind sucks [it open].
- i. The mix has the ability to absorb a tremendous amount of water. So if you use dry mix, it will suck [the reservoir dry].
- j. Richmond summers were just as hot, without benefit of ocean breezes to sweep [the air clean].
- k. The night's rain washed [the glacier clean], making its face shine a pale but scintillating blue.
- l. The blast threw Khan into the air, knocking [him unconscious] and covering him with debris.
- m. The speeding car knocked [him dead]. (google)
- n. The slight extra depth of the Micro SIM plus adapter had pressed [the pins flat].
- o. She hit a snow hill. The wind had packed [it hard], but not so hard that it was solid ice.

(59)

a. *The body buffed smooth.	i. *The reservoir sucked dry.
b. *The pavement pelted clean.	j.* The air swept clean.
c. *The old wood pounded smooth.	k. *The glacier washed clean.

d. *The steel rubbed smooth.	l. *Khan knocked unconscious.
e. *The land scoured clean.	m. *He knocked dead.
f. *The island scraped clean.	n. *The pins pressed flat.
g. *The landscape scraped bare.	o. *The snow hill packed hard.
h. *The backdoor sucked open.	

In all examples (58) above, the verbs do not denote a change-of-state in their direct objects. Hence, a lexical account predicts they do not alternate, as is borne out. The induction of RESULT STATE via secondary prediction does not change the picture, which is an unexpected result for compositional approaches. In particular, the data above are strong evidence against both purely constructional approaches (Goldberg 1995) and purely decompositional approaches (Borer 2005).

In this stage, one may be tempted to argue that unaccusatives composed of two predicates are unattested in English because English does not allow the formation of overt complex predicates (e.g. **John red-painted the walls*). That is, it is possible to argue that the second predicate cannot raise from inside the RESULT STATE constituent to the verbal projection because the latter projection is already occupied by the first predicate. However, this line of reasoning is false, because the ungrammaticality of these unaccusatives is also observed in Dutch, a language known to allow overt complex predicates. Consider:

- (60) a. *Dat de storm het strand schoon veegde*
that the storm the beach clean wipes
‘that the storm wipes the beach clean.’

- b. **Dat het strand schoon veegde*
 that the beach clean wiper
- c. *dat de slag Jan buiten westen sloeg*
 that the blow Jan out west beat
 ‘that the blow knocked Jan unconscious.’ (out west = knock unconscious)
- d. **dat Jan buiten westen sloeg*
 that Jan out west beat
- e. *dat de golven het hout glad beukten*
 that the waves the wood smooth pounded
 ‘that the waves pounded the wood smooth.’
- f. **dat het hout glad beukte*
 that the wood smooth pounded

The example above shows that although there is an overt complex predicate for the causatives (60a,c,e), the unaccusatives with the same complex predicate are ungrammatical (60b,d,f). Therefore, the hypothetical availability of composed unaccusatives (e.g. example (59)) does not depend on whether or not a language allows complex predicates.

4.3.2.3 Non-alternating causatives with particles

The same state of affairs is observed in more syntactic environments. For instance, Folli & Harley (2005) claim that the addition of certain particles renders verbs of consumption causatives. They argue that the particle changes the event structure to resultative and the flavor of little *v* from *v*-DO to *v*-CAUSE. Nonetheless, the presence of a causative event and

a result state still does not license an unaccusative alternate, as seen below (61a,c,e are taking from Folli & Harley 2005):

- (61) a. The sea ate away the beach.
b. *the beach ate away.
c. The wind carved the beach away.
d. *the beach carved away.
e. The washing machine chewed up the laundry.
f. *the laundry chewed up.

The examples above again show that outputs of syntactic operations do not give rise to the alternation. The same data is repeated in Italian. Folli & Harley claim that *si* in verbs of consumption is a light verb which changes the event structure to resultative. Yet, the very same structure does not license an unaccusative alternate:

- (62) a. *Il mare si é mangiato la spiaggia.*
the sea si is eaten the beach
'The sea ate away the beach.'
b. **la spiaggia si é mangiata.*⁵⁰
the beach si is eaten.
c. *Il vento si é ritagliato un pezzo di spiaggia.*
the wind si is carved a piece of beach
'The wind carved away a piece of beach.'
d. **un pezzo di spiaggia si é ritagliato.*
a piece of beach si is carved

⁵⁰ The intransitives in (62) are not rescued by an additional *ci* (assuming that a clitic is independently required to form the unaccusative).

e. *L'inflazione si é (ri)succhiata i risparmi.*

the inflation si is sucked the savings

‘the inflation sucked up the savings.’

f. **i risparmi si sono (ri)succhiati.*

the savings si is sucked.

Once again, the examples above show that post-lexical operations do not give rise to the alternation.

4.3.2.4 causatives and transitives with goal PPs

Schäfer (2008) argues, following Folli & Harley, that the phenomenon discussed in section 4.3.2.3 is not limited to consumption verbs; causatives may also be licensed by resultative syntax as well as particles. However, the resultative syntax does not show an unaccusative alternate, as is seen below:

(63) a. The wind pushed the shopping cart ??(across the parking lot).

b. *The shopping cart pushed across the parking lot.

More widespread is the modification of agentive manner of motion verbs e.g. *run*, *march*...) with PP goals or with directional particles. I explored such verbs in chapter 3, arguing them to be unaccusatives (see Borer 2005; Folli & Harley 2006; Hoekstra & Mulder, 1990; Levin & Rappaport-Hovav 1995, among many others). Let us re-iterate the relevant evidence below. Although they are unaccusatives that have syntactic RESULT STATES, the causative alternate is not productive for them (Narasimhan et al 1996):

- (64) a. *John swam/ran/danced the children apart.
 b. *She jumped/leapt the dog clear of the oncoming vehicle.
 c. *The general trudged/ambled the tired soldiers to their tents.
 d. *We sashayed/swaggered the models along the catwalk.

Even when they do sporadically show transitive alternates, the external argument does not correspond to the canonical, underspecified cause role, which licenses agents, natural forces and instruments. The transitive is strictly agentive, as seen below:

- (65) a. The soldiers marched to their tents.
 b. John / *the rain / *the hunger marched the soldiers to their tents.
 c. The mouse ran through the maze.
 d. John / *the trap / *the hunger ran the mouse through the maze.
 e. The horse jumped over the fence.
 f. John / *the stick / *the fright jumped the horse over the fence.

Recall that in chapter 3, I derived unaccusativity of such constructions via a VP-shell reanalysis of the PP constituent. Since their unaccusativity is derived via a compositional mechanism, the lack of alternation in (64) and (65) supports the conclusion that the availability of alternation is determined in the lexicon.

4.3.3 Summary of the empirical findings

I reviewed evidence motivating a lexical analysis of the causative-unaccusative alternation. Syntactic operations which induce causative structures were shown not to give rise to unaccusative alternates. Table (3) is repeated below:

(63) Table 3, repeated:

	Causative event?	Syntactic Result state?	Decompositional prediction: alternates?	Alternates ?
Unergatives with resultative predication <i>The clock ticked the baby awake</i> (section 4.3.2.1)	Yes	Yes	Yes	No
Causative transitives with resultative predication <i>The storm swept the beach clean</i> (section 4.3.2.2)	Yes	Yes	Yes	No
Causative transitives with particles <i>The sea ate the beach away</i> (section 4.3.2.3)	Yes	Yes	Yes	No
Causative transitives with goal PPs <i>The wind pushed the cart across the parking lot</i> (section 4.3.2.4)	Yes	Yes	Yes	No

Syntactic approaches that maintain that the alternation expresses a non-directional relation between two structures (Alexiadou et al., 2006; Borer, 2005; Folli & Harley, 2005; Schäfer, 2008, Pylkkaenen for the case of English Zero-causatives, among others) cannot explain the absence of the intransitives.

Theories arguing for syntactic causativization are also compromised given my findings. There are three relevant problems:

- (i) I have shown in the first part of the chapter that there is no positive evidence for the existence of decomposed structure for English causatives. That is, syntactic theories failed to show that there are good reasons to accept a causative head on top of a RESULT STATE constituent.
- (ii) Manner verbs with goal PPs are unaccusatives. Syntactic causativization fails to predict the absence of corresponding productive causative alternates or their sporadic agentive versions (see (49)-(50)).
- (iii) Syntactic theories also do not explain what blocks the formation of unaccusatives with a composed RESULT STATE constituent that may serve, in turn, as input to causativization (i.e, **the reservoir [sucked dry]*)

is a possible unaccusative which has a change-of-state interpretation: *the reservoir dried*). If only lexical change-of-state unaccusatives may give rise to the alternation, assuming a syntactic operation is clearly superfluous (see also (i)).

Recapitulating the second part of the chapter (section 4.3), I have shown a pattern: the alternation is insensitive to syntactic structure.

4.4 Conclusions

This chapter addresses the question: which component of the grammar is the locus of the causative-unaccusative alternation? I have hypothesized that it is derived lexically (abstracting away from the question of directionality). The hypothesis has been validated in a two-fold way. First, I showed that decompositional theories have no positive evidence. Specifically, evidence from adverbial modification, primarily the ambiguous readings of *again* and temporal adverbials, has been shown to be inconclusive. Thus, decompositional theories are, at best, compatible with the data so far, but do not perform better than competing lexical alternatives.

Second, I went on to demonstrate that, in fact, decompositional theories do perform less well. I compiled evidence corroborating the claim that the alternation is insensitive to syntactic decomposition. Namely, in any environment in which we introduced RESULT STATEs compositionally into a causative or an intransitive structure, that structure did not exhibit the alternation, given that it did not alternate in the absence of compositional modifications. This necessarily shows that the causative-unaccusative alternation is not a syntactically derived structural relation, given that

decompositional theories explicitly argue that alternating verbs decompose into a RESULT STATE constituent, as allegedly detected by the restitutive reading of *again* in verbs such as *open*.

Recapitulating, there is no positive evidence for deriving the causative-unaccusative alternation in the syntactic component. Rather, all empirical findings point to the contrary: it is fixed prior to the emergence of syntactic structure.

Appendix: Is a von-Stechowian analysis really simpler?

1 von Stechow's analysis

A syntactic decomposition approach to ambiguous readings of *wieder/again* such as von Stechow's has its precursors in Generative Semantics (McCawley 1968; Dowty 1979). Dowty (1979) discusses – and ultimately rejects – *again* as receiving a single semantic representation (see (1), Lang, Maienborn & Fabricius-Hansen 2003):

(1) *again* **p** =_{Def} **p** is the case and **p** has been the case before.

Abstracting away from theory-internal derivational mechanisms, Dowty's discussion yields a decompositional semantic representation of the relevant (accomplishment and achievement) verbs:

- (2) a. **again** (CAUSE (john, BECOME (OPEN, the door))).
b. CAUSE (john, BECOME **again** (OPEN, the door)).

Dowty himself never argued for the syntactic representation of semantically decomposed structures such as the ones in (2). Following the emergence of Distributed Morphology models (Halle & Marantz 1993; Marantz 1997; Chomsky 1998, among others), the expression of lexical semantics via syntactically decomposed structures was a natural development.

A modernized version of an unambiguous *again* is put forth by von Stechow (1996). Under his approach, the different readings of *wieder* represent nothing more than a structural scope ambiguity. The restitutive reading is a standard repetitive reading that arises from having *again* modify a small clause constituent in the scope of the operator BECOME. By contrast, the repetitive reading arises when *again* scopes over a [CAUSE [BECOME ...]] constituent. Von Stechow's representation is as follows:

(3) *weil Max das Fenster wieder öffnete*

because Max the window again opened

- a. [_{AgrS} Max₁ [_{AgrO} the window₂ **again** [_{VoiceP} t₁ [_{Voice} CAUSE
[_{VP} BECOME [XP t₂ OPEN]]]]]]] (repetitive reading)
- b. [_{AgrS} Max₁ [_{AgrO} the window₂ [_{VoiceP} t₁ [_{Voice} CAUSE
[_{VP} BECOME **again** [XP t₂ OPEN]]]]]]] (restitutive reading)

In what follows, I investigate theoretical issues and empirical challenges of a syntactic decomposition analysis.

2 Theoretical issues

von Stechow's account hinges on two central claims. The first of which is meta-theoretic: alternative approaches taking *again* to be polysemous (Kamp & Rossdeutscher 1994; Fabricius-Hansen 2001; Pedersen 2014) are a-priori not an appealing direction as they introduce redundancy. The claim is correct. However, it does not conclusively support von Stechow's argument. Semantic accounts which treat *again* as possessing a single meaning also abound (Klein 2001; Maienborn 2003; Dimroth 2004, see below). i.e. a syntactic decomposition analysis that performs better compared to competing semantic single-meaning theories is yet to be demonstrated. Furthermore, when pitted exclusively against multiple-meaning approaches, a syntactic treatment of *again* incurs a toll: it turns out that other adverbs in English do not display the same ambiguous behavior. So, in order to exclude the lack of ambiguity exhibited by the rest of the adverbs, a visibility parameter that controls the legible syntactic attachment sites of adverbs was suggested

(see von Stechow 2003; Beck 2005). Thus, the toll incurred for avoiding the stipulation of *again*₁ and *again*₂ is to introduce a similar stipulation concerning the adverb type: *adverbytype*₁ [+visible] (e.g. *again*) and *adverbytype*₂ [-visible] (e.g. everything else). I doubt that one can unequivocally argue that either of the stipulations incurs additional theoretical complexity. That is, if theoretical differences between accounts are in fact reducible to different selections of a specific value from a list, then, in Lang's et al (2003) words: "In the end, it remains to be seen whether there is any interesting difference between the 'lexicalist' and the scopal account at all."

von Stechow's analysis also hinges on a second claim corroborating a syntactic analysis: word order is correlated with different readings of *wieder/again*. More elaborately, If *wieder* occurs to the right of the object, then both readings are available. If *wieder* occurs to the left of the object, only the repetitive reading is available. However, Jäger & Blutner (2003) point out that a structural account alone cannot account for the disambiguating effect of focus accent. In spoken language, the two readings of (4) are differentiated prosodically: the repetitive reading comes with (narrow) focus on the adverb, whereas the restitutive reading has focus accent on the verb:

- (4) *(dass) John die Tür wieder öffnete*
 (that) John the door again opened
- | | |
|--|---------------------|
| a. <i>(dass) John die Tür WIEder öffnete</i> | repetitive reading |
| b. <i>(dass) John die Tür wieder ÖFFnete</i> | restitutive reading |

Moreover, the same pattern also emerges with indefinite objects when *wieder* precedes the object (thus contradicting von Stevchow's original prediction):

- (5) a. (weil) Hans wieder ein FENster öffnete
(because) Hans again a window opened restitutive reading
b. (weil) Hans WIEder ein Fenster öffnete repetitive reading

In light of the above, Jäger & Blutner argue that a syntactic decomposition account is unable to motivate the range of available readings. Rather, they suggest that the correlation between the adverbial interpretation and word order/prosody in German is an indirect one, mediated by focus. To this effect, they propose a pragmatically based optimality theory (OT) approach.

In direct response, von Stechow (2003) acknowledges that a syntactic account must take into consideration the above data, and proposes a more fine-grained decompositional analysis. He shows that this improved decomposition and scope approach is compatible with Jäger and Blutner's pragmatically based OT approach and, hence, can be seen as a viable alternative.

3 Empirical challenges:

At present, we conclude that from a theoretical perspective, a decompositional account is a viable alternative. However, it does not have theoretical advantages over competing accounts. Apart from the above theoretical considerations, a decompositional analysis ushers in certain crucial empirical problems, which were discussed in detail in chapter 4:

- (v) A restitutive reading may be obtained easily for external possessors. The restituted state does not correspond to a constituent (section 4.2.2.2).

- (vi) VP-ellipsis allows the elided constituent to target an antecedent which contains *again* with a different reading. This is unexpected if the reading is dictated by the properties of the syntactic constituent (section 4.2.2.3).
- (vii) Verbs such as *dig*, *slam* and *abandon* demonstrate that a restitutive reading may be inferred from an entailment of the activity rather than the alleged syntactic RESULT STATE (section 4.2.2.4).
- (viii) The syntactic structure accorded to Degree Achievements such as *widen* or *rise* in the presence of *again* seems to be purely stipulative (see section 4.2.2.5).

In light of the theoretical and empirical challenges listed, the answer to the question: “is a von-Stechowian account really simpler?” is negative.

4 An alternative pragmatic/syntactic account: underspecification

I believe that a theoretically desirable element underlies the assumptions of a decompositional account: a fixed-meaning analysis of *again* is preferable provided that that it explains the distributions of interpretations and grammatical word orders successfully.

Several proposals have been made in the literature towards this goal. For instance, Klein (2001) and Dimroth (2004) assign to *wieder/again* the meaning “... and not for the first time”, leaving the rest of the interpretational burden to the context. In what follows, I summarize Maienborn’s (2003) account as a representative theory that derives the restitutive reading of *again* from world knowledge (rather than a scope ambiguity), while retaining a compositional treatment of adverbs.

In the core of Maienborn's theory lies the observation that there is a need to extend the Davidsonian event semantics to tackle variable interpretational contribution of adjuncts. For instance:

- (6) a. Eva signed the contract in the office. (external modifier)
b. Eva signed the contract on a separate sheet of paper. (internal modifier)

The locative modifier in (6a) expresses the notion that the whole event specified by the verb is located in the office. By contrast, the locative in (6b) expresses that only a certain part of the event, pertaining to the signature, is located on paper. Such observations led Maienborn to propose the following architecture: in the case of external modification, the value of free variable introduced by the adverbial is identified strictly with the verb's own eventuality argument in a traditional Davidsonian way (e.g. (6a)). By contrast, in the case of internal modification, the value of the free variable is not the verbal event argument itself, but rather a certain part thereof that is determined by the conceptual system on the basis of contextually salient world knowledge. The actual target of such an event-internal modifier is semantically underspecified (e.g. (6b)). Maienborn suggests that the distinction between internal and external modification is compositionally reflected: externally-modifying adjuncts attach in the level of the maximal projection (XP) they modify, whereas internally-modifying adjuncts attach below it.

A repetitive *again* is thus base-generated in the VP periphery and modifies the verbal event variable in a standard way. The restitutive reading, however, is derived from an adverb that is base-generated in the V-periphery and whose contribution is computed on the basis of world knowledge. Maienborn puts forth a compositional theory in which syntax and pragmatics "conspire" to produce the relevant interpretation via semantic

underspecification which is associated with an adjunct generated in a low position (an event-internal modifier).⁵¹

If Maienborn is on the right track, then, her theory shares with von Stechow's account two theoretical constructs: (i) the semantic contribution of the adjunct is fixed (a free variable signifying repetition), and (ii) the way the variable of adjunct is assigned a specific value (e.g. a given event) is sensitive to its position in syntactic structure. However, her account differs significantly from von Stechow's by deriving the interpretation via a combination of compositional operations and underspecification. This line of reasoning makes the correct prediction that *again* does not necessarily serve as a constituency test and may have subtler inferences according to conceptual information (as extensively shown in chapter 4).

⁵¹ I cannot do justice here to a fully detailed account of the conceptual interpretation of event-internal modifiers. Generally speaking, an event-internal modifier (such as *again* in its restitutive reading) supplies further information on an already-established information in the conceptual structure (CS) of the event referent to which they attach. Maienborn (2003) uses abductive reasoning (Dölling 1997): the inference to the best explanation. In abductive frameworks, the interpretation of a sentence is the result of reducing it to its most economical explanation that is consistent with what we know. In that process of reduction, free variables are assigned values that depend on world knowledge, according to the available structures of the conceptual system during the course of the derivation (see Lang et al 2003:490-502).

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תקציר

חקר ממשק הלקסיקון-תחביר זוכה לתשומת לב רבה בתחום הבלשנות התיאורטית בעשורים האחרונים. חקר ממשקים ככלל נותן לנו הזדמנות מצויינת לבחון את הארכיטקטורה של הדקדוק: איזה מידע הוא פנימי למערכת נתונה? איזה מידע זורם בין המערכות? מהו המכניזם שבאמצעותו הוא מועבר? התשובות לשאלות אלו יאפשרו לבלשנים להבין את האירגון והיכולת החישובית של המערכות המעורבות.

שדה המחקר העיקרי של ממשק הלקסיקון-תחביר הוא **מימוש ארגומנטים**; הווה אומר: הקשר בין הפועל לבין המבנים התחבירים שבהם הוא יכול להופיע. בשדה זה יש שני נושאי מחקר שהתפתחו היסטורית באופן בלתי תלוי: (i) מיפוי הארגומנטים (ii) אלטרנציות פעליות. בעבודה זו אבחן הן את המיפוי והן את האלטרנציות של קבוצת פעלים מרכזית מאוד בספרות הבלשנית: הפעלים האנאקוזטיביים.

קבוצת הפעלים האנאקוזטיביים היא תת-קבוצה של הפעלים העומדים. פעלים אלו ממפים את נושאם לעמדה פנימית בעץ התחבירי (עמדה שהיא אחות של הפועל בעץ). נמצא כי קבוצת הפעלים הזו היא (פחות או יותר) אותה קבוצה בשפות שנחקרו. יתרה מכך: התברר שיש להם מקבילה יוצאת המצביעה על אותה פעולה. למשל:

(1) הדלת נפתחה. (2) הבלון התפוצץ. (3) הבגדים התייבשו.
 דן פתח את הדלת. הסיכה פוצצה את הבלון. השמש ייבשה את הבגדים.

מאחר שאין דובר ילידי לומד בעל פה את המבנים האפשריים של כל פועל ופועל, עלתה השאלה כיצד ניתן להגדיר קבוצת פעלים זו. בעבודה זו אטען שישנו חוק מסוים הממפה את הארגומנט של פעלים אנאקוזטיביים לעמדה פנימית, ושיש לחוק גם השלכות ישירות על המאפיינים של האלטרנציה.

המחקר נפתח בדיון במאפיין מוכר של האלטרנציה האנאקוזטיבית. כבר משנות ה-70 (Fillmore 1970) ידוע לבלשנים כי פעלים המשתתפים באלטרנציה מצייתים לאילוץ הבא: בארגומנט הפנימי חל שינוי מצב (change of state). מאחר ששינוי מצב איננו תכונה טריוויאלית של ארגומנטים או של פעלים, תיאוריה טובה של מימוש ארגומנטים תידרש להסביר מדוע האילוץ קיים.

אני מעניק אישוש אמפירי לקיומו של האילוץ בכך שאני בוחן פעלים רבים, הן יוצאים והן אנאקוזטיביים, שבהם הוא אינו מתקיים. בפעלים אלו אכן לא מתקיימת האלטרנציה, בהתאם לניבוי. לאחר בחינת הנתונים, אני מציע שקיום האילוץ נגזר ממבנה סקלרי של הפועל (Hay, Kennedy & Levin 1999; Kennedy & McNally 2005; Levin & Rappaport Hovav 2010; Beavers 2011). בקצרה, מבנה סקלרי הוא מבנה בו הפועל מטיל (projects) את הארגומנט שלו על גבי סקאלה מסויימת באמצעות פונקציית מדידה. הערך שהארגומנט מקבל על גבי הסקאלה הזו נקרא דרגה (degree). **המצב** (state) של ארגומנט ברגע נתון הוא אוסף הדרגות הרלוונטי. שינוי מצב, לפיכך, הוא שינוי בערך (בדרגה) שהארגומנט מקבל על גבי סקאלה אחת לפחות.

בהינתן שנושא הפועל היוצא מתפרש כגורם – הנחה שאיננה שנויה במחלוקת בספרות המקצועית (Dowty 1979, Reinhart 2002, Härtl 2003, Borer 2005, Alexiadou et al 2006, Pytkänen 2008, Horvath & Siloni 2011a, Harley 2012) – אני מציע תיאוריה שבה האינטראקציה בין יחסי גרימה לבין מבנה סקלרי גוזרת את אילוץ שינוי המצב. הן יחסי גרימה והן מבנה סקלרי ניתנים לצפייה באופן בלתי תלוי; נוכחותם בו-זמנית מגבילה את תנאי האמת של המשפט.

לאחר שאני מראה בפרק 2 כי מבנה סקלרי מנבא את אילוץ שינוי המצב של פעלים אנאקוזטיביים, הצעד הטבעי הבא הוא לבדוק את ההיפותזה כי הקשר בין מבנה סקלרי

לבין קבוצת הפעלים האנאקוזטיביים איננו מקרי. הווה אומר: ישנו חוק מיפוי הרגיש למבנה סקלרי, הממפה ארגומנטים פנימית. מאחר שהראיתי כי פעלים אנאקוזטיביים הם סקלריים, המיפוי הפנימי של נושאם נובע מהחוק.

בפרק 3 אני מעריך האם אפשר להגן על קיומו של החוק. ההערכה מתבצעת בשני שלבים. ראשית, אני בודק האם מבנה סקלרי הוא תכונה של אנאקוזטיבים בלבד ולא של יתר הפעלים העומדים. מתברר כי אכן כך. כלומר, אם קיים חוק כזה, הוא ימפה ארגומנטים פנימית, בהתאם לממצאים. שנית, אני בודק תופעות של אנאקוזטיביות משתנה (variable unaccusativity), שבהן הנושא של הפועל ממופה פנימית במבנה תחבירי אחד, אך ממופה חיצונית במבנה תחבירי אחר. הניבוי התיאורטי שלי הוא כי האינטרפרטציה של הפועל במבנה התחבירי הראשון, בניגוד לשני, תהיה סקלרית. לפיכך, חוק המיפוי פועל רק במקרה הראשון. מחקירת התופעות עולה כי אכן השינוי באינטרפרטציה מקביל לשינוי במיפוי. נראה אם כן, שחוק המיפוי המוצע עומד בבדיקה אמפירית.

בפרק 4 אני בוחן את השאלה באיזה רכיב של הדקדוק נקבעת האלטרנציה. כיום, רווחת העמדה המצדדת בארכיטקטורת single generative engine. הווה אומר: הלקסיקון איננו אלא רשימה של ערכים, והיכולת החישובית של מימוש הארגומנטים נגזרת מיכולות קומפוזיציונליות (סטנדרטיות) של התחביר. ארכיטקטורה כזו מתארת פועל כמורכב מסידרה של ראשים תחביריים. אני מראה שארכיטקטורה זו איננה יכולה להיות נכונה.

הטיעונים שלי נגד העמדה המרוקנת את הלקסיקון מכל יכולת חישובית נחלקים לשני סוגים. ראשית, תופעות שנחשבות כמאששות את פירוק הפעלים האנאקוזטיביים בתחביר לא נבחנו מספיק לעומק. בבדיקה מחודשת, מתגלה סידרה של בעיות מהותיות

ובלתי תלויות שהסבר תחבירי אינו יכול לתפוס את מקורן. יתרה מכך, תיאוריות לקסיקליות אינן גרועות יותר בתחזיותיהן לגבי אותם הנתונים. כלומר, לתיאוריות פירוק בתחביר אין שום יתרון אמפירי מוכח. שנית, אני מראה בברור כי מנוע תחבירי טהור מביא לייצור-יתר (overgeneration). למעשה, קבוצת הפעלים המשתתפים באלטרנציה מצומצמת ממה שהיינו מצפים, לֹו ייצוג הפעלים היה באמצעות פירוק תחבירי. לכן, מימוש הארגומנטים, לפחות במקרה של הפעלים האנאקוזטיביים, נקבע על ידי מנוע לקסיקלי ייעודי התפור בדיוק למידותיהם ואיננו תוצר לוואי של יכולות קומפוזיציונליות כלליות.

במבט על, העבודה בודקת את חלוקת העבודה בין הלקסיקון לבין התחביר על ידי התבוננות בהתנהגות פעלים אנאקוזטיביים. הטענות העיקריות שלי הן:

(i) ישנו חוק מיפוי הרגיש למבנה סקלרי הממפה ארגומנטים פנימית. פעלים אנאקוזטיביים הם סקלריים ולכן המבנה התחבירי שלהם צפוי. שינוי בתוצאות המיפוי חופף לקיום או להעדר מבנה סקלרי.

(ii) מניתוח סקלרי של אנאקוזטיבים נצפה גם לאילוץ של שינוי מצב בארגומנט הפנימי. תיאוריה טובה של מימוש ארגומנטים נדרשת להסביר את קיום האילוץ.

(iii) ייצוג אנאקוזטיבים ע"י מערכת תחבירית בלבד איננו עומד במבדק אמפירי מדוקדק. ללקסיקון יכולת חישובית עצמאית (קטנה יותר) המספיקה כדי לייצר **בדיוק** את המבנים התחביריים האפשריים עבור פועל כלשהו.

עבודה זו נעשתה בהדרכת

פרופסור ג'וליה הורבט

פרופסור טל סילוני

אוניברסיטת תל-אביב

הפקולטה למדעי הרוח ע"ש לסטר וסאלי אנטין
בית הספר למדעי התרבות ע"ש שירלי ולסלי פורטר

סקלריות ואנאקוזטיביות בממשק לקסיקון-תחביר

חיבור לשם קבלת התואר "דוקטור לפילוסופיה"

מאת

יוסף פוטשניק

הוגש לסנאט של אוניברסיטת תל-אביב

אוקטובר 2014