THE SYNTAX-SEMANTICS INTERFACE IN DISTRIBUTED MORPHOLOGY

A Dissertation
submitted to the Faculty of the Graduate School of Arts and Sciences
of Georgetown University
in partial fulfillment of the requirements for the
degree of
Doctor of Philosophy
in Linguistics

By

Justin Robert Kelly, M.S.

Washington, DC
April 9, 2013
THE SYNTAX-SEMANTICS INTERFACE IN DISTRIBUTED MORPHOLOGY

Justin Robert Kelly, M.S.

Thesis Advisor: Paul Portner, Ph.D.

ABSTRACT

Distributed Morphology (DM; Halle & Marantz 1993; Marantz 1997) is founded on the premise that the syntax is the only computational component of the grammar. Much research focuses on how this premise is relevant to the syntax-morphology interface in DM. In this dissertation, I examine theory-internal issues related to the syntax-semantics interface in DM. I also propose an account of the Encyclopedia, where meaning is stored in the semantic component of the grammar, since a clear model is generally absent from DM literature.

Much of this dissertation is based on the Strong DM Hypothesis (SDMH; Embick & Noyer 2007), the idea that roots lack syntactico-semantic features. However, a corollary of the SDMH is necessary but generally ignored: a root cannot take an argument directly. The SDMH has repercussions for the syntax and compositional semantics in DM, so I propose models for both that are compatible with the SDMH. By defining the syntax of lexical categories, based on Hale & Keyser (2002) and Baker (2003), I extend the syntax to present an inventory of functional heads in DM. Utilizing a semantics based on Kratzer (1996), I define a formal semantic model for DM, and show how it interprets the syntax. I then present an approach to causation based on Kratzer (2004) and Pylkkänen (2008), providing an overt syntax and semantics for a variety of causative structures in English; zero and analytic causatives, and prepositional and adjectival resultatives. This approach to causation is applied to an analysis of other argument-structure phenomena in English, as well as in Italian and Japanese, showing how these phenomena are accounted for within this model of DM. However, cases remain where
argument-structure phenomena cannot be resolved in the syntax alone, so I present an approach to the Encyclopedia with Hopper & Thompson’s (1980) typology of transitivity as a starting point, and show how it can account for such cases.

By further specifying the nature of the syntax in DM and integrating this with a broader semantic model encompassing both compositional semantics and the Encyclopedia, this dissertation contributes to our overall understanding of the DM framework.
ACKNOWLEDGEMENTS

This dissertation was a long time in the making, and it would not have been possible without the input and support from many people.

I consider myself extremely lucky to have worked with Dr. Paul Portner. From the outset, he took interest in my fundamental research questions, and he pushed me to integrate my perspective into a larger semantic framework. His wealth of knowledge was an invaluable resource as I struggled with some of the more formal portions of this work. As a mentor, Paul was patient with my progress and quick to provide thorough feedback. Many of the ideas in this dissertation grew out of discussions with Dr. Donna Lardiere, who introduced me to Distributed Morphology and challenged my understanding of DM at every turn. And Donna’s balance between attention to detail and a big-picture perspective was always refreshing and welcome.

When Dr. John Beavers came to Georgetown as a visiting professor, I knew little about the field of lexical semantics. John was excited to introduce me to new ideas from a variety of theoretical perspectives, and he encouraged me to integrate these ideas into my own work, providing insights I would have missed otherwise. Dr. Ruth Kramer began at Georgetown after I had finished coursework, but when I approached her with my dissertation topic, she gladly joined my committee. Ruth’s deep understanding of the nature of DM was highly appreciated as I dealt with some of the more obscure aspects of the theory. It was truly a pleasure to work with all of my committee members, whose passion for research and teaching served as inspiration to me throughout this process.

Many other professors and teachers provided assistance and inspiration as I pursued my degree. I am indebted to Dr. Raffaella Zanuttini, who read many of my early papers and was always encouraging when I was faced with a seemingly impossible problem. To Dr. Héctor
Campos I am grateful for lively and insightful introductory syntax courses, which integrated a keen focus on theory with a broad range of empirical data. I would like to thank Dr. Elena Herburger, who taught my first ever semantics class, introduced me to a number of interesting phenomena, and assisted me early on as I pursued research on yet. I have also been honored to take classes at the University of Maryland, College Park with Dr. Howard Lasnik and Dr. Norbert Hornstein, two leading minds in syntactic research. I am grateful for my linguistics professors at UMBC as well: Dr. Thomas Field, Dr. Omar Ka, Dr. Steven Young, and Dr. Germán Westphal, who sparked my interest in syntax. I want to express a special thanks to Mr. Victor Corbin, my Spanish teacher at Mt. St. Joe, who inspired my love for Spanish and grammar, and whose life lessons I will never forget.

During my time at Georgetown, my studies were funded by the Graduate School and the Department of Linguistics, which provided tuition support, research and teaching assistantships, and conference travel funding for several years. I am indebted to Manela Diez and Erin Esch, whose professionalism, availability, and efficiency were invaluable to me throughout my career at Georgetown.

I am grateful to Dr. Charles Stansfield for giving me a job when I needed one, even though I didn’t know anything about language testing, and I thank everyone I have worked with at Second Language Testing over the years.

Lastly, I would like to express my gratitude to all of my friends and family that have been by my side through part or all of this process. To my friends from Georgetown for all the fun times with and without linguistics over the years: Dr. Jim Gruber, Dr. Paco Fernández, Dr. Jong-Un Park, Dr. Mike Diercks, Dr. Zhaleh Feizollahi, Dr. Grant Armstrong, Dr. Luis Cerezo, Dr. Soojeong Eom, Dr. Natalia Jacobsen, Dr. Missy Baralt, Dr. Melissa Bowles, Dr. Ashley Fidler,
Dr. Anna Trester, Dr. Lissa Krawczyk, Corinne Hutchinson, Dana Hunter, Julie Lake, Luke Amoroso, Joo Yoon Chung, and Amy Pogoriler; Dr. Mika Hama, who was always up for food and fun to distract us from the daily grind; Dr. Cala Zubair, for music and talk and a great GLS conference; and Carlos Balhana, who got me out of the house when I needed to not think for a while.

I am also grateful to all of my friends outside of school for all the good distractions from work: my Baltimore people (John, Steve, Neal, Hilton, Marc, Jeff, Lauren, Dave, Ashleigh), my Carroll County people (Eric, Sam, Celestial, Beth, Jarrod, Tim, Rachel, all the Toms, Mario, Ray, Jason, George), my furry people (Cleo, Felix, Gu, Tiki, Eddie), and everyone in between. I want to express a special thanks to Gary Barnhart, who moved to DC with me when we both started grad school, and taught me so much about the world outside of linguistics.

My family was with me from the (very) beginning and they were tremendously supportive throughout, even though they sometimes ribbed me for being in school for forever. If I named everyone, it would take up another three pages, but I want to thank my Godmother Mary Ellen for always being a grounding force and always being ready to have a crab feast in the summer. To Paul Sabatiuk, always calm, understanding, and supportive, I’m so glad you’re part of our family. And to my mother, Jacquelyn Kelly: Mom, you have always believed in me, no matter how many mistakes I made, and your unconditional love is something I will cherish forever. I love you, Mom! I did it! We did it!

To Rebecca Sachs, now that we’re both done, let’s have some fun! With your help, I’ve found my sound shelter, now it’s time to head for the turnstiles!
This dissertation is dedicated to dad and Sean Mac. Love you guys, miss you.
# Table of Contents

CHAPTER 1: INTRODUCTION ........................................................................................................... 1

CHAPTER 2: THEORETICAL FOUNDATIONS OF DISTRIBUTED MORPHOLOGY ........ 8
  2.1 DISTRIBUTED MORPHOLOGY .............................................................................................. 9
  2.2 ARGUMENT STRUCTURE IN GB, MINIMALISM, AND DM ............................................. 18
  2.3 SYNTACTIC SYSTEMS AND THE SEMANTIC COMPUTATION ......................................... 24
  2.4 THEORY-INTERNAL CRITICISMS OF DISTRIBUTED MORPHOLOGY .......................... 28
  2.5 SOME CRITICISMS OF DM ................................................................................................. 36
  2.6 ON “LEXICALISM” ............................................................................................................... 47
  2.6 CONCLUSION ....................................................................................................................... 49

CHAPTER 3: FORMAL FOUNDATIONS OF THE SYNTAX-SEMANTICS INTERFACE IN DM ........................................................................................................... 51
  3.1 THE SYNTAX OF LEXICAL CATEGORIES IN DM ............................................................... 52
    3.1.1 Lexical Categories according to Baker (2003) ................................................................. 53
    3.1.2 Lexical Categories and the Syntax of Argument Structure ........................................... 57
  3.2 THE SYNTAX OF THE VERBAL SYSTEM IN MINIMALISM AND DM ............................ 61
  3.3 A MODEL-THEORETIC SEMANTICS FOR DISTRIBUTED MORPHOLOGY .................. 67
    3.3.1 Model .......................................................................................................................... 68
    3.3.2 Logical Language .......................................................................................................... 70
      3.3.2.1 Syntax of the Logic ................................................................................................. 71
      3.3.2.2 Semantics of the Logic .......................................................................................... 72
    3.3.3 Translations ................................................................................................................... 73
      3.3.3.1 Translation of Syntactic Terminals ....................................................................... 74
      3.3.3.2 Translation Rules .................................................................................................. 80
  3.4 APPLYING THE MODEL ...................................................................................................... 81
    3.4.1 Nominal and adjectival heads ...................................................................................... 82
      3.4.1.1 Determiners .......................................................................................................... 83
      3.4.1.2 More on adjectives ............................................................................................... 96
      3.4.1.3 Summing Up ........................................................................................................ 100
    3.4.2 The verbal architecture ............................................................................................... 100
    3.4.3 Summing Up ................................................................................................................. 104
  3.5 THE ENCYCLOPEDIA IN DM ............................................................................................. 104
    3.5.1 A typology of transitivity ............................................................................................. 106
    3.5.2 Transitivity and the Encyclopedia ................................................................................. 110
3.6 ON THEMATIC ROLES ........................................................................................................... 127
3.7 CONCLUSION.......................................................................................................................... 134

CHAPTER 4: APPLICATIONS OF THE FRAMEWORK TO CAUSATIVE ALTERNATIONS
.................................................................................................................................................. 135

4.1 THE CAUSATIVE HEAD......................................................................................................... 135
   4.1.1 Selectional characteristics of Cause$^0$ ........................................................................... 136
      4.1.1.1 Cause$^0$ selects the VoiceP .................................................................................. 137
      4.1.1.2 Cause$^0$ selects a vP .......................................................................................... 142
      4.1.1.3 Cause$^0$ selects a $\sqrt{\text{root}}$P ....................................................................... 149
   4.1.1.4 Selectional characteristics of Cause$^0$: Summing Up ............................................. 164
   4.1.2 Voice Bundling ................................................................................................................. 166

4.2 ON CASE AND HEAD MOVEMENT................................................................................. 168
   4.2.1 Case checking ............................................................................................................... 169
   4.2.2 On head movement ....................................................................................................... 173

4.3 EXPANDING THE ANALYSIS OF THE VERBAL SYSTEM...................................................... 182
   4.3.1 Subject-consumption alternations ............................................................................... 182
   4.3.2 Causatives of directed motion...................................................................................... 193
   4.3.3 Japanese causatives ...................................................................................................... 207
      4.3.3.1 Analytic and lexical causatives .......................................................................... 208
      4.3.3.2 Japanese causatives in DM ................................................................................. 215
      4.3.3.3 A revised analysis of Japanese causatives ............................................................ 221

4.4 SUMMING UP ...................................................................................................................... 233

CHAPTER 5: EXTENSIONS AND CONCLUSIONS ...................................................................... 234

5.1 EXTENDING THE SYSTEM: NOMINALIZATIONS AND GERUNDS .................................... 234

5.2 CONCLUSION....................................................................................................................... 241

REFERENCES ............................................................................................................................ 244
Chapter 1: Introduction


Like the model of grammar assumed in the Minimalist Program (MP)\(^1\), DM assumes that grammar is essentially derivational, where lexical and functional elements combine and move via successive applications of fundamental operations like Merge and Agree. However, a primary tenet of DM, which departs from standard Minimalist assumptions, is that lexical elements (i.e., nouns, verbs, adjectives, and adverbs) are not basic components of what is generally classified as the Lexicon, the list of elements that serves as the input to the derivational system. Rather, lexical material is stored as an acategorial ‘root’, which receives its lexical category specification by combining with a ‘lexical’ functional head in the syntax (Marantz 2001:18). This assumption is known as the Root Hypothesis (Arad 2005). For example, a root like \textit{break} (which will be represented throughout this dissertation as \texttt{\sqrt{break}}) can take on verbal

---

\(^1\) In referring to the Minimalist Program as a program of inquiry, I alternately refer to it as MP or Minimalism.
properties if it combines syntactically with the verbal functional head \( v^0 \), possibly yielding a sentence like in (1a), but if \( \sqrt{\text{break}} \) combines with a nominal functional head \( n^0 \), it will be realized with nominal properties, perhaps like in (1b).²

(1) a. John broke the vase.

   b. I see a small break in the vase.

The Root Hypothesis is one of the primary innovations of DM that sets it apart from standard Minimalism, and the derivational syntax leading to the categorization of roots is simply assumed as an aspect of the syntax in DM research. However, when we look at the nature of the root from the perspective of the syntax-semantics interface, several issues are not clear. What is the lexical entry and semantic type of the root? How does this initial combination of a root and a category-determining head look in a model-theoretic semantics? If we develop a semantic model that can account for the nature of the root in DM, does this have repercussions on other aspects of the model? One of the goals of this dissertation is to ask these exact questions, and propose a solution to them in terms of a formal semantic model that is compatible with the syntactic assumptions imposed by DM. To date, no one has proposed a rigorous semantic model that adequately describes how the syntax-semantics interface would explicitly function in a DM context. Therefore, the formal semantic model that I develop to integrate with a DM-style syntax is one major contribution of this dissertation.

Another issue in the DM literature with implications for the syntax-semantics interface is related to the content of roots. According to Embick & Noyer (2007:295): “Roots do not contain or possess grammatical (syntactico-semantic) features.” This assumption stems from the

² Initial research in the DM framework (e.g., Marantz 1997) assumed that the root always combined with a verbal head, and the distinction between verbs and nouns was derived later via combination with \( T^0 \) (verbs) or \( D^0 \) (nouns). Marantz (2001) and subsequent work revised the derivational process to involve ‘little’ lexical heads like ‘little v’ and ‘little n’, represented here as \( v^0 \) and \( n^0 \).
assertion in DM that the syntax is the only computational component of the grammar (Marantz 1997) and there is no ‘generative lexicon’; if a root had features, these features could potentially interact with other elements of the derivation with features pre-syntactically, thus weakening the anti-lexicalist stance taken in the formative DM literature. Therefore, the null hypothesis of DM is that roots lack syntactico-semantic features, which I formalize as the *Strong DM Hypothesis* (SDMH). Assuming the SDMH, we necessarily conclude that roots lack selectional features. Following Chomsky (2001), arguments are introduced into the computation via External Merge, and since Merge is feature driven, some type of selectional feature must be present to drive the selection/merger of arguments. So if roots lack syntactico-semantic features, then they cannot be responsible for selecting their complements (arguments), and some other element must be responsible. However, most research in DM that depicts the syntactic composition of roots assumes that a root can combine with a complement/argument *before* it combines with a category-determining head. (Marantz 1997; Embick 2004a, 2007; Embick & Marantz 2008; Embick & Noyer 2007; Harley 1995, 2005, 2009; Pylkkänen 2008) If we want to maintain a purely non-lexicalist formulation of DM that complies with the SDMH, this position is untenable. Therefore, one of the goals of this dissertation is to describe a syntactic framework that is compatible with a theory of DM that incorporates the SDMH.

Argument-structure alternations lie squarely at the interface between syntax and semantics because two (or more) structures containing a single root are available, and each structure has a different interpretation. This is the desired relationship in a strongly derivational framework like DM, where structure isomorphically maps to meaning. And given the anti-lexicalist stance of DM, where the syntax is the only computational component of the grammar, only the syntax can be responsible for the licensing of argument-structure alternations. Previous
DM analyses of argument-structure alternations rely on a syntax that does not comply with the SDMH, and these syntactic analyses are problematic when we try to derive the semantics from the syntactic output (e.g., Alexiadou 2001; Folli & Harley 2005, 2006, 2007; Pylkkänen 2008; See Chapter 4 for discussion). A goal of this dissertation is to show how the syntactic framework and the semantic model that I develop can account for certain argument structure alternations better than previous DM analyses.

Although syntactic approaches within the DM framework can explain a number of argument-structure alternations, cases where some roots permit argument-structure alternations while others do not present problems for any syntactic analysis. For example, in (2), break shows the causative-inchoative alternation, but destroy in (3) does not.

(2)  
  a. John broke the vase.  
  b. The vase broke.

(3)  
  a. John destroyed the vase.  
  b. *The vase destroyed.

Most DM analyses assume that something about destroy prevents it from participating in the causative inchoative alternation, relegating the issue to the Encyclopedia. In DM, the Encyclopedia is the repository of real-world meaning, and elements from the Encyclopedia are inserted at the LF interface between the syntax and the semantic computation. However, no research in the DM framework has attempted to explicitly define the content and structure of the Encyclopedia, or how it prevents destroy from alternating while allowing break to alternate. A final goal of this dissertation is to present an initial look at the formal structure of the Encyclopedia within the DM framework.
From the discussion above, it is clear that this dissertation focuses on the syntax-semantics interface in DM. In Chapter 2, I begin the investigation of the syntax-semantics interface in DM by presenting an introduction to the DM framework itself. I first present an overview of DM and its stance against the ‘Lexicalist Hypothesis’. I then evaluate the advantages of DM in contrast to lexicalist analyses with respect to the overall Minimalist enterprise. Next, I examine some theory-internal issues with how DM is formulated. Here, the focus is on the nature of roots and on the nature of the Encyclopedia. In terms of roots, the main issue lies in how roots are represented, both syntactically and semantically. With regards to syntax, DM theorists assume that roots lack syntactico-semantic features (again, the Strong DM Hypothesis or SDMH). The SDMH has repercussions for both the clausal syntax and the compositional semantics: how does the root enter into the syntactic computation initially, and what is the lexical entry of the root for the purposes of semantic interpretation? Turning to the Encyclopedia, most DM researchers follow Marantz (1997) in assuming that the Encyclopedia is where ‘special’ (i.e., idiomatic) meanings of roots are stored. However, the overall nature of the Encyclopedia is poorly defined, and tends to serve as a catch-all to explain anything that escapes a purely syntactic explanation. Therefore, I propose that the Encyclopedia is the repository for the translations of syntactic terminals; at the interface between the syntax and the semantics, the translations are inserted at the terminals so that the semantic interpretation can occur. Finally, I present some lexicalist criticisms of DM, but I show that these criticisms are unwarranted, and I conclude the chapter by presenting some perspective on the term ‘lexicalism’.

In Chapter 3, I present the formal backbone of the dissertation. Building on theories of the nature of lexical categories (Baker 2003; Hale & Keyser 2002), I first develop a framework for the syntax of category-determining heads that is compatible with the SDMH and fits within a
broader framework of DM and Minimalist syntax. Then, I develop a semantic model to interpret the output of the DM syntax. At the interface with the semantics, translations are inserted at the syntactic terminals. These translations are logical expressions, defined in terms of the logical language, and each translation has a semantic type. The syntax of the logic defines the logical types and how the types can combine, while the semantics of the logic allows us to interpret the meaning of logical expressions in terms of the model.

With the semantic model explicitly defined, I show how a fragment of English can be interpreted with respect to the model. I show the interpretation of basic nominal, adjectival, and verbal phrases, and I illustrate how the explicit semantic model gives us some insight regarding the nature of the ‘phase’, the syntactic unit of locality in Minimalism.

I conclude Chapter 3 with some further discussion of the Encyclopedia. As I mentioned above, while the DM framework can readily account for many instances of argument-structure alternations, cases where an alternation fails to occur are often attributed to the Encyclopedia. This is the case for a verb like destroy in (3), and it is also the case for the distinction between the verbal and nominal forms of grow in (4) – (5), where both transitive and intransitive versions are licensed when grow is a verb, but only the intransitive version is licit when grow is nominal.

(4) a. John grew the tomatoes.
   b. The tomatoes grew.

(5) a. *John’s growth of the tomatoes
   b. The tomatoes’ growth

I propose that the Encyclopedia can be formalized in terms of features, specifically those involved in Hopper & Thompson’s (1980) notion of transitivity. I show how these features are
applied to roots, and I show how the features interact with an interface constraint to define which roots may alternate.

In Chapter 4, I extend the syntactic and semantic analysis developed in Chapter 3 to account for additional data. I begin the chapter with a discussion of causation, focusing on the influential proposal regarding causation by Pylkkänen (2008). Pylkkänen proposes that in causative constructions, an overt causative head appears, and nature of this causative head varies according to language; in some languages Cause⁰ takes a ‘root phrase’ as a complement, in some it takes a vP, and in some it takes a ‘phase’. I show that Pylkkänen’s characterization is not entirely accurate, due to the fact that in some languages, it appears that Cause⁰ can take different complements depending on the context. Therefore, I propose a revision of Pylkkänen’s system, whereby two versions of Cause⁰ exist, one that takes an eventive complement and one that takes a stative complement. I show how this distinction allows us to account for a number of argument-structure facts in English, Romance, and Japanese. I conclude the chapter by developing a notion of markedness in the Encyclopedia, and I demonstrate how Encyclopedic markedness correlates with syntactic markedness to account for some argument-structure alternations that were problematic in previous analyses.

In Chapter 5, I examine nominalizations and gerunds and provide a sketch of how the concepts developed in this dissertation can be extended to contribute to the existing DM literature on the topic. Then, I briefly sum up what I accomplished in this dissertation, describe some limitations of the work, and suggest some directions for future research.
Chapter 2: Theoretical Foundations of Distributed Morphology

This chapter is intended to provide a thorough theoretical background for the subsequent discussion of the framework of Distributed Morphology (Halle & Marantz 1993; Marantz 1997; *inter alia*) (henceforth DM), highlighting some of the beneficial aspects of DM, and bringing to light some criticisms of DM as well.

In section 2.1, I provide some theoretical background for DM, and I introduce the primary tenets and the architecture of the grammar in a DM framework. In section 2.2, I focus on a variety of approaches to argument structure, showing how these approaches have evolved over time. The purpose of this discussion is to contrast previous approaches to argument structure with the one taken in DM and in this dissertation, that argument structure is derived entirely through syntactic processes. Section 2.3 presents a discussion of the semantics of derivational approaches to syntax that assume a fundamental split between word syntax and phrasal syntax. I present some issues with how the semantics interfaces with the syntax in such approaches, and I use this as a conceptual argument for DM, with a single syntactic computational system and a single interpretive semantics. Section 2.4 examines DM in a critical light, both theoretically and methodologically. On the theoretical side, I identify some issues with how DM is explicitly characterized as a linguistic framework, and I explain the implications that these characterizations have for the architecture of the grammar. When considering methodological issues, I evaluate how some syntactic analyses are implemented within the DM tradition. The purpose of the section is to identify problematic aspects of DM, with the intention to address these issues in subsequent chapters. In section 2.5, I introduce some of the external criticisms of DM and I show that many of these criticisms are unfounded, often based on incorrect
assumptions about the nature of DM. I conclude the chapter with a discussion of the term “lexicalism” in section 2.6.

2.1 Distributed Morphology

In Chomsky’s (1970) seminal discussion of nominalizations, the so-called ‘lexicalist position’ is introduced, contrasting with the ‘transformationalist position.’ This distinction effectively reduces to what kinds of operations are permitted in the syntax; under the ‘lexicalist position’ (or alternatively, the Lexicalist Hypothesis or Lexicalism), word-formation operations like nominalizations cannot occur in the syntax, while the ‘transformationalist position’ (Lees 1960; Lakoff 1970) argues that nominalizations must be formed via syntactic transformation in the classical sense. Prior to Chomsky’s formulation of the Lexicalist Hypothesis, all generative grammar was essentially ‘transformationalist’:

“…the correctness of the transformationalist position was taken for granted: and, in fact, there was really no alternative as the theory of grammar was formulated at that time.”

Chomsky (1970:188)

When we consider the origins of the Lexicalism debate, it is important to remember the historical context of Chomsky’s writing. A phrase marker began as a kernel sentence, and transformations took the form of rewrite rules that operated successively, beginning with the kernel. Chomsky’s primary criticism of the transformationalist position was related to the lack of systematicity in the transformational system. For example, if nominalizations are formed by way of transformation from a verbal kernel sentence, it is difficult to see how the all argument realization possibilities for the nominalization destruction in (2) could be derived from the single sentence in (1a) involving verbal destroy. Similarly, if (2a) can be derived by transformation
from (1a), it’s not clear why a similar transformation could not be employed to derive (3b) from (3a).

(1)  
  a. John destroyed the vase.
  b. *John destroyed.
  c. *The vase destroyed.

(2)  
  a. John’s destruction of the vase
  b. The destruction of the vase
  c. The vase’s destruction
  d. The destruction

(3)  
  a. John grew tomatoes.
  b. *John’s growth of tomatoes

Therefore, Chomsky proposed that some transformations, specifically category-changing (i.e., derivational) transformations, occur in the lexicon, separately from the syntactic transformational process. Within the newly developed Lexicalist Hypothesis, the idiosyncratic facts about derivational processes, such as illustrated with (1) – (3) above, were encoded in the lexicon, and did not have to be accounted for syntactically. In other words, the lexicon became the repository for the idiosyncratic phonological, syntactic, and semantic properties of words. The lexicon was a computational system of its own, where word-formation could occur, and which fed the computational system of the syntax.

As Marantz (1997) points out, the primary objective of Chomsky’s (1970) discussion is to argue against deriving nominals from sentences, and not to argue for deriving nominals in the lexicon. Since these were the only logical possibilities within the architecture of the theory of the
time, arguing against deriving nominals from sentences essentially entailed deriving nominals in the lexicon, arguing against transformationalism effectively entailed arguing for Lexicalism. This is due to the fact that no middle ground existed; there was no way to derive something in the syntax without starting with a sentence. However, with the strongly derivational nature of syntax within Minimalism (see especially Chomsky 2000, *et seq.*), the entailment described above disappears, and a syntactic derivation no longer presupposes a fully formed kernel as its basis. Rather, a derivation proceeds from a set of lexical items and functional elements, and the contents of the set largely determines the derivational process.

As an alternative to the Lexicalist Hypothesis, researchers in the DM framework propose that the syntax is the only generative component of the grammar. The lexicon, on the other hand, is not a separate module of the grammar with its own operations and constraints, but rather is ‘distributed’ between three separate non-computational ‘lists’ that interface with the syntax, thus the name Distributed Morphology. The basic architecture of the grammar is schematized in (4).
The first list, the ‘Narrow Lexicon’, provides the syntax with primitives with which to operate, including functional heads and lexical roots. Elements from the Narrow Lexicon are selected into a numeration/lexical array, and the syntax can choose these elements to manipulate in the course of the derivation. Functional heads contain bundles of syntactic features, while lexical ‘roots’ are featureless and are underlingly neutral with respect to lexical category.

According to the Root Hypothesis (Marantz 1997; Arad 2005), roots obtain their lexical category via syntactic combination with a category-determining functional head. For example, if the root √destroy merges with a verbal functional head in the syntax, it takes on a verbal role in the sentence; it can have arguments, it can take tense and aspect morphology and combine with
inflectional functional heads, it can display agreement, and it can have an eventive denotation. On the other hand, if √destroy merges with a nominal functional head, the root takes on a nominal role in the sentence; it can combine with determiners, it can agree with determiners, adjectives, and verbs, etc. Elements from the Narrow Lexicon enter into the syntactic computation via the operation Merge in a Minimalist-style numeration/lexical array. More details about the specific syntactic mechanisms assumed in this dissertation are presented in Chapter 3.

The second list, the ‘Vocabulary’, provides phonological forms for syntactic terminals, both roots and functional heads alike. Elements of the Vocabulary (Vocabulary Items) are inserted in the morphological component of the grammar, which intervenes between Spell Out and the phonological component proper of the grammar. The Vocabulary effectively translates between syntactic features of the syntactic terminals (i.e., features of the Narrow Lexicon) and features that are legible to the morpho-phonological system. Multiple Vocabulary Items can map to a single syntactic terminal node, so after Spell Out, Vocabulary Items compete for insertion in the terminals. For example, consider the structure in (5).

(5) NumP
    /\                  
   /   \                
  Num₀ [Plural] nP    n₀√cat

In (5), we have an instance where a root merges with a nominal head, which then merges with an inflectional head Number₀, which is responsible for number morphology on the noun. Several different morphemes have the feature specification [Plural] in English, including [-s], [-en], and [Ø]. However, both [-en] and [Ø] have additional features besides [Plural], as they only appear in specific contexts. Therefore, in (5), the morpheme [-s] wins the competition for
insertion in Num⁰. However, if the root was √sheep, the morpheme [Ø] is the most highly specified, so [Ø] would be inserted. The information about the morphological specification of a root is encoded in the Vocabulary Item for the root and not on the root as a syntactic object.

The third list, the ‘Encyclopedia’, contains the list of special meanings of roots or of larger objects, like syntactically composed idioms (e.g., *bit the dust, kicked the bucket*). However, defining the difference between ‘special meaning’ and ‘non-special’ or ‘regular’ meaning (which remains undefined in DM) is somewhat problematic and is discussed further in section 2.4 below.

The ‘distributed lexicon’ described above is attractive from the perspective of Minimalist syntax, because the Vocabulary and the Encyclopedia are relevant at the interfaces. According to Chomsky, syntactic convergence in Minimalism essentially reduces to satisfying interface conditions- the syntactic output must be legible to the morpho-phonology and to the semantics. In DM, this translates into having the right structure so that the right elements are inserted at the PF and LF interfaces, by the Vocabulary and the Encyclopedia respectively.

For overall convergence of a derivation, a number of interface conditions must be met. Even a morphologically poor language like English shows PF requirements, as the proper Vocabulary items must be inserted for PF convergence. For example, consider the sentence in (6) with the basic structure in (7). The irregular plural of *child* and the suppletive past-tense form of *eat*, namely ‘ate’, must be inserted by the Vocabulary for PF convergence. And with regards to LF convergence, a root like √eat is acceptable with the two-argument structure in (7), but for some reason, roots like √arrive or √cry are not permissible with this structure. In addition to the interface requirements, syntactic constraints from Minimalism (e.g., locality constraints, Bare Phrase Structure (Chomsky 1995b)) hold in DM as well.
(6) The children ate apples.

(7)
```
TP
  \_ T^0
      [Past]
  \_ VoiceP
      \_ DP
          the children
      \_ Voice^0
          vP
              \_ DP
                  apples
              \_ v^0
                  √
                      eat
```

To conclude this section, I would like to illustrate how a typical derivation works in DM. First, let’s look more at how the ‘distributed lexicon’ works. The Narrow Lexicon contains a list of roots and functional heads. Functional heads have the syntactic features necessary to drive the syntactic computation. For example, a head like T(ense) licenses case on DPs, and drives subject movement to its specifier via an EPP feature. The syntactic features of the functional heads can be discussed in terms of the standard features of Minimalism. In the Narrow Lexicon, roots lack syntactico-semantic features, so the only thing that a root does is indexes the root in the Narrow Lexicon with its corresponding Vocabulary Item at PF and Encyclopedia Entry at LF. The Vocabulary item for a root contains the relevant morphophonological characteristics of the root. For example, with break, the corresponding Vocabulary Item might contain information like \{/breIk/, Past: /brouk/, Participle: /broukn/, etc.\}. The Encyclopedia Entry for a root contains semantic and real-world knowledge regarding the root. For example, with break, the Encyclopedia Entry would contain a denotation like \[\lambda x.\text{break}(x)\], in addition to other information: when break appears with up, it can mean ‘to end a relationship’, when break appears in a context where billiards are involved, break means something like ‘to hit the cue ball
at the rack of target balls’, etc. Thus, both semantic meaning and real-world meaning are encoded.

Crucially, roots as syntactic objects are distinguished from each other by the nature of the root itself; √break is a different syntactic object than √destroy, and √break and √destroy each have their own corresponding Vocabulary Items and Encyclopedia Entries. Roots are necessarily present in this form in the syntax. Again, take for example √break; when this root is present in the syntax, we can guarantee that the Vocabulary Item for √break is inserted at PF and the Encyclopedia Entry for √break is inserted at LF. If, on the other hand we assumed that a general root syntactic object √root was inserted in the syntax, we could run into problems. For example, consider break and sink. Both behave the same with respect to the syntactic computation; both can participate in the causative-inchoative alternation, both take a middle, both can be passivized, etc. The semantic component of the grammar and the morphophonological component on the grammar operate on the output of the syntax. And since break and sink behave the same syntactically, if we just had a general element √root in the syntax, there is nothing to prevent the Encyclopedia Entry for break being inserted at LF but the Vocabulary Item for sink being inserted at PF. Clearly, we do not want this kind of mismatch, so a specified root (√break instead of √root) in needed in the syntax. Since each root is a distinct syntactic object, any root can be selected into the Lexical Array for insertion into the syntax.

Now that I have described the contents of the distributed lexicon with respect to roots, let me illustrate how a derivation occurs in DM. For a sentence like John put the ball in the drawer, the following elements would be selected from the Narrow Lexicon and inserted into the Lexical Array: {T^0-past, Voice^0, v^0, John, √put, the_1, ball, P-in, the_2, drawer}. The elements of the Lexical Array are then inserted into the syntax in the relevant positions in the syntactic
computation. The contents of the Lexical Array determine what appears in the syntax, but a syntactic computation can be valid but crash at one of the interfaces. So if, for example, we had a Lexical Array like \{T^0\text{-}past, \text{Voice}^0, v^0, John, \sqrt{put}, the_1, ball\}, the output of the syntactic computation would be *John put the ball*. Since *put* does not have any syntactico-semantic features in DM, the syntactic derivation would converge. However, at the interface with LF, the derivation would be problematic because *put* requires a PP goal. This is a problem at the syntax-semantics interface because the requirement that *put* have a PP goal must be encoded in the Encyclopedia, given that the goal requirement of \sqrt{put} cannot be encoded on the root itself; that would involve a syntactico-semantic feature on the root, which is prohibited in DM.³ After the syntactic derivation is complete, the Encyclopedia Entries for the terminals are inserted at LF and the Vocabulary Items for the terminals are inserted at PF.

In this dissertation, I assume the same architecture of the grammar proposed for DM, with the same underlying Minimalist foundation. In the description of the architecture of the grammar that I have presented here, I refer to LF; for the purposes of this dissertation, LF is where the semantic component of the grammar functions. LF involves post-syntactic operations like quantifier raising, in addition to the actual semantic computation. In investigating the nature of the syntax-semantics interface in DM, I propose some revisions to the syntax, which facilitates the application of a model-theoretic semantics in DM.

³ This is not the case for prepositional elements with derived nominals. For example, if we consider the root \sqrt{refer}, many of the nominals derived from the root can take specific prepositional phrases: referent (of $X$); referral to $X$; reference to $X$; co-reference with $X$. First, these PPs are adjuncts because they are not required. However, we must somehow encode that certain prepositions appear with certain derivations of refer. If we assume that these nominal are derived in the syntax in DM, and the root lacks syntactico-semantic features, these prepositional requirements must be encoded Encyclopedia, which can be done in a straightforward manner. We would simply encode in the Encyclopedia Entry for \sqrt{REFER}, \sqrt{REFER} + -ent takes a PP adjunct headed by P-of, \sqrt{REFER} + -al takes a PP adjunct headed by P-to, etc.
2.2 Argument Structure in GB, Minimalism, and DM

One aspect of GB was the notion that argument structure was lexically represented. For example, if a verb like *hit* is present in a derivation, we know that two arguments are going to be present, and that one argument is the participant that performs the hitting action, and the other argument is the participant that gets hit. The thematic information described here was conveyed in terms of thematic grids, where a verb was listed with its argument positions and thematic roles. For verbs like *break*, which can appear in both intransitive and transitive contexts, there were simply two different instantiations of *break*, one with one argument/thematic role, and one with two, respectively.

One important line of research focused on increasing our understanding of argument structure. Within the framework of GB, Grimshaw (1990) proposes that argument structure (a-structure) is a structured representation for lexical item, containing thematic and aspectual information about that lexical item. It is this a-structure that serves as input to the syntax, which essentially enforces that the thematic and aspectual information in the a-structure is conveyed syntactically.

Other research on argument structure sought to examine how lexical information like argument structure is conveyed syntactically. In Levin & Rappaport Hovav (1995), the linking between lexical semantic representations and syntactic representations of argument structure is further formalized to account for argument structure alternations. For a verb like *break*, with both intransitive and transitive instantiations like in (8), the lexical semantic representation can be mapped to argument structure in two different ways, as illustrated in (9) (adapted from Levin & Rappaport Hovav (1995:108)).
(8)  a. The vase broke.

     b. John broke the vase.

(9)  a. Intransitive break

     LSR  \[ [[x \text{ does something}] \text{ cause } [\text{become } y \text{ broken}]] \]

     Lexical binding \[ \exists \]

     Linking rules \[ \downarrow \]

     Argument structure \[ \langle y \rangle \]

     b. Transitive break

     LSR  \[ [[x \text{ does something}] \text{ cause } [\text{become } y \text{ broken}]] \]

     Linking rules \[ \downarrow \]

     Argument structure \[ x \quad \langle y \rangle \]

For Levin & Rappaport Hovav, verbs of accomplishment like break denote an eventuality composed of two subevents, the causing subevent \([x \text{ does something}]\) and the main subevent \([\text{become } y \text{ broken}]\), as indicated in the LSR. In the transitive construction in (9b), the argument in the causing subevent is mapped to the most prominent argument position \(x\) by the linking rule in (10), and the argument in the main subevent gets mapped to the internal argument \(\langle y \rangle\) by the linking rule in (11)

(10)  \text{Immediate Cause Linking Rule}

     The argument of a verb that denotes the immediate cause of the eventuality described by that verb is its external argument.

(11)  \text{Directed Change Linking Rule}

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

     The intransitive form in (9a) is derived by ‘binding’ the argument in the causing subevent via existential closure, essentially removing it from the derivation, and the argument in the main
subevent gets mapped to the internal argument \(<y>\) by the linking rule in (11) as normal. In this manner, lexical semantic information and argument structure is conveyed syntactically.

One major contribution of these and many other influential accounts of argument structure (Dowty 1979; Jackendoff 1972, 1976, 1983, 1990; Levin and Rappaport Hovav 1998, 2005; Rappaport Hovav and Levin 1998; Pinker 1989; inter alia) is the observation that lexical meaning and syntactic structure must be linked together in some way. As the issue of argument structure was investigated more, ideas from research on thematic roles and predicate decompositions were further incorporated into GB and ultimately Minimalism. This allowed researchers to explore a transparent syntactic representation of lexical semantic information. For example, the insight that the vase has the same thematic role in both (8a) and (8b), even though it serves two distinct grammatical functions (subject and object), can be encoded in the syntax; according to the Uniformity of Theta-Assignment Hypothesis (UTAH) (Baker 1988), since the vase serves as the theme in both (8a) and (8b), it should initially be projected in the same syntactic position, namely in direct object position, in both sentences, and in (8a) it moves from object position to subject position.

Such syntactic approaches to argument structure were further developed and elaborated in the 1990s and incorporated into Minimalism (Chomsky 1995; Kratzer 1996). For example, Kratzer (1996) proposed that the external argument of a verb be separated from the verb itself; according to Kratzer, the external argument of a verb licensed by a ‘light-verb’ head like Voice\(^0\) or \(v^0\), and this head is also responsible for licensing Case on the direct object. When Voice\(^0/v^0\) is not present, the external argument is not projected and Case cannot be checked on the internal argument, so the internal argument must move to subject position for Case checking, thus formalizing Burzio’s Generalization (Burzio 1986). This approach also supports the
Unaccusativity Hypothesis (Perlmutter 1978), whereby the subject of unaccusatives is generated in a different position than the subject of unergatives. This type of system also allows for a parallelism in syntactic projection between the causative variant of break and unergative verbs on one hand (where the subject is base-generated in the specifier of $v^0$), and the inchoative variant of break and unaccusative verbs on the other hand (where the subject is base-generated as the complement of the verb).

Rappaport Hovav & Levin (1998) implement a direct mapping between a decompositional syntax compatible with Minimalism and a decompositional approach to lexical semantics. Rappaport Hovav & Levin (henceforth RHL) assume an essentially lexicalist notion of argument structure; each predicate has an underlying lexical semantic representation that constrains the syntactic environment in which the predicate may appear. For RHL, each aspectual class is associated with an event structure template; the five base event structure templates are given in (12).

(12) a. Activity: \[ x \ act_{<\text{manner}>} \]

b. State: \[ x \ <\text{state}> \]

c. Achievement: \[ x \ become [ <\text{state}> ]\]

d. Accomplishment 1: \[ [x \ act_{<\text{manner}>} \] cause \[ y \ become [ <\text{state}> ]]]\]

e. Accomplishment 2: \[ x \ cause [ y \ become [ <\text{state}> ]]]\]

Within this system, ‘canonical realization rules’ account for argument structure by mapping Encyclopedic knowledge of a predicate to an event structure template. Since the notion of breaking involves an externally caused state, the canonical realization rule for accomplishments in (13) is appropriate for break. The event structure template for a verb is then

---

21
mapped onto the syntax, with a series of well-formedness conditions that constrain the syntactic realization, two of which are given in (14) and (15).

(13) externally caused state → [x cause [y become [<state>]]]

(14) Subevent Identification Condition (RHL 1998:112)

Each subevent in the event structure must be identified by a lexical head (e.g., a V, an A, or a P) in the syntax.

(15) Argument Realization Condition (RHL 1998:113)

a. There must be an argument XP in the syntax for each structure participant in the event structure.

b. Each argument XP in the syntax must be associated with an identified subevent in the event structure.

For example, in a sentence like John broke the vase, the verb break is an externally caused state, so the canonical realization rule in (13) is utilized. In a standard Minimalist analysis, (14) is satisfied, as the two relevant verbal functional heads in a transitive construction $v^0$ and $V^0$ are present in the syntax, $v^0$ being associated with the cause subevent and $V^0$ being associated with the become subevent. And (15) is satisfied as well: John maps into $x$ and is associated with cause in the event structure, and the vase maps into $y$ and is associated with become in the event structure. The parallelism between semantic decomposition and syntactic decomposition is illustrated in (16).

(16) Semantic decomposition: [John cause [the vase become [<break>]]]

Syntactic decomposition: [$_v$P John $v^0$ [VP $V^0$-break the vase]]
Within the system developed by RHL, the argument structure of a verb from any aspectual class can be augmented, but subevents (and associated arguments) inherently associated with a verb cannot be eliminated, due to the *Monotonicity Hypothesis*; “…assume that verb meaning is built up in a monotonic fashion, in a way which precludes the elimination of any basic element of meaning…” (RHL 1998:105) In order to account for the intransitive variant of *break*, which violates the monotonicity hypothesis and fails to satisfy (15a) because the external argument is not present, RHL look to Romance, where intransitive uses of verbs like *break* are morphologically more complex, often employing reflexive morphology as illustrated in the Spanish in (17).

(17) El vaso se rompió.

the cup refl broke

‘The cup broke.’

RHL follow Chierchia (2004), arguing that reflexivization is always present when verbs like *break* appear as intransitives. The morphological reflexive marking serves to satisfy (15), and English is just odd in that no overt marking is present. (See Koontz-Garboden 2007 for a related analysis.)

One of the main goals of DM (and similar approaches, such as in Borer 2005a,b and Ramchand 2008) has been to show that argument structure is entirely due to the syntactic computation. The influential work by Heidi Harley and Raffaella Folli (Harley 2005, 2008, 2009; Folli & Harley 2005, 2006, 2007) is a great example of an in-depth examination of how argument-structure patterns can be derived using the standard Minimalist assumptions, updated from the DM viewpoint. One goal of this dissertation is to pursue this line of reasoning further.
2.3 Syntactic Systems and the Semantic Computation

One of the primary claims in Marantz (1997) is that there is no separate ‘generative lexicon,’ and that ‘words’ are formed in the syntax in the same way that phrases are formed. There is a single computational system, the syntax. This claim is fundamentally in conflict with other systems framed within the GB/Minimalist framework, where there is a separate component of grammar, a ‘word syntax’ or a ‘generative lexicon,’ with its own rules and relations for word formation, separate from (but similar to) the rules and relations relevant for phrasal syntax (Lieber 1992, Di Sciullo & Williams 1987; Selkirk 1982; see Williams 2007 for recent defense of this line of analysis). The core assumptions of this version of the Lexicalist Hypothesis are summarized by Williams (2007:356) in (18).

(18) a. The word system provides input objects to the phrasal system.

b. The objects in the word system are atomic in the phrasal system.

c. The word system and the phrasal system have different internal syntax.

d. The word system is subject to a condition of “immediate resolution” (locality, or word-internal atomicity) which is irrelevant to the phrasal syntax.

The approaches that assume something like (18) have primarily focused on developing accounts of morphology, but I would like to present in this section one issue with these approaches from the perspective of the semantics. From (18), we can essentially assume that the

4 Many other frameworks can be described as ‘lexicalist,’ e.g., HPSG (Pollard & Sag 1994 and related work), the generative lexicon of Pustejovsky (1995), Jackendoff (1990), and many others. These systems have underlyingly different assumptions regarding the architecture of the grammar when compared to Minimalism and DM, and it is beyond the scope of this dissertation to give a thorough description and theoretical comparison of all lexicalist theories in contrast to DM. Therefore, I keep my discussion here to the theories that assume a generative lexicon with an overall GB/Minimalist foundation.
word system is a different module of the grammar than the syntax; the word system feeds the syntax, is opaque to the syntax, has different structure than the phrasal syntax, and has different rules than the syntax. If the word system is a separate module of the grammar from the syntax, then we must understand how the word system and the syntax interact. More specifically looking at the semantics, since the output objects of the word system are opaque to the syntax, they should also be opaque to the phrasal semantics. Consider the noun *nominalization*. If we assume that this noun is derived in the word system, we would have something like the structure in (19).

(19)

```
NP
  VP
    N/A -ation
      nominalize
```

Informally, we begin with a noun (or adjective) stem *nominal*, which then takes a verbalizing affix -ize, which in turn takes a nominalizing affix -ation. These types of word formation operations are what the word system described by (18) is designed to account for. However, what is the semantics of the word *nominalization*? It is clearly different than the semantics of *nominal*; the latter has a meaning like ‘the property of being a noun’, while the former has a much more complex meaning. First, we must compute the meaning of *nominalize*, which is something like ‘a event of becoming noun-like’ or ‘a event of achieving a noun-like property.’ In that way, a sentence like *Linguists nominalize verbs* means something like ‘Linguists do something that causes verbs to become noun-like.’ Then, the -ation affix has a meaning like ‘the resulting state or property of an event’, so *nominalization* means something like ‘the property or state resulting from something becoming noun-like’. The question is, how is
the meaning of *nominalization* computed in a system that assumes (18) above? If *nominalization* is atomic once it gets to the syntax, the internal structure of word formation is opaque, and *nominalization* simply serves as a terminal, to be manipulated by the syntax and interpreted by the semantics. And in systems like GB/Minimalism, semantics is interpretive, in that it reads the syntactic output and interprets meaning based on this output. Therefore, in approaches that employ a word system based on (18), it would seem that the meaning of *nominalization* would have to be somehow attached or indexed to the syntactic terminal so that the semantics can interpret it. How is the meaning of *nominalization* arrived at?

From here, there are a couple different ways we can proceed. First, we could assume that the same semantic system that interprets the phrasal syntax also interprets the output of the word system. If this is the case, we must assure that the semantics is capable of interpreting the word system; the semantics is designed to interpret phrasal syntax, and since phrasal syntax and word syntax are different, we would have to explicitly show that the same semantic system can account for both syntactic systems. Then, we might also ask why the same semantic system is employed if there are two separate syntactic computations.

Alternatively, we could assume a separate (but similar) semantic component of the grammar interprets the output of the word system. Conceptually, this makes the argument for a separate word system more complex; in order to account for human language, we need one computational system and one interpretive system for words, and a completely separate computational system and interpretive system for phrases.

Along with the issues regarding the number of semantic systems that may be needed, we have to ask about how the semantics interacts with the syntax under frameworks involving a word syntax. For the purposes of this discussion, I want to focus on how the elements derived in
the word syntax are interpreted, given the fact that in systems with a word syntax, the internal structure of lexical items is opaque to the syntax. There are a number of logically possible ways that elements derived in the word syntax could be interpreted. If we assume either a single semantic system or dual semantic systems, one for the word syntax and one for phrasal syntax, the relevant semantics could apply to the output of the word syntax before the operations of the phrasal syntax. Then, the meaning could be present as a feature on the derived element in the phrasal syntax, or the semantics could store the meaning of derived lexical items until the phrasal syntax applies and the semantics can apply to the phrasal semantics. In this latter case, for example, the semantics would interpret the output of (18), and the denotation of nominalization would be stored until the phrasal syntax involving nominalization was complete. Then, when the semantics interprets the output of the phrasal syntax, the denotation of nominalization would be inserted.

Again, in a grammatical architecture with either a single semantic system or dual semantic systems, we could propose that the semantics interprets both the meaning of phrasal syntax and word syntax after the computation of the phrasal syntax. This proposal has a number of issues. In standard Minimalism, the structural output of the phrasal syntax is relevant to the semantics; the semantics can ‘see’ the structural relations encoded in the phrasal syntax. But if the output of the word syntax is opaque to the phrasal syntax, it is difficult to see how the semantics could then see into the structure of the word syntax in order to interpret it. We would also have to propose that the meaning of elements formed in the word syntax needs to be computed before the phrasal semantics.

Another logical possibility is that elements derived in the word syntax do not have derived meanings, but these meanings are simply stored in the semantics. For example,
nominalize and nominalization are both derived from nominal in the word syntax, but the meanings of these elements exist independently. This proposal would seem to eliminate the reason that something like a word syntax is proposed, that morphologically complex words (and their meanings) are not primitives but are derived by the grammar.

Given this line of reasoning, it seems that a system like DM, with a single computational system and a single interpretive system, is conceptually better than a system built on (17), with a word syntax separate from phrasal syntax. Of course, this is just a conceptual argument, and therefore we cannot make any judgments about the validity of DM as compared to frameworks built on (18). Rather, I use this conceptual argument to motivate the potential benefits of the DM analysis I present in this dissertation, with a single syntactic computational system and the accompanying interpretive semantics.

2.4 Theory-internal criticisms of Distributed Morphology

One of main problems with the DM framework lies not in the how the framework itself is constructed, but with the lack of a single, definitive, and unambiguous explanation of the DM framework. Although there exist several sources that present what purports to be the state of the art in DM, many of these sources are vague concerning critical definitions. In other cases, key the sources contradict each other. In this section, I focus on some problematic aspects of the DM architecture that I have identified and that I try to resolve in this dissertation.

Within the DM literature, one of the questions left unanswered revolves around the status of roots from the Narrow Lexicon with respect to what features are inherent to these elements and thus present during the syntactic computation. The following passage from Marantz (1997:204-205) is indicative of the overarching question:
“It is an important and open question how much information about roots is present in the narrow Lexicon (e.g., does the narrow lexicon contain sufficient information to identify particular roots or does it contain only information about classes of roots…), whether the phonological forms of roots are among the Vocabulary items, and whether and how the particular choice of root from the narrow Lexicon or from the Vocabulary feeds semantic interpretation. The issue of whether root morphemes, like all grammatical morphemes, are subject to “late insertion” (post-Syntactic insertion) is orthogonal to the question of whether or not there’s a computational lexicon…”

Embick & Noyer (2007:295) make the assumption that “Roots do not contain or possess grammatical (syntactico-semantic) features.” On the other hand, Embick & Noyer propose that functional heads have “a full complement of syntactico-semantic features.” (Embick & Noyer 2007:299) This assumption I label the Strong DM Hypothesis (SDMH), as in (20).

(20)  Strong DM Hypothesis (SDMH)

A root has no syntactico-semantic features.

The SDMH has wide-ranging repercussions for the architecture of the grammar in DM. There are two necessary consequences of the SDMH, formalized in (21) and (22). I will discuss these in turn.

(21)  SDMH: Corollary 1

A root has no subcategorization features (i.e., a root cannot take an argument directly).

(22)  SDMH: Corollary 2

The denotation of a root is stored in the Encyclopedia.
First, let’s discuss Corollary 1 of the SDMH in (21). The logic behind (21) is fairly straightforward. In Minimalism, all aspects of lexical items are encoded as features. Even the operation Merge is feature driven. Arguments enter the syntactic computation via External Merge. If roots completely lack syntactic-semantic features, then there is no way to encode subcategorization on a root. In other words, if a root lacks features, there is no feature to drive the merger of the argument. Therefore, roots cannot take arguments directly. Functional heads, on the other hand, can have syntactic-semantic features, so subcategorization must be encoded on functional heads via some kind of a selectional feature. Roots only take arguments indirectly through combining with functional heads. However, most research in the DM framework assumes that the internal argument in a sentence begins the derivation as the complement of the root, so in these systems, no feature is necessary to drive External Merge\(^5\), or the process is substantially different for processes involving Internal Merge (where Internal Merge is essentially equivalent to movement). In Chapter 3, I propose a syntactic model that conforms with the SDMH by assuming that roots cannot take arguments directly.\(^6\)

Now, let’s turn to Corollary 2 in (22) above. Corollary 2 of the SDMH is related to the Encyclopedia in DM. Throughout the DM literature, the Encyclopedia is considered the repository for ‘special meaning’, which is typically defined as idiomatic meaning and other non-compositional meaning. What is left undefined in the DM literature is meaning not considered ‘special’. Where are regular, compositional meanings introduced into the derivation? What is the

---

\(^5\) Although see Hornstein (2001) for a proposal whereby thematic roles are features on verbs.

\(^6\) The hypothesis that roots lack syntactic-semantic features is orthogonal to the question whether roots contain morpho-phonological features. For the purposes of this dissertation, it would be ideal if roots also lacked morphophonological features as well. Both perspectives are taken in the DM literature. Embick (2000) argues that a morphological feature is necessarily present on the root to account for the difference between analytic and syntetic variants of the Latin perfect. On the other hand, Kramer (to appear) argues for an approach to natural and grammatical gender in Amharic where the relevant computations occur entirely in the morpho-phonological component of the grammar.
status of the denotations that participate in the compositional semantics? If we assume that the Encyclopedia contains only special meanings, some other mechanism must be implemented to insert denotations and interpret the compositional semantics. And if such a mechanism is required, we must ask whether it is ordered in relation to the Encyclopedia, and if so, how. We could posit that roots contain denotations, but then we must ask whether denotations are syntactico-semantic features referred to in the SDMH. If we consider denotations as syntactico-semantic features, then the denotations/features of roots must be introduced post-syntactically if we also assume the SDMH. A post-syntactic repository for denotations that is not part of the Encyclopedia is possible, but seems unnecessary given that the Encyclopedia is already assumed as a post-syntactic repository for special meanings. Therefore, I propose that it is too restrictive to claim that the Encyclopedia is the repository for ‘special’ meaning and that we need to revise the definition of the Encyclopedia to contain all meaning, including ordinary denotations. Under this proposal, the choice of regular meaning or special meaning would be determined based on contextual factors. By including all meaning in the Encyclopedia, a clearer idea of the function of the Encyclopedia surfaces: The Encyclopedia examines the syntactic output, inserts denotations at the terminals, and the overall truth conditions are calculated by the semantic component of the grammar. The Encyclopedia also evaluates the syntactic output to see if a relevant special meaning, such as that associated with an idiom, can be mapped to the structure, and if so, the special meaning competes with the computed meaning.\footnote{This is essentially the position taken by Arad (2005), who assumes that the root contains real-world knowledge, and meaning of the root must be calculated with respect to the syntactic environment of the root. Arad focuses on Hebrew morphosyntax, with its complex system of templates for a given root. These templates condition root meaning in Hebrew in the same general way that root meaning is conditioned by the syntactic environment in English, but in Hebrew, the template system is quite rich, providing for a wider variety of root conditioning than generally found in English.} To illustrate, consider the syntactic output in (23a). The Encyclopedia would insert the denotations of the terminals and
compute the truth conditions in (23b), and no relevant special meaning would be available. On the other hand, given the syntactic output in (24a), the Encyclopedia could insert the standard denotations and the compositional meaning in (24b) would be calculated by the semantics.

However, the idiomatic meaning associated with \([\text{VP kick the bucket}]\) in (24c) could also be made available by the Encyclopedia and the idiomatic meaning of the sentence as a whole would be calculated. The two possible meanings in (24b) and (24c) would compete for insertion, based on context; (24b) could be the response to a question like *How did the paint spill?*, while (24c) could be the response to *What happened to John?*\(^8\)

(23)  
\begin{enumerate}
  \item \([\text{CP John kissed Mary}]\)
  \item \([\text{[John kissed Mary]}] = 1\) iff there is an event of John kissing Mary and the event occurred in the past.
\end{enumerate}

---

\(^8\) In sentential semantics, it is almost always the case that, for a given sentence containing special meaning, a regular compositional meaning can also be assigned, even if the special meaning is highly preferred. For example, with a sentence like *John bit the dust*, the preferred meaning is that John died (or something equally unpleasant happened to John), although the sentence could be interpreted literally. However, with nominal compounds in English, it is often the case that, even though the compounds are productive, no compositional meaning can be assigned, and the idiomatic meaning is the only one available. For example, in a compound like *fire truck*, *fire* and *truck* are both of type \(\langle e, t \rangle\), so if they are sisters, they would combine via Predicate Modification (Heim & Kratzer 1998) to form another element of type \(\langle e, t \rangle\) with the meaning \(\lambda x.\text{fire'}(x) \land \text{truck'}(x)\); this is clearly not the intended meaning of *fire truck*, so unless we propose additional structure in the syntax to support a compositional computation of *fire truck*, it is not clear how *fire truck* is compositional. The issue of compositionality in compounds is further complicated by the fact that, for example, compounds involving *truck* have a variety of different meanings relating *truck* to the other element involved: a fire truck is used to put out fires, a garbage truck takes away garbage, and a UPS truck brings packages from UPS. Thus, there seems to be some relational meaning between the elements in a nominal compound, but it is not strictly compositional meaning.

In cases of nominal compounds, we might assume that the DP is constructed in the same manner as a sentence, with its own lexical array mapping to the syntax, resulting in spell out to the interfaces. With this in mind, consider the example of *fire truck*. At LF, the Encyclopedia inserts the denotations for *fire* and *truck*, although the compositional meaning does not result in the intended meaning of the compound. However, a special meaning is available for *fire truck*, namely ‘a truck that is equipped with fire suppression equipment that is used by the fire department’, and since no compositional meaning is available, no competition is necessary, and the special meaning will always be mapped to the compound. Then, the DP, along with the assigned special meaning, is then mapped into the lexical array for the sentential syntax.

In compounds where the meaning is more compositional, for example *fire suppression equipment*, we would have to look more closely at the internal structure of the compound to see how (or if) compositionality is obtained.
The clarification of the nature of the Encyclopedia proposed here fits nicely into the general conceptualization of grammatical interfaces assumed in DM. I have argued that the Encyclopedia contains both special meanings and regular denotations, which compete for insertion at the syntax-semantics interface, where the competition is resolved according to context, both syntactic and extralinguistic. Given this definition of the Encyclopedia, the syntax-semantics interface would function in a manner parallel to that proposed for the syntax-morphology interface, where morphological forms compete for insertion by the Vocabulary based on the featural specification of the syntactic terminals.

Another issue with the Encyclopedia in DM is related not to how it is conceptualized, but rather to how it is used by researchers. Since the exact contents of the Encyclopedia have been left vague, the Encyclopedia has become the default locus of explanation for anything that cannot be explained purely in the syntax. Thus, the Encyclopedia serves a similar function for DM theorists as the lexicon does for other theories.

According to Embick (2004), the Encyclopedia is where the possibility of transitivity alternation for a given root is listed. This notion of the Encyclopedia is also utilized by Harley and Noyer (2000) to explain the difference between *destroy* and *grow* in their verbal and nominal forms, as in (25).

(24)  a. \( [\text{CP} \text{ John kicked the bucket}] \)

b. \( [[\text{John kicked the bucket}]] = 1 \) iff there is an event of John kicking the bucket and the event occurred in the past.

c. \( [[\text{John kicked the bucket}]] = 1 \) iff John died.
(25)  
a. John destroyed the vase.

b. John’s destruction of the vase

c. John grew tomatoes.

d. *John’s growth of tomatoes.

e. The tomatoes’ growth.

For Harley and Noyer, both (25a) and (25c) involve a causative verbal head $v_{\text{CAUSE}}$, but in the nominalizations in (25b) and (25d), there is only a single underspecified nominalizing head $D^0$. Since $\text{destroy}$ involves ‘external causation’ (Levin and Rappaport Hovav 1995), the specifier of $D^0$ may be interpreted as the external causer, but $\text{grow}$ implies ‘internal causation’, so only the internal causer may occur in the specifier of $D^0$ (25e). Since the distinction between internal and external causation is rooted in real-world knowledge, and is not specifically linguistic in nature, it is not surprising that this distinction is encoded in the Encyclopedia. However, it is not clear how this distinction relative to verbal and nominal heads is formally encoded. The Encyclopedia would have to specify that, for $v_{\text{CAUSE}}$, any causer is appropriate, but for the underspecified $D^0$, the specifier must match the verb root for type of causation.

A final issue that I would like to point out is that the DM literature is often contradictory with respect to the inventory of functional heads available in the Narrow Lexicon. In initial DM analysis of the verb phrase, the verbalizing functional head was the equivalent of Chomsky’s $v^0$ and Kratzer’s $\text{Voice}^0$ (Chomsky 1995; Kratzer 1996), the functional head responsible for introducing the external argument/agent into the structure, although Marantz makes the distinction between $v_1$, which does introduce an agent, and $v_2$, which doesn’t. In later work, Marantz finds it necessary to make the distinction between $v^0$, the verbalizing head, and $\text{Voice}$,
the head that introduces arguments. Harley (2005) also concludes that the argument introducing head and the verbalizing head must be distinct, and implements a set of ‘flavors’ of $v^0$ to derive the structural differences between transitive and intransitive predicates; transitive predicates involve $v_{\text{CAUSE}}$ (or $v_{\text{DO}}$, depending on whether agency is involved) selects Voice$^0$ while $v_{\text{BECOME}}$ (or $v_{\text{BE}}$, depending on whether a change of state occurs) does not (see also Folli & Harley 2005, 2006, 2007).

A similar discrepancy in DM can be found when examining the nominal architecture. In early work on DM, it was assumed that the verbalizing functional head was a light-verb head similar in nature to Voice$^0$ or $v^0$ (in terms of Kratzer 1996 and Chomsky 1995, respectively), while the nominalizing functional head was D$^0$. (Halle and Marantz 1993; Marantz 1997; Harley & Noyer 2000). In this view, there is a fundamental difference between the structure of nominal and verbal projections. In more recent work in DM, the structure of the DP was revised. Several researchers (Embick & Noyer 2007; Harley 2005, 2008; Marantz 2001) now assume that $n^0$, a nominal cognate of $v^0$/Voice$^0$, is the nominalizing functional head, with other nominal functional layers merged above $nP$, terminating with DP. This proposal brought verbal and nominal structures closer together architecturally, although no explicit motivation was made for the change.\(^9\)

In summary, much of the DM literature contains inconsistencies related to the syntax and semantics that is necessary based on the fundamental assumptions of DM. I have defined the Strong DM Hypothesis based on prior DM research, and shown that this hypothesis has certain

---

\(^9\) In the literature going back to Abney (1987), researchers looked to draw parallelisms between the DP and the CP/\(\lambda\)/VP architecture in terms of structure (e.g., Radford 2000, Ogawa 2001), but no strong consensus could ever be reached regarding the architectural correspondences in the nominal and verbal domains, and it increasingly appears that such architectural parallelism is ultimately untenable (Bruening 2009; Punske 2012). However, in Chapter 3, I motivate the inclusion of $n^0$ in the inventory of functional heads in the syntax, focusing on the syntactic and semantic differences between the nominal and verbal systems, and not from the perspective of architectural parallelism.
repercussions for the syntax and semantics. I have also shown some inconsistencies in the DM literature. It is precisely the issues that I have described in this section that I address in the remainder of this dissertation, specifically in Chapters 3 and 4.

2.5 Some criticisms of DM

In recent literature, critics of DM (Ackema & Neeleman 2007; Williams 2007; Newmeyer 2009) present data that they claim is problematic for DM. I would like to preface my discussion of this literature with an observation; much of the criticism levied at DM by these researchers is based on foundational works in DM (mostly Halle & Marantz 1993 and Marantz 1997). Although these articles laid the groundwork for future research on DM, many issues had not been fully resolved, and many of the cases that have been introduced as problematic (e.g., compounding) have since been analyzed in more recent DM research (e.g., Harley 2009 for compounding). I do not claim that the contemporary DM research has fully developed solutions to these issues, but I do think it is worthy to note that researchers in DM have been looking at the difficult cases that appear problematic, and fruitful research has resulted.


(26)  
(a. Late Insertion  
(b. Underspecification  
(c. Syntactic Hierarchical Structure All The Way Down
After dismissing (26a-b) as properties of a number of other prior theories (e.g., Late Insertion in Generative Semantics; Underspecification in Williams 1981), Williams argues that the only truly distinctive property of DM is the claim in (26c), rephrased in (27), and due to this assumption, DM should be considered the null hypothesis because it has a single combinatorial system, while other approaches where words are built in a system separate from the syntax adds something (possibly wrong) to the null hypothesis. (Williams 2007:359)

(27) Phrases are built (directly) out of morphemes, with no intervening notion of word.

Although Williams is technically correct, the theoretical environment that serves as a background to the current debate has been couched within the a lexicalist approach to GB/Minimalism for so long (at least back to Williams 1981, if not Chomsky 1970) that Marantz assumed that the Lexicalist Hypothesis is the theoretical null hypothesis.

As a further consequence of (27), Williams (2007:359-360) notes that in DM, ‘words’ and idioms cannot be listed in the lexicon, but as stated by Marantz (1997:204), “The Encyclopedia lists the special meanings of particular roots, relative to the syntactic context of roots, within local domains.” This contrasts with the traditional view that idioms are actual linguistic units. According to Williams, this traditional view is desirable because, a VP like kick the bucket has a meaning associated with a linguistic form, which can easily be inserted into a derivation. On the other hand, Williams claims that the position in DM is problematic because in the VP kick the bucket when kick means ‘die’, the bucket must lack meaning (because otherwise, it would violate the Theta Criterion), and a special contextually determined rule must apply to strip away the meaning of the bucket. Williams argues that the problem is centered on the fact that the idiomatic meanings are centered on roots and not on the idioms themselves; if an idiom
has meaning and can function as a linguistic unit, the problem does not arise. However, Williams’ argument is has some issues. Williams claims that if an object is added to the verb *die*, it results in a violation of the Theta Criterion, and as the Theta Criterion is phrased in GB/Minimalism, I agree. However, the notion of the Theta Criterion is highly problematic in Minimalism, as discussed at length by Hornstein (1999, 2001). Second, the Theta Criterion is entirely couched within the GB/Minimalist perspective, where additional mechanisms must be introduced to account for verbs like *break*. If *break* is underlyingly intransitive, the transitive version would appear to violate the Theta Criterion, and if *break* is underlyingly transitive, the intransitive version would produce a violation. Therefore, in GB/Minimalism, there is a need to assume that there are two different (and potentially derivationally related) lexical entries for *break* in order to avoid such Theta Criterion violations. Within highly derivational, syntactically driven theories such as DM, the Theta Criterion is not a principle of grammar, but is epiphenomenal, and apparent Theta Criterion effects are simply a product of the interaction between the syntactic output and verb meaning (Borer 2005b; Marantz 1997; Pylkkanen 2008; Ramchand 2008; Travis 2000). In DM and related theories, the syntax is free to merge any combination of verbs and arguments, and the Encyclopedia filters out illicit combinations. For example, the syntax is free to derive sentences like *John died the bucket*, but due to the lexical semantics of *die* (primarily its nature as an unaccusative verb), the sentence with two arguments is filtered out. Furthermore, if the Encyclopedia stores idiomatic meaning associated with the verb *kick* in the context of *kick the bucket*, and the idiomatic meaning competes with the compositional meaning in a manner similar to what I have outlined in section 2.4, then Williams’ argument no longer applies. The compositional meaning of *kick the bucket* can be calculated as
normal, and *kick* never means ‘die’, as claimed by Williams. Rather, the Encyclopedia sees *kick* in the context of *kick the bucket* and assigns a possible denotation ‘die’ to the entire constituent.

Williams (2007:360-361) also discusses Marantz’s claim that, since idioms are constructed syntactically, they should be sensitive to locality constraints, and he identifies $v^0$ as one locus for locality constraints. According to Marantz (1997:208-209): “Nothing above this head may serve as the context for the special meaning of any root below this head, and vice versa.” As a result, there should be i) no idioms with fixed agents, and ii) no idioms with causative morpheme and lower agentive verb. Williams offers (28) and (29) as counterexamples to i) and ii), respectively.

(28) The cat has got X’s tongue. ‘X is speechless.’

(29) The devil made me do it. ‘I am not responsible for doing it.’

In Marantz’s 1997 version of DM, as in Minimalism, the typical assumption is that $v^0$ is a phase head and thus relevant for locality constraints. However, in Minimalism, the entire projection of $v^0$, including the specifier, is considered to be ‘at the edge’ of the phase (Chomsky 2001). In a standard finite monoclausal transitive sentence, the agentive subject in the specifier of $v^0$ is considered to be part of the lower phase (the $vP$ phase), so it can bind a reflexive in object position (in English, a necessarily local relation), but it is still accessible to the higher phase (the CP phase), so an Agree operation between finite $T^0$ and the subject can result in subject-verb agreement and case checking (and the resulting movement of the subject to the specifier of $T^0$ due to an EPP feature on $T^0$). Marantz excludes the subject in the specifier of $v^0$ from participation in idioms due to the fact that it is accessible to syntactic operations higher in the derivation; only the spell-out domain of the $vP$ is subject to idiomatic interpretation. If we accept
the standard Minimalist assumptions that an agentive subject is at the edge of the vP, we also have to assume that v̄^0 is also at the edge of the phase. Since v̄^0 is subject to syntactic operations higher in the derivation (e.g., the verb agrees with its subject, the verb can be supplemented with aspectual morphology), it’s not clear why v̄^0 in idioms would be classified differently than the specifier of v̄^0 in such idioms. So we might conclude that in some cases, the specifier of v̄^0 can participate in idioms, and we could explain why (28) and (29) can be idioms without having to provide any additional characterization of idioms. Furthermore, we can revise Marantz’s assumptions about idioms to fit within the conventions of phase based locality constraints, as in (30).

(30) The context for the special meaning of a root and the root must be in the same phase.

We can also provide an explanation for why (29) can be an idiom using only standard Minimalist assumptions (e.g., v̄^0 and C̄^0 are phase heads, T̄^0 is not) and (30). Note that in the causative construction in (29), the embedded clause is non-finite. First, assume that the embedded vP is somehow ‘defective’ and thus not relevant for locality constraints. We can also assume that embedded nonfinite clauses do not contain a CP, so all of material relevant to the

---

10 Chomsky (2001) assumes the same for ECM and raising constructions in English.

11 In early incarnations of Minimalism, Control constructions contained a CP, which was necessary to license null case on PRO, while ECM constructions lacked a CP, which allowed the exceptional case marking to occur. However, assuming the elimination of PRO and Control from the grammar (Hornstein 1999, 2001), a CP is no longer necessary in Control constructions, and it is assumed that only a TP/IP is present. In causatives such as the one in (29), reflexive binding into the lower clause is permitted (ia), and if an embedded CP were present, the embedded reflexive subject would have to move to the specifier of the embedded C̄^0 to be at the edge of the CP phase for licensing (ib), and this movement would be unmotivated featurally. In (ic), no embedded CP is present, and the licensing of the reflexive follows without issue, as the matrix vP serves as the phase.

(i) a. John made himself eat the apple.
   b. [vP John made [IP himself [TP himself [vP himself eat the apple]]]]
   c. [vP John made [TP himself [IP himself eat the apple]]]

Furthermore, if we look at question formation in such causative constructions (ii), we can conclude that no intermediate CP is present because Wh-elements must appear in the specifier of the matrix C̄^0 (iaa-b) and cannot appear in an intermediate position (iia-d; note that iia and iie are licit only as an echo question, where the Wh-elements are assumed to be in their standard positions and lack Wh-features).
Idiom in (29) is in a single phase (before movement of *the devil* to the matrix specifier of TP). Thus, (29) would comply with (30) for status as an idiom.

Of course, a great deal more can be said about the issue of idioms as related to Williams’ discussion of Marantz’s claims. For example, Jackendoff takes an extreme view of idioms, assuming that idioms of any size and of quite varied nature can be stored (Jackendoff 2002). He even goes so far as to suggest that memorized language, such as prayers, song lyrics, an other canned phrases can be treated as idioms in that they are stored whole, and their internal structure and meaning are often poorly understood, if not unknown, by the people who have them stored. Consider the song lyric that is difficult to decipher or is easily misheard, so the hearer constructs some idea of what the words are supposed to be and stores the string, and even sings along to the song using the misheard words. Or the typical Catholic parishioner before Vatican II that was required to memorize songs and other verbal rites in Latin, even though he or she may not have any significant knowledge of Latin and therefore does not understand what is being stored. It is beyond the scope of this dissertation to discuss all the issues regarding idioms, but I have tried to show briefly how idioms might be accommodated in DM in a more explanatory way than was outlined by Marantz.

The final issue that Williams (2007:364-367) levies at Marantz (1997) that I will discuss here is in relation to Marantz’s analysis of argument projection in nominalizations and gerunds. Williams begins with a discussion of the DM analysis of *destroy* and *grow* in their verbal and nominal forms, which I have already pointed out as problematic (see the discussion of (25)

(ii)  a.  Who did John make eat the apple?
     b.  What did John make himself eat?
     c.  #John made who eat the apple?
     d.  *John made what Mark eat?
     e.  #John made Mark eat what?
above). Essentially, Marantz assumes that roots like break and grow are specified in the Encyclopedia to have no inherent agent, so only $v^0$ can introduce an agent (31), and the possessive in nominalizations may not (32). In nominal gerunds, a $v^0$ is assumed to be present, thus allowing for the agent to be introduced by the possessive (33).

(31)  
   a. John grew tomatoes.  
   b. John broke the vase.

(32)  
   a. *John’s growth of tomatoes.  
   b. *John’s break of the vase.

(33)  
   a. John’s growing of tomatoes.  
   b. John’s breaking of the vase.

Williams introduces a number of nominalizing affixes that do not produce transitive nominalizations in (34).

(34)  
   a. *the endurance of the play  
   b. *the breath of the air (where air is breathed)  
   c. *the kick of John (where John gets kicked)

First, Williams notes that eventive roots as a rule do not allow for transitive nominalizations, and the roots that take the -ion, -ment, and -ing nominalizing affixes are exceptions to the rule. So for Williams, the goal should be to explain the exceptional cases. However, what Williams fails to note is that in general, the eventive roots that lack transitive nominalizations do not produce eventive nominalizations. Rather, these roots produce what have been called result (Grimshaw 1990) or referential (Borer 2003) nominalizations. These nominalizations denote the output of a process or an element associated with a process. For example, although (34b) is unacceptable, a
nominal like *the breath (or his breath or John’s breath is acceptable), where the breath is the output of the process of breathing. It seems more relevant to investigate why these eventive roots lack eventive nominalizations than to investigate why the eventive roots that take the -ion, -ment, and -ing nominalizing affixes permit eventive nominalizations.

Next, Williams questions Marantz’s assumption that nominal gerunds contain a verbal element, given that they possess no other verbal qualities (they have no ‘unmediated’ direct objects and they are modified by adjectives). He points out that roots that have an -ion nominalization do not have a nominal gerund form. If these two elements (nominal -ion and nominal gerund -ing) appear in different contexts, the blocking relationship would be unexpected, so Williams uses this as evidence that the two forms appear in the same syntactic context, just with different verbs. I agree with Williams on this point, but I don’t believe that he can discount an entire approach because he shows that the analysis of a single bit of data is incorrect (and likewise, it is hard to entirely discount lexicalist approaches like that assumed by Williams based on one or two examples).

Ackema & Neeleman (2007) also argue against DM, based primarily on morphological data. For example, they argue that DM cannot account for the data in (35), while a theory that separates the lexical derivation from the syntactic derivation is especially suited to handle such data.

(35) a. driver of a truck
    b. *driver a truck

Ackema & Neeleman assume that \[N \text{ driver}\] is derived prior to insertion into the phrasal syntax; nouns cannot license arguments, so the distinction in (35) falls out naturally from the
separation of word syntax and phrasal syntax. On the other hand, syntactic accounts involving head movement of *drive* and incorporation to the agentive suffix *–er* are problematic according to Ackema & Neeleman; assuming the structure in (36), Ackema & Neeleman claim that syntactic accounts must posit a loss of argument licensing of the verbal head due to incorporation.

(36)

```
NP
   /\        V  DP
  N    VP    a truck
      \-er  drive
```

However, the structure in (36) is not the only structure available for a syntactic analysis of the data in (35). In older versions of DM (Marantz 1997; Harley & Noyer 2000), it was assumed that derived nominals underlyingly involved a root, a verbal functional head, and nominal functional heads such as $D^0$. However, in more recent incarnations of DM, the structure in (37) is available (Embick & Marantz 2006).

(37)

```
nP
   /\   \√P
  n^0  
      /\-er  DP
     \  √drive  a truck
```

In (37), the object *a truck* is merged directly as the complement of the root $\sqrt{\text{drive}}$, which then merges with a nominal functional head deriving the agentive *driver*. Since no verbal projection was ever present to license *a truck*, and assuming nominal functional heads like $n^0$
cannot license arguments directly, (35b) is not a licit spell out of (37); rather, a preposition must be inserted as a last-resort operation to license the argument of the root, yielding (35a).

Ackema & Neeleman (2007: 338) also give evidence for a lexical/morphological analysis of compounds compared with syntactically formed NPs. Take the Norwegian data in (38).

(38)  a. \([NP \text{ hans } [N' \text{ bøker om syntaks}]]\)

  his books about syntax

b. \([DP [bøke]-ne [NP \text{ hans } [N' \text{ ti om syntaks}]]]\)

  books-the his about syntax

c. \([NP \text{ hans } [syntaks bøker]]\)

  his syntax books

d. \([DP [syntaks bøke]-ne [NP \text{ hans } \text{ ti}]]\)

  syntax books-the his

e. \(*[DP [bøke]-ne [NP \text{ hans } [syntaks ti]]]\)

  books-the his syntax

In (38a-b), the head noun of a syntactically formed NP can freely move to D\(^0\), as can an entire compound (38c-d). However, as is seen in (38e), the head noun of a compound may not move to D\(^0\) stranding the remainder of the compound. Under a theory that separates word syntax and phrasal syntax, the data in (38) falls out as a consequence of the dual syntactic systems; the head of an NP constructed in phrasal syntax is a licit target for movement, while the head noun of a compound formed in the word system is not a licit target of movement due to the atomicity of elements formed as such. Ackema & Neeleman argue that this difference is difficult to capture in a system whereby phrasal syntax is the only computational system. However, Ackema & Neeleman do not consider potential syntactic explanations for the data in (38). For example,
consider a system where compounds are formed syntactically, and part of the computation triggers a syntactic projection from which extraction is impossible, effectively freezing the compound and thus accounting for the unacceptability of (38e). Thus, compounds could be treated syntactically in a similar manner as conjunction, a transparently syntactic construction from which extraction is also impossible, as first noted by Ross’s (1967) Coordinate Structure Constraint. A syntactic solution to the data in (38) is available within current Minimalist assumptions. Chomsky (2001:12) discusses the possibility of a Lexical Subarray as the locus of the construction of phrases; lexical and functional elements are selected into a Lexical Subarray, whose elements are exhaustively merged to form e.g. a DP, which is then subject to insertion into a further Subarray. Although Chomsky states that CP and v*P (where * indicates a verbal projection with full thematic content) are phases, he admits the possibility that DP is also a phase, and conditioning factors (e.g., Case) determine extraction possibilities with respect to the distinction between v*P/CP and DP. (Chomsky 2001: 14, fn. 29) The challenge for a syntactic solution is to develop mechanisms that account for the perceived atomicity of compounds. In fact, some recent research has focused on doing just that (e.g., Harley 2009 in DM; Delfitto, Fabregas, & Melloni 2008 in the Parallel Merge framework of Citko 2005).

To summarize, although there have been a number of criticisms of DM, I think there is confusion about both what can and can’t be done in DM, much of which stems from the lack of clarity in DM about certain aspects of the computational system, as discussed in section 2.4 above. As I have shown, many of these criticisms of DM fall out when we consider more recent research in the DM framework.

---

12 Much current research has focused on the status of DP as a phase, with conclusions coming out on both sides. See Chomsky (2008) and Radford (2004) for discussion.
13 The proposed opacity of elements that are derived pre-syntactically and then inserted into the syntax are problematic as well, as discussed in section 2.3 above.
2.6 On “Lexicalism”

The term “lexicalism” has become a somewhat contentious term when discussed in relation to DM, primarily due to Marantz (1997). One issue is that the term itself has a number of meanings depending on the context. As discussed in section 2.1, the term “lexicalism” was initially derived from the notion of the Lexicalist Hypothesis in GB, which essentially states that some operations (such as category-changing operations and word formation) must occur in the lexicon, and thus, the lexicon is a separate component of the grammar, with its own rules and operations. However, the term “lexicalism” or “lexicalist” has come to be used to describe any theory where the lexical entries drive the computation in any way. In this manner, several highly divergent theories can be described as lexicalist.

Another related issue is that lexicalism should be viewed as a continuum rather than a binary scale. At its core, a linguistic theory is lexicalist in nature if the lexicon, or the lexical entries contained therein, drive the computation. For example, HPSG is a highly lexicalist theory, where rich lexical entries defined for syntactic, semantic, morphological, and phonological features are combined by rudimentary syntactic relations (complement of, specifier of). The features encoded on the lexical elements do the majority of the work, and the syntax is just a skeleton. In theories like GB/MP, the lexicon and the syntax are equally important in the computation; lexical features are relevant for syntactic operations, and the two interact throughout the course of the derivation. In DM and related theories (e.g., Borer 2005a,b, Ramchand 2008), the ‘lexical’ elements essentially serve no role, and only the syntax (with the relevant functional heads bearing syntactico-semantic features) is involved in the computational process, the lexical root essentially serving as a placeholder for the association with the
Vocabulary and the Encyclopedia at the PF and LF interfaces, with no other function in the derivation.\textsuperscript{14}

The primary reason that the syntax and lexicon are afforded different relative strengths in HPSG vs. GB/MP lies in the natures of the two theories; HPSG is conceived of as \textit{representational}, where lexical elements are mapped to a static syntax, and the resulting structure is the final representation of a linguistic form, where in GB/MP, the grammar is essentially \textit{derivational}, where lexical elements map to a structure, pieces of the structure move, and more lexical elements are added at latter stages in the derivation, although GB had some representational qualities as well (e.g., all syntactic elements are present at all levels of representation). So while a syntactic structure in HPSG is built all at once, with the lexical elements providing the necessary features to license the structure, in GB/MP, the structure is built piecemeal, with lexical elements and syntactic operations interacting until the final structure is achieved. And furthermore, theories like HPSG and GB/MP, termed endo-skeletal by Borer (2003) due to the fact that the lexical entry is the center around which structure is built and upon which meaning relies, contrast with DM and related theories (e.g., Borer 2005a,b; Ramchand 2008), termed exo-skeletal by Borer because in these theories, the syntax itself determines the structural output and many aspects of meaning, while the lexical elements only contribute non-linguistic, real-world meaning.

A number of theories (Baker 1988; Hale & Keyser 2002; Li 2005) seek to integrate lexicalist and syntactic accounts of word-formation and argument structural considerations. In general, these theories are similar to DM in that they assume that the syntax is the only computational system, and a variety of structural mechanisms are utilized to derive word-

\textsuperscript{14} In Ramchand (2008), the root is not even a portion of the syntactic computation, but the root is indexed with features for which functional heads it can take, so the system produced by Ramchand does maintain some lexicalist assumptions.
formation and argument realization patterns. These theories contrast with DM in assuming that there is a single lexicon, lexical categories are formatives, and the lexicon contains words and morphemes with rich feature specifications that drive the syntactic computation. Although these theories and DM are not simply notational variants, their research goals are largely the same.

It is not my intention to contribute to the discussion on the role of “lexicalism” in relation to DM. Marantz (1997) painted with a broad brush in his condemnation of all things lexicalist, so I wanted to include this section to make it clear that there are problems with simply labeling a system as lexicalist without looking more at all aspects of the theories in question.

2.6 Conclusion

In this chapter, I have tried to provide a clear introduction to Distributed Morphology and how it relates to the topic of this dissertation. I have attempted to illustrate some criticisms of DM, in order to put the framework itself into perspective; some of these criticisms have already been addressed, and in the remaining chapters, I look to refine our understanding of the DM framework, developing a formal model-theoretic semantics to interpret the structural output of the syntactic computation. I do not take up Marantz’s criticisms of “lexicalism,” nor do I attempt to theoretically motivate the DM framework; rather I assume the DM framework, with something like the SDMH in (20) as the null hypothesis. The assumption that the SDMH is the null hypothesis for DM is based on previous claims about the nature of DM. This hypothesis is presented as an assumption about DM, and questions about whether the SDMH can be empirically validated are valid but are outside the scope of this dissertation. In the remainder of the dissertation, I develop a syntactic system and a semantic model to account for a DM
framework with the SDMH as a foundational premise; if the SDMH is correct, I describe one approach to the syntax and semantics of DM that takes the SDMH into account.
Chapter 3: Formal Foundations of the Syntax-Semantics Interface in DM

As I discussed at length in Chapter 2, much research in the DM framework focuses on the syntax-morphology interface, while the semantic component of the grammar in DM is left largely unspecified. The goal of this chapter is to provide an explicit model of the syntax-semantics interface in DM, which will complement the explicit models of the syntax-morphology interface present in the literature (e.g., Alexiadou 2001, 2010; Alexiadou & Anagnostopoulou 2004; Embick 2000, 2004a,b, 2007; Embick & Marantz 2008; Embick & Noyer 2007).

I begin in section 3.1 with a discussion of the syntax of lexical categories in DM. It is important to have an explicit model of the syntax of lexical categories because these elements form the core of the larger sentential syntax, and it is impossible to calculate the compositional semantics if the syntax is not fully specified. Therefore, in section 3.1, I explicitly define the syntactic nature of the lexical category determining functional heads in DM, employing insights from Baker (2003) and Hale & Keyser (2002). In section 3.2, I summarize the major assumptions about the syntax in DM. A thorough understanding of the syntax is necessary before we can investigate the syntax semantics interface, because with an interpretive semantics, the input to the semantic computation comes directly from the syntactic output.

In section 3.3, I develop a formal semantic model for DM. In section 3.4, I apply the model to a fragment of English grammar, showing how the syntax developed in the first two sections feeds into the semantic component of the grammar, and how the semantics in turn interprets the syntactic output. I section 3.5, I discuss the Encyclopedia, and propose a formal feature system for the Encyclopedia which is employed to account for the lack of argument-structure alternations in certain cases. I conclude the chapter in section 3.6 with a brief
discussion of thematic roles and where they sit in the system of syntax and semantics described in this dissertation.

3.1 The Syntax of Lexical Categories in DM

In Chapter 2, I introduced two key assumptions of DM, the Root Hypothesis and the Strong DM Hypothesis. The Root Hypothesis assumes that roots obtain their lexical category via syntactic combination with one of the lexical category determining functional heads ($n^0$, $v^0$, or $a^0$). The Strong DM Hypothesis assumes that roots lack syntactico-semantic features, and thus cannot select arguments directly. Given these two assumptions, we conclude that arguments can only be generated in the projection of the lexical category determining functional heads. However, no one working in the DM framework has proposed a specific typology for the lexical category determining functional heads. We need to know which of the lexical category determining functional heads project arguments, and we need to know the syntactic configuration associated with each of the different heads. To answer the first question, I turn to Baker’s (2003) research on lexical categories. Baker proposes that the lexical category heads have certain distinguishing characteristics, and these characteristics are syntactically relevant. In order to answer the second question, I tie the discussion of Baker’s typology to Hale & Keyser’s (2002) ideas about the syntax of argument structure. The result is a comprehensive characterization of the syntax of lexical categories in DM.
3.1.1 Lexical Categories according to Baker (2003)

The core proposal of Baker’s (2003) research on lexical categories is that the three lexical categories, nouns, verbs, and adjectives, each have certain characteristics that are grammatically relevant, as described in (1).

(1)  
   a. verbs project a specifier,
   b. nouns introduce a referential index, and
   c. adjectives neither project a specifier nor introduce a referential index.

According to Baker, this type of characterization is superior to the characterization of lexical categories assumed in the GB tradition. The typology of lexical categories in GB is given in (2), based on the binary features ±N and ±V, following Chomsky (1970).

(2)  
   a. +N -V : noun
   b. -N +V : verb
   c. +N +V : adjective
   d. -N -V : adposition¹⁵

The typology in (2) is problematic from a number of perspectives. First, it’s not clear where the N and V features come from. These are clearly different from the features in other areas of linguistics like phonology, where the features align with physically observable phenomena, like voicing, nasality, or airstream occlusion (i.e., ±voice, ±nasal, ±continuant). Second, it seems like circular reasoning to define nouns by saying that they have the N feature and they lack the V feature. Finally, it’s not clear what the ±N and ±V feature system actually

¹⁵ Chomsky initially omitted adpositions from the set of lexical categories, but Jackendoff (1977) proposed to fill the gap in the paradigm. Baker (2003:11-16) provides a brief discussion of alternative approaches to defining the lexical categories in linguistic theory.
gets us, especially in terms of Minimalism, because the syntax doesn’t make reference to these types of features. Besides the fact that the lexical categories are defined in terms of a concrete featural system, the necessity of said featural system is suspect.

With this being said, Baker aims at devising a system of lexical categories that interfaces with the syntax. For example, one of Baker’s claims is that the defining characteristic of verbs is that they project specifiers. The proposal that verbs project specifiers correlates with Chomsky’s [+V, -N] feature specification for verbs. Baker assumes that the projection of specifiers is syntactically real because it references structural relations, while Chomsky’s system is circular because lexical categories are defined in terms of the lexical category features themselves. In Baker’s system, projecting a specifier essentially reduces to hosting an argument. So in this manner, Baker’s system is similar to many of the decompositional theories that map verbal heads to subevents, either in the lexicon (e.g., Dowty 1979; Rappaport Hovav & Levin 1998; Levin & Rappaport Hovav 1995, 2005) or in the syntax (e.g., Harley 1995; Embick 2004a; Folli & Harley 2005, 2006, 2007; Alexiadou 2001, 2010; Alexiadou and Anagnostopoulou 2004; Ramchand 2008; Siddiqi 2009). Likewise, nominal elements in Baker’s system introduce a referential index. This reduces to nouns serving as arguments, and the referential indices are needed for a number of phenomena, including binding, movement, and quantification. I refer the reader to that work for more information.

It is worth noting that Baker’s characterization of lexical categories is fundamentally incompatible with DM in one important way; Baker assumes that roots are innately associated with lexical categories (Baker p.c.). So instead of having a root that gets its lexical category from the syntactic environment, Baker assumes that a noun or verb or adjective exists in the lexicon and is mapped into the syntax as such. So for example, the lexicon contains different elementary
particles like \([v^0 \text{ break}]\) and \([n^0 \text{ break}]\) and \([\lambda^0 \text{ broken}]\). This assumption is in direct conflict with the Root Hypothesis of DM.

Notwithstanding this incompatibility, I think that Baker’s intuitions regarding the lexical categories is extremely valuable, and these intuitions can be easily be recast into a notation that is compatible with DM. Therefore, I propose that the lexical category determining functional heads in DM have largely the same characteristics as the lexical heads do in Baker’s theory, as in (3).

(3)

a. verbal functional heads \(v^0\) project a specifier,

b. nominal functional heads \(n^0\) require a referential index, and

c. adjectival functional heads \(a^0\) neither project a specifier nor require a referential index.

There is one major difference between the typology in (2) and the one in (3); in (2b), nouns have a referential index, while in (3b), nominal functional heads require a referential index. According to Baker, nouns have a referential index because they are the only things that can refer. However, I feel that this characterization is not entirely accurate, due to the fact that nouns denote properties. Only by combining with a determiner (in many cases a null one) that serves as a type-shifter can they have a kind denotation, and thus refer (Chierchia 1998 and Krifka 2004, based on work on type shifting by Partee 1986).

So given (3), any category determining functional head may combine with a root, but the possible resultant structure is defined by the functional head; a verbal element has a specifier, and thus projects an argument, a nominal elements serves as an argument once it combines with a determiners to gain a referential index, and an adjectival element can neither project an
argument or serve as an argument, requiring additional functional material to combine with anything.

One aspect of the relationship between the lexical category determining functional heads and roots is assumed in DM is crucial to the system proposed here: a root must combine with a category determining functional head in order to be assigned a lexical category label. I motivate this requirement by proposing that the root is not legible to the PF interface since it does not have a category label; the category label is required to determine what morphophonological forms and/or features are assigned to the root node at the PF interface. In order for the root to be legible to the PF interface, it must merge with a lexical category determining functional head, with some kind of head movement or incorporation (a la Baker 1988) of the root to the lexical category determining functional head.

There are other logical ways to ensure that roots require a category determining functional head; we could posit that only the category-determining heads syntactically select roots, or we could propose other interface conditions (e.g., the Vocabulary system at PF crucially refers to roots in context the context of a category determining head). The motivation for my assumption that the root requires a lexical category label is based on previous DM research regarding the nature of the interfaces, specifically the Category Assumption (Embick & Marantz 2008:6), and is not independently motivated.

To sum up, the typology in (3) may seem to be a trivial translation of (2), but it is an important one to maintain the SDMH. In the next sub-section, I show how the typology in (3) is mapped onto specific syntactic structures.
3.1.2 Lexical Categories and the Syntax of Argument Structure

In their attempt to reduce argument structure to more basic syntactic structures, Hale & Keyser (2002) propose two fundamental syntactic relations related to argument structure, the Head-Complement Relation and the Specifier-Head Relation.

(4) The fundamental relations of argument structure (Hale & Keyser 2002:12)

a. The Head-Complement Relation

If X is the complement of a head H, then X is the unique sister of H (X and H c-command one another).

b. The Specifier-Head Relation

If X is the specifier of a head H, and if P₁ is the first projection of H (i.e., H’, necessarily nonvacuous), then X is the unique sister of P₁.

Hale & Keyser go on to define four logically possible lexical structures based on the relations in (4); these structures are given in (5).¹⁶

(5) a. X⁰

   /  
  /   Y
 / 
 X

b. Y

   /  
  /   Y
 / 
 X

   /  
  /   X
 / 
 X

      /  
     /   X
    / 
 Specifier X

      /  
     /   X
    / 
 Specifier X

   /  
  /   X
 / 
 X

      /  
     /   X
    / 
 Specifier X

      /  
     /   X
    / 
 Specifier X

¹⁶ The notation for the structures given in (5) is modified from Hale & Keyser’s (2002:13) original notation for clarity.
In (5a), a head can be atomic, selecting no complement and projecting no specifier. Hale & Keyser associate this structure with nouns. Second, a head can select a complement but project no specifier, with the resulting phrase serving as the complement of a second head Y, as in (5b). Hale & Keyser associate this basic structure with verbs, assuming that verbs are fundamentally monadic, taking a single argument as a complement, with multiple verbal projections required for the projection of multiple arguments. A third possibility in given in (5c), where a head can select a complement and project a specifier. According to Hale & Keyser, the structure in (5c) is associated with prepositions, as prepositions basically relate two arguments; X is in/on/about Y.

A fourth possible structure is given in (5d), where the head $X_1$ does not select a complement, but requires a specifier. Due to the definition in (4b), a head $X_1$ without a complement cannot project a specifier on its own because the specifier must be the unique sister of $P_1$, where $P_1$ is the first non-vacuous projection of $X_1$. Therefore, in order to satisfy its specifier requirement, $X_1$ must serve as the complement of another head $X_2$, where $X_1$ grants $X_2$ the ability to project a specifier.\footnote{It is not clear how one head can ‘grant’ another head the ability to project a specifier. In addition, it is not specified what type of head $X_2$ is. One logical possibility would be to state that head $X_1$ requires a specifier but lacks the ability to do so, and $X_2$ is of type (5c), so by $X_2$ projecting a specifier, it satisfies the specifier requirements of $X_1$ as well.}

Hale & Keyser’s notion of fundamental syntactic structures provides us with some good insights regarding the structures that can possibly be associated with the category determining functional heads in DM. However, Hale & Keyser, like Baker, do not assume the SDMH, so in Hale & Keyser’s system the verbal head $V^0$ contains root information, and the complement of $V^0$ is the argument, as in (5b). Given the differences between Hale & Keyser’s system and the system necessary assuming the SDMH, I propose a modification in how the structures in (5) are mapped. Rather than mapping these structures to lexical heads, I map these structures to the
lexical category determining functional heads assumed in DM. To begin, the most basic structure in (5a) can only be associated with a root, because according to the SDMH, the root contains no syntactico-semantic features, and thus cannot select any other material with which to combine.

Turning to the structure in (5b), I propose that the projection of X corresponds to the adjectival functional head $a^0$, which takes a root as a complement, but projects no specifier, as in (6a). In order for an adjectival construction to take an argument, it would have to combine with some other functional head (such as a predicational head) in a structure like (5d), as shown in (6b).

\[
\begin{align*}
(6) & \\
\text{a. } & aP & \text{b. } & \text{PredP} \\
& a^0 & \sqrt{\text{root}} & \text{Specifier} & \text{Pred}^0 & aP
\end{align*}
\]

The structure in (5c) maps transparently to the verbal lexical category head, as shown in (7); the root is merged as the complement of $v^0$, and the argument required by the verbal head is merged in the specifier position.

\[
\begin{align*}
(7) & \\
\text{vP} & \sqrt{\text{root}}
\end{align*}
\]

Finally, the structure in (5d) is associated with a nominal functional head $n^0$, although it can also be associated with adjectival heads as described above. When (5d) is associated with a nominal head, the $n^0$ takes a root as its complement, and the resultant $nP$ functions like $X_1$ in

---

18 The claim that an adjectival construction requires a functional head has both theoretical and empirical justification. Theoretically, if an adjective could take an argument without an intervening functional head, there would be no difference between an adjective and a verb. Empirically, predicate adjective constructions require a copula in some languages, and in others, no copula is required. So it is easier to assume that a predicational head is present in all situations and not morphologically realized in some, rather than proposing that the head is only present where it is morphologically realized.

19 With seem and weather verbs, where no argument is projected, I assume that basic structure is like in (7). However, for these roots no specifier is projected, because these roots do not license case in their complement domain (a la Burzio’s Generalization; see Baker 2003:27).
since the \( n^0 \) needs a referential index, which can only be satisfied by a determiner, the \( nP \) merges as the complement of the determiner (\( X_2 \) in (5d)), as illustrated in (8). If the determiner is genitive in English, a specifier can be projected.

(8) \[
\begin{array}{c}
\text{DP} \\
\text{DP2} \\
\text{D}\text{\textsuperscript{1}} \\
\text{D}\text{\textsuperscript{0}} \\
\text{nP} \\
\text{n}\text{\textsuperscript{0}} \text{√root}
\end{array}
\]

There is no difference in the fundamental structures associated with \( n^0 \) and \( a^0 \); they both take a root complement and do not take a specifier. The difference is that \( n^0 \) requires additional structure (in the form of a referential index, introduced by \( D^0 \)). When additional structure intervenes between a determiner and an \( nP \) (e.g., a NumP or a quantifier), I must assume that the presence of this material does not interfere with a determiner satisfying the requirement that an \( nP \) get a referential index, so long as a determiner is ultimately present.\(^{20}\)

With respect to prepositions (adpositions more generally), I follow Baker (2003) in assuming that they are functional elements and not lexical elements; they are a closed class, they

\(^{20}\) The requirement that an \( nP \) have a determiner is in conflict with instances where nominal phrases that are smaller than DPs exist. For example, Baker (2003) discusses noun incorporation in Mohawk, where bare nouns that serve as arguments incorporate into verbs. As I discussed above, a noun generally denotes a property, and only by combining with a determiner or quantifier can it type-shift to denote a kind so that it can refer. Baker presents evidence that no additional structure appears in the Mohawk cases; it truly is a bare noun that has incorporated, and the presence of a null determiner would be problematic from the perspective of constraints on head movement. (Baker 2003:114) In these cases, there are a couple different possibilities. First, we could assume that in some languages, nouns can freely typeshift without a corresponding syntactic node. Alternately, we could follow Chierchia (1998) in assuming that in some languages nouns are fundamentally kinds (i.e., of type \( \langle e \rangle \)), and thus bare nouns can refer and serve as arguments. If we were to pursue this line of reasoning in the system developed here, \( n^0 \) would serve to type-shift the root from type \( \langle v,t \rangle \) to type \( \langle e \rangle \) (see Section 3.3 below).

Given this discussion, the claim that an \( nP \) receive a referential index from a determiner is probably an overgeneralization. However, the intuition behind the claim, based on the semantics of nouns, needs to be instantiated in some way, so I fleshed out the claim in this fashion for the purposes of this dissertation.
do not take part in derivational morphology, etc. I refer the reader to Baker (2003:303-325) for discussion.

Baker’s typology of lexical categories is based on the observation that each lexical category is associated with a cluster of characteristics. So associating a specific syntactic structure to each lexical category in order to account for these characteristics is desirable. This mapping between lexical category and structure is exactly the avenue I have pursued in this section. In contrast, Hale & Keyser’s approach to argument structure cannot account for the generalizations that accompany lexical category labels. For example, Hale & Keyser’s typology of structures cannot account for the observation that verbs project specifiers while nouns and adjectives do not. Therefore, I utilize the modified version of Baker’s framework coupled with the fundamental syntactic structures proposed by Hale & Keyser to define the nature of the lexical category defining functional heads. These heads serve as the foundation of the syntax and semantics for DM that I develop through the remainder of this dissertation.

3.2 The Syntax of the Verbal System in Minimalism and DM

In the GB framework, the verbal system consisted of a single verbal projection. The VP was the complement of the inflectional head, and the subject was generated in the specifier of the inflectional head, as schematized in (9).

![Diagram](9)

(9)

```
IP
 /   |
DP   1^0
    |   VP
   /   |
V^0   DP
     |   Object
```
Following much research on the nature of the verb phrase (e.g., Larson 1988 for the theory of VP shells; Koopman & Sportiche 1991 for the VP-Internal Subject Hypothesis; Marantz 1984, Chomsky 1995a, and especially Kratzer 1996 for the notion of \(v^0\) or Voice\(^0\) and separating the external argument from the verb), the single verbal projection from GB was split into the projection of the lexical verb (headed by \(V^0\)) and the projection of a ‘light-verb’ head \(v^0\), where VP is the complement of \(v^0\). \(^{21}\) Within this Minimalist architecture, the prototypical argument positions are the complement of \(V^0\), where objects are merged, and the specifier of \(v^0\), where subjects are merged, as schematized in (10).

\[
\begin{align*}
TP & \\
T^0 & vP \\
DP & v^0 \\
 & VP \\
 & V^0 \\
 & DP \quad \text{Object}
\end{align*}
\]

In this configuration, Case is checked on objects by \(v^0\), while Case is checked on subjects by \(T^0\). Burzio’s Generalization (Burzio 1986) falls out as a condition of the nature of \(v^0\); when \(v^0\) projects a specifier containing the external argument, \(v^0\) can check Case on the complement of \(V^0\), but if \(v^0\) fails to project a specifier, it cannot check Case on the complement of \(V^0\). Chomsky assumes that there are two versions of \(v^0\), a ‘theta-complete’ version (indicated by \(v^0^*\)) that

\(^{21}\) In Minimalism, which adopts the combinatorial system of Bare Phrase Structure (Chomsky 1995b), the notation VP is intended to simply indicate ‘maximal projection of \(V^0\).’ According to Bare Phrase Structure, only nodes that are required as part of the derivation are projected, so in theory, an element could simultaneously be an \(X^0\) and an XP (or in other notation, \(X^\text{max}\)) if it projects no specifiers or complements. This is in contrast to the system assumed in the X’-theory of GB, where for any head X, at least one X’ and the XP were necessarily projected. Throughout this dissertation, for any head X, I use \(X^0\) when specifically referring to the head, and XP when referring to the maximal projection of the head. Furthermore, labels like X and XP are simply that, labels which are used for convenience. These labels serve to indicate the relevant features of the head, but have no syntactic reality.
projects a specifier and thus has Case-checking capabilities, and a ‘defective version’, that is, one that does not project a specifier and does not check Case.

As discussed in Chapter 2, the Minimalist formulation of the verbal architecture could account for a number of different types of verbal constructions in Minimalism. Standard transitive constructions are generated with two verbal heads $V^0$ and $v^{0*}$, each projecting an argument. Unergative intransitives are generated with both verbal heads $V^0$ and $v^{0*}$, although the lower head does not project an argument. Unaccusative intransitives also are generated with two verbal heads, but in this instance, $v^0$ is defective, with only the lower head projecting an argument. Thus, the argument generated in the lower verbal layer must raise to $T^0$ for EPP reasons. (See Alexiadou et al. 2004b for discussion.) This syntactic framework for the verbal domain also accounts for basic causative-inchoative alternations as well. The causative variants have transitive syntax while the inchoative alternants have unaccusative syntax. Thus, a number of different argument structures are syntactically represented, and the syntactic structure determines to some extent the associated event structure. The upper verbal layer is associated with agents and causation, while the lower layer is associated with themes and result states.

The bipartite verbal structure described here is generally accepted in the Minimalist literature, but in early manifestations of DM, the bipartite structure of the verbal architecture was called into question. (Marantz 1997; Harley 1995, 2005) Given that roots were generated separately from the functional projections that define category, they assumed that a single verbal head $v^0$ could serve to both define the lexical category of the root and function as the Voice head simultaneously. This structure, as depicted in (11), was relevant for transitive constructions, in addition to unergative and unaccusative ones; a DP complement could merge directly with a
root, the resulting ‘root phrase’ could then merge with a verbalizing head, and a DP specifier could merge in the vP.

(11)

However, this configuration is problematic, because even when the typical characteristics of voice (agentivity or external argument, often causation) are absent from a sentence as in unaccusatives, the verbalizing functional head must surely be present (see Harley 2009 for discussion). Other contemporary instantiations of DM follow standard minimalist assumptions, where the verbalizing functional head $v^0$ and $\text{Voice}^0$ are distinct. $\text{Voice}^0$ and $v^0$ project specifiers, which require the merger of arguments; objects merge in the specifier of $v^0$ and subjects merge in the specifier of $\text{Voice}^0$, as schematized in (12). (Siddiqi 2009; Alexiadou 2010) Both $\text{Voice}^0$ and $v^0$ project specifiers, so they require the

(12)

Given the SDMH, I propose that this bipartite verbal structure is necessary in standard transitive constructions where the licensing of multiple arguments (via structural Case) is required.
In addition to the bipartite verbal structure, a number of other functional projections have been proposed in Minimalism and DM to account for a variety of phenomena, such as agreement and Case (Pesetsky & Torrego 2001, 2004, 2006), telicity/inner aspect (Tenny 1987, Ritter & Rosen 1998, McDonald 2006), applicatives (Pylkkänen 2008), and predicational and resultative constructions; e.g., a Pred<sup>0</sup> head as in Baker 2003, a Res<sup>0</sup> head as in Ramchand 2008, or the syntactic reflex of the BE and BECOME operators (Harley 1995), which are familiar from decompositional approaches to argument structure (e.g., Dowty 1979, Jackendoff 1990, Levin & Rappaport-Hovav 1995, 1998, 2005). Ramchand (2008), who takes a position similar to DM researchers, assumes three fundamental functional projections corresponding roughly to the subevents *initiation*, *process*, and *result*. Folli & Harley (2005, 2006, 2007) propose different “flavors of little v”, where v<sup>0</sup> corresponds structurally to Voice<sup>0</sup> to account for a variety of data dealing with result states.

One example of a functional head that has been proposed in relation to argument structural issues is a causative head Cause<sup>0</sup> (Kratzer 2004; Pylkkänen 2002, 2008). This head intervenes between v<sup>0</sup> and Voice<sup>0</sup> and serves as a linker between the events introduced by v<sup>0</sup> and Voice<sup>0</sup>. Consider the schematic structure of a standard transitive clause involving the causative head in (13).

As pointed out by both Kratzer and Pylkkänen, this type of structure is similar to those predicted in the various forms of the Split-Infl hypothesis (Pollock 1989), where different functional heads are responsible for different components of the computation related to Case and agreement. For example, in work by Pesetsky & Torrego (2004), which is essentially a permutation of the Split-Infl hypothesis, two tense heads exist in transitive constructions, as in
In this way, the structure in (13) assumed by DM researchers correlates well with the structure assumed in Minimalism in (14).

The structure in (13) assumed by DM researchers correlates well with the structure assumed in Minimalism in (14). The outer $T^0$ is familiar from standard Minimalist terminology, licensing Case on the DP in the specifier of $v_P$, but a new inner $T^0$ lies between $v_P$ and VP and is responsible for licensing Case on the DP complement of $V^0$. In (13), we have a similar structure,
so we might assume similar structural relations; Voice\(^0\) and \(v^0\) are heads that introduce arguments, while \(T^0\) and Cause\(^0\) are functional elements that license the arguments. Further discussion of the causative head and the structure schematized in (13) is found in Chapter 4 below.

In this section I have provided a brief discussion of the basic syntactic architecture related to verbal constructions in DM. In the next section, I define a semantic model that is compatible with the DM architecture described above, and in section 3.4, I demonstrate how the semantic model applies both to the syntax of the lexical category heads and to the larger sentential syntax.

3.3 A Model-Theoretic Semantics for Distributed Morphology

In this section, I define a semantic model for DM that is compatible with the syntax for DM described above. The development of a formal semantics for DM has not been attempted before, so this is an important step in defining how the syntax-semantics interface functions in the DM framework. In the semantic model, I assume that the output of the syntax is first translated into a logical language, which is in turn interpreted compositionally with respect to the model. I leave it open whether cyclic spell-out (and thus the possibility of cyclic interpretation) is present in the syntax-semantics interface, although this position has been supported in a variety of literature both on syntax (Uriagereka 1999; Chomsky 2000, 2001; Fox and Pesetsky 2005) and formal semantics (Chierchia 2004b), and the model described here is compatible with this position, as discussed in section 3.4.1.1 below.

I begin this section by presenting the model itself, which is a fairly standard extensional model that incorporates the set of events and the set of states in addition to the set of individuals. Next, I define the syntax and the semantics of the logical language. Finally, I focus on the
translation rules, and I develop an initial analysis of the translations of the roots and the
category-determining functional heads that are present in the DM syntax.

3.3.1 Model
The model I present here is fairly standard; it defines the sets over which the model applies along
with some fundamental relations between elements interpreted within the model. The model is
designed around an event semantics in the Davidsonian tradition, as this format is familiar in
discussions of the event structure and argument structure at the syntax-semantics interface. This
model is compatible with a mereological approach to event structure, as has been applied to
capture telicity facts (e.g., Krifka 1998, based on the algebraic formulation of part-structures
utilized by Link 1983 for mass nouns; see also Beavers 2010 for a recent implementation of a
mereological model to telicity and the argument-oblique alternation), although I do not present a
mereological semantics here.

I evaluate the meaning of sentences based on the model, but not based on possible
worlds, so the semantics elaborated here is fundamentally extensional, but the model developed
here could be adapted to an intensional system to capture meaning more precisely in certain
domains as demonstrated in the vast literature (see Gamut 1991 for an introduction to intensional
logic). The model itself is presented in (15).

(15) \[ M = \langle U, I, E, \tau, <, \equiv \rangle \]
a. \( U = \) the set of individuals
d. \( I = \) the set of times
e. \( E = \) the set of eventualities
f. \( \tau \), the temporal trace function, a function from \( E \) to \( I \)
g. \( < \) is the temporal precedence relation, a two-place relation in \( I \), such that:
   \[ \forall \alpha, \beta \in I, \alpha < \beta \text{ means ‘\( \alpha \) precedes \( \beta \)’} \]
h. \( \equiv \) is the ‘is a’ relation, a relation from \( E \) to \( U \)
The sets of entities involved in the model are fairly self-explanatory; we have a set of individuals, a set of times, and a set of eventualities, and these sets define the participants in the universe of discourse. The elements in the set of eventualities are not inherently defined for the two subtypes of eventualities, events and states; these characterizations are provided by the syntactic and semantic derivation.

Some of the relations between sets require additional explanation. First, let me discuss the ‘is a’ relation. This relation is necessary in DPs, since as I explain below, nominal phrases are defined as predicates of states. (For a related proposal, see Schwarzschild 2002.) In order for the compositional semantics to function properly, the ‘is a’ relation is involved in the translation of determiners, and serves to indicate that we have an individual instance of the stative predicate. The translation of a nominal head takes a predicate of eventualities and further specifies it as a predicate of eventualities that are states. The ‘is a’ relation is present in the translation of determiners, so the translation of the determiner specifies a set of individuals (e.g., one, some, all), and the *is a* relation says that the individuals are instances of that state. In other words, the predicate of eventualities that are states denotes a property, and the ‘is a’ relation allows us to define individuals as entities that are defined by that property.

Now I turn to the temporal trace function, the temporal precedence relation, the sum operation, and the part-whole relation. Following the seminal work of Krifka (1998), I assume that the temporal trace function maps the events to their run times, a homomorphism such that the run time of two events is the sum of the run times of the individual events. Tense then fixes the run times with respect to the reference time; temporal precedence orders the run time of an event before or after the run time of another event or before or after the reference time.²²

---

²² In this dissertation, I abstract away from the semantics of grammatical aspect. In some approaches to aspectual semantics (e.g., Alexiadou, Rathe, & von Stechow 2003; Katz 2003) with the simple past tense a perfective
Krifka defines the temporal trace function and the temporal precedence relation axiomatically, and these axioms are based on the definitions of other relations, which are ultimately defined in terms of an algebraic part structure. I follow Krifka’s definitions of the mereological structure, but I present the definitions in (15f-h) as a simplification, which suffices for our purposes here.

For the purposes of this dissertation, I will assume following Kratzer (2000) and Katz (2003) that the temporal trace function in introduced in the translation of an aspectual head above the predicate(s) of events but below T⁰. However, in the formal implementation, I collapse the temporal trace function and the relation to the reference time (e.g., precedence, containment) in T⁰ for simplicity. For concreteness, I focus on past-tense constructions in this dissertation, thus only the precedence relation is defined.

3.3.2 Logical Language

For the logical language L presented here, the syntax of the logic defines the logical types and how the types can combine, while the semantics of the logic allows us to interpret the meaning of logical expressions in terms of the model.

aspectual operator lies between the past tense head and the verbal architecture. The perfective aspectual operator associates the event time E with the reference time R, and the past tense head then relates the event time and the reference time to the utterance time U. In event-based approaches to tense and aspect, the aspectual heads convert the output of the verbal semantics (a predicate of events) to a predicate of times. And the tense operator locates the predicate of times in relation to the utterance time.

Since I do not provide a treatment of aspectual semantics in this dissertation, I encode the semantics of both the perfective aspect operator and the tense operator into a single translation for the tense head. Although this is not ideal, I need to define the semantics of the tense head in order to illustrate how a full derivation, including both the syntax and semantics, would work given the model for the syntax-semantics interface I propose in this dissertation. The tense head is independently necessary in the syntax to drive Case checking and subject movement, as assumed in Minimalism and DM.
### 3.3.2.1 Syntax of the Logic

(16) **Types**
Types: $e$, $i$, $v$, and $t$ are types;
if $\rho$, $\tau$ are types, $\langle \rho, \tau \rangle$ is a type;
nothing else is a type.

**Conjoinable Types** (Partee & Rooth 2002)
- $t$ is a coinjoinable type
- if $\tau$ is a coinjoinable type, then for all $\rho$, $\langle \rho, \tau \rangle$ is a coinjoinable type.

**Semantic Type**
- $e$ U = the set of individuals
- $i$ I = the set of times
- $v$ E = the set of eventualities

(17) **Variables**
For each number $n$ there is a variable $v_{n,\rho}$ of type $\langle \rho \rangle$ and index $n$.

(18) **Combination Rules**
- If $\alpha$ is of type $\langle \rho, \tau \rangle$ and $\beta$ is of type $\langle \rho \rangle$, then $\alpha(\beta)$ is of type $\langle \tau \rangle$.
- If $\alpha$ is of type $\langle \tau \rangle$ and $\nu$ is any variable of type $\langle \rho \rangle$, $\lambda\nu[\alpha]$ is of type $\langle \rho, \tau \rangle$.
- If $\alpha$ and $\beta$ are both of the same conjoinable type, $\alpha \land \beta$ is of the same conjoinable type
- If $\alpha$ and $\beta$ are both of the same conjoinable type, $\alpha \lor \beta$ is of the same conjoinable type
- If $\alpha$ and $\beta$ are both of the same conjoinable type, $\alpha \rightarrow \beta$ is of the same conjoinable type
- If $\alpha$ and $\beta$ are both of the same conjoinable type, $\alpha \leftrightarrow \beta$ is of the same conjoinable type
- If $\alpha$ is of a conjoinable type, $\neg \alpha$ is of the same conjoinable type
- If $\beta$ is of type $\langle e, \langle \rho, t \rangle \rangle$ and $\gamma$ is of type $\langle \rho, t \rangle$, $\beta \land \gamma$ is of type $\langle e, \langle \rho, t \rangle \rangle$

As discussed above, type $v$ is based on the set of eventualities in $M$. The set of eventualities contains both states and events, but a predicate of eventualities is not inherently defined as either a predicate of events or a predicate of states. This information is provided by functional heads in the syntax, as I discuss below.
3.3.2.2 Semantics of the Logic

(19) Domains:

\[ \mathbf{D}_\tau \text{ is the set of possible denotations for expressions of type } \langle \tau \rangle, \text{ defined as:} \]

\[ \mathbf{D}_c = \mathbf{U}, \quad \mathbf{D}_i = \mathbf{I}, \quad \mathbf{D}_v = \mathbf{E}, \quad \mathbf{D}_t = \{0,1\} \]

For all types \( \langle \rho \rangle \) and \( \langle \tau \rangle \), \( \mathbf{D}_{\langle \rho, \tau \rangle} = \mathbf{D}_\rho \rightarrow \mathbf{D}_\tau \), the set of functions from \( \mathbf{D}_\rho \) to \( \mathbf{D}_\tau \).

Expressions of L are interpreted with respect to the model M, the context C, and a variable assignment \( g \in \mathbf{G} \) (the set of variable assignments).

(20) Semantic rules:

a. If \( v_{n,\rho} \) is a variable of type \( \rho \) with index \( n \), \([ [v_{n,\rho}] ]^{M,C,g} = g(v_{n,\rho}) \)

b. If \( \alpha \) is of type \( \langle \rho, \tau \rangle \) and \( \beta \) is of type \( \langle \rho \rangle \), \([ [\alpha(\beta)] ]^{M,C,g} = [[\alpha]]^{M,C,g}([[\beta]]^{M,C,g}) \)

c. Recursive definition of generalized \( \cap, \cup, \) and \( \neg \):

(i) In \( D_t, \cap, \cup, \) and \( \neg \) are equivalent to \( \land, \lor, \) and \( \neg \) respectively (defined by standard truth tables).

(ii) If \( g, h \in D_{\langle \rho, \tau \rangle} \), \( g \cap h = \text{the function } f \in D_{\langle \rho, \tau \rangle} \text{ such that for all } v \in D_\rho \),

\[ f(v) = \lambda v. [g(v) \cap h(v)] \]

(iii) If \( g, h \in D_{\langle \rho, \tau \rangle} \), \( g \cup h = \text{the function } f \in D_{\langle \rho, \tau \rangle} \text{ such that for all } v \in D_\rho \),

\[ f(v) = \lambda v. [g(v) \cup h(v)] \]

(iv) If \( g \in D_{\langle \rho, \tau \rangle} \), \( \neg g = \text{the function } f \in D_{\langle \rho, \tau \rangle} \text{ such that for all } v \in D_\rho \),

\[ f(v) = \lambda v. [\neg g(v)] \]

d. Given (20c), where \( \alpha \) and \( \beta \) are of any conjoinable type:

(i) \([ [\alpha \land \beta] ]^{M,C,g} = [[\alpha]]^{M,C,g} \cap [ [\beta] ]^{M,C,g} \]

(ii) \([ [\alpha \lor \beta] ]^{M,C,g} = [[\alpha]]^{M,C,g} \cup [ [\beta] ]^{M,C,g} \]

(iii) \([ [\neg \alpha] ]^{M,C,g} = \neg [[\alpha]]^{M,C,g} \]

e. If \( \alpha \) and \( \beta \) are of the same coinjoinable type, \([ [\alpha \rightarrow \beta] ]^{M,C,g} \) and

\([ [\alpha \leftrightarrow \beta] ]^{M,C,g} \) are defined in terms of (20c-d), as described in Partee & Rooth (2002)

f. If \( \alpha \) is of type \( \tau \) and \( v_{n,\rho} \) is a variable of type \( \rho \) and index \( n \), \([ [\lambda v(\alpha)] ]^{M,C,g} = \text{the function } f \in D_{\langle \rho, \tau \rangle} \text{ such that for any } x \in D_\rho \),

\[ f(x) = [[\alpha]]^{M,C,g(x/v)} \]

g. If \( \beta \) is of type \( \langle e, \langle v, t \rangle \rangle \) and \( \gamma \) is of type \( \langle v, t \rangle \), \([ [\beta \land \gamma] ]^{M,C,g} = \text{the function } f \in D_{\langle e, \langle v, t \rangle \rangle} \text{ such that for any } x \in D_e \text{ and for any } e \in D_v \),

\[ f(x)(e) = [[\beta]]^{M,C,g} (x)(e) \land [ [\gamma] ]^{M,C,g} (e) \]
The rules in (18h) and (20g) are required to implement Kratzer’s Event Identification analysis of Voice$^0$, which I extend to other functional heads in sections 3.4.1 and 3.4.2 below.

### 3.3.3 Translations

At the interface with semantics, syntactic structures of natural language expressions are the input to the logic $L$; syntactic terminals have specific translations in terms of $L$, and translation rules convey the syntactic environment in terms legible to $L$, which is a necessary step before $L$ can interpret the logical expressions in terms of $M$. We can analyze the translation process as a component of Spell Out in the Minimalist literature; at Spell Out, Vocabulary items are inserted for the morphophonological computation, and translations (from the Encyclopedia) are inserted for the semantic computation. The syntactic structure must appear in the proper configuration so that the morphophonology and the logical language can be properly interpreted, i.e., the syntactic output must be ‘legible’ at the interfaces.

Marantz (1997) describes the Encyclopedia as the non-generative (but expandable) list of special meanings of roots, relative to the local syntactic context. With the standard architecture of the grammar in Figure 2.1 in Chapter 2 above, the Encyclopedia is relevant at the interface between syntax and semantics. As I discussed in detail in Chapter 2, one underlying assumption in DM is the SDMH, i.e., that roots, at the point where they are inserted into the syntactic derivation, possess no syntactico-semantic features. (Marantz 1997; Embick & Noyer 2007) One side effect of this assumption is that the translation of the root cannot be encoded on the root itself, so the only relevant place for the translation to be encoded is in the Encyclopedia entry of the root. If translations are not encoded on roots during the narrow syntactic computation, then we can assume that the translations of purely functional heads are likewise absent from the
terminals inserted as primitives in the syntax, but are present in the Encyclopedia entries of the heads. Thus, the Encyclopedia can be interpreted as the component of the grammar where all ‘meaning’ is stored (in the form of translations).

The Encyclopedia is the natural place for the listing of translations, given that the Encyclopedia is the list relevant for the syntax-semantics interface. Thus, the Encyclopedia is like the pivot in the transition between the syntactic and the semantic components of grammar, and a model-theoretic semantics follows naturally from the DM architecture. The characteristics of the Encyclopedia and the role of the Encyclopedia in the grammar are discussed at greater length in section 3.5 below.

3.3.3.1 Translation of Syntactic Terminals

The translation of a terminal √root is of type ⟨v,t⟩, and the translation of √root as a predicate of eventualities is given in (21), along with some sample translations of roots. For the translations presented here, β ⇒ γ can be read as “β translates as γ”, and α’ indicates the translation of α.

(21)  
a. √root ⇒ λ.e.root’(e)  
b. √CLOSE ⇒ λ.e.close’(e)  
c. √DOOR ⇒ λ.e.door’(e)  
d. √RED ⇒ λ.e.red’(e)

Essentially, the root is the syntactic terminal that allows for lexical information to enter into a derivation, although the nature of the root has no effect over the narrow syntax. Roots are inert without a lexical head to provide arguments and define the nature of the predicate of eventualities more precisely, as described below.
In (22), it is important to note that even roots that tend to surface as nouns, like √door, are classified as predicates of eventualities. An eventuality described by the √door entails some characteristics of “doorness”, which can be further specified in the semantics as an event, a state, an individual, etc. Since states are one type of eventuality, this analysis is useful in that it allows us to interpret the noun door as a predicate of states, similar to the proposal by Schwarzschild (2002).

In English, one analysis of proper names is that they are of type ⟨e⟩ and translated like in (22); however, in languages where determiners are obligatory (e.g., Greek), a proper name might be interpreted as a root of type ⟨e,t⟩ like in (23), with a nominal and/or determiner head functioning as a type-shifter (resulting in a generalized quantifier).

(22) John ⇒ john'

(23) √J O H N ⇒ λe.john'(e)

In (23), as with the discussion of √door above, the eventuality of being john’ is a predicate describing any characteristics of “Johnness”, whatever that may be in the context; a property, a kind, an event. This treatment of proper names is advantageous because it allows not only for ‘nominal’ translations of proper names, but proper names may also show up in ‘eventive/verbal’ and ‘stative/adjectival’ constructions, like in (24). These cases are straightforwardly accounted for in the DM framework, we simply have structures where the root combines initially with a verbal or adjectival head instead of a nominal one.

(24) a. Aren’t we Cheneyed out yet? (eventive)

b. How many people were "Enroned"? (eventive)
   Retrieved on 11/30/10 from:
c. A very Kafka Christmas (stative)\textsuperscript{23}
Retrieved on 11/30/10 from: \url{http://www.imdb.com/title/tt1185861/}

d. …and the other day a man attempted to do an MJ [Michael Jackson] move in his car…
Retrieved on 11/30/10 from: \url{http://www.michaeljackson.com/my/node/99200}

Within the system developed here, traces and pronouns are translated as variables, as defined in (25). Traces are coindexed with the moved element, bound variable pronouns are coindexed with the binding operator, and free pronouns receive an index that is associated with the sentence-internal or external referent via the assignment function.

(25) \text{For any pronoun or trace } v \text{ with index } n, v_n \Rightarrow x_{n,c}

DP traces and pronouns are of type \langle e \rangle. DP traces can be due to typical DP movement, such as movement from a VP-internal position to the specifier of TP, or due to operator movement, such as Wh-movement or quantifier raising (QR). Any type of XP movement, either overt or covert, yields an operator-variable structure, as schematized in (26). The structure in (26) requires a translation rule like Predicate Abstraction, as in (27). Locality restrictions on movement and notions of cyclicity are pervasive in syntactic frameworks that involve movement. In section 3.4.1.1 I show how cyclicity is relevant to the semantic computation as well.

\textsuperscript{23} However, these may potentially be treated as noun-noun compounds and not as adjective-noun constructions.
Predicate Abstraction (PA)

Let $\alpha$ be a branching node with daughters $\beta$ and $\gamma$, where $\beta$ is a numerical index $i$ and $\gamma$' type $\langle \rho \rangle$. Then, $\alpha' = \lambda x[,\gamma']$, of type $\langle e,\rho \rangle$.

The translations of the lexical-category heads $v^0$, $n^0$, and $a^0$ are crucial to the semantic model I am developing here. Beginning with $v^0$, we can assume that $v^0$ is similar to Voice$^0$ in Kratzer’s (1996) sense, as illustrated in (28) – (29).

(28) a. $v^0 \Rightarrow \lambda x . \lambda e . [\text{event}(e) \land \text{argument}(e,x)]$

b. $v^0 \Rightarrow \lambda x . \lambda e . [\text{eventuality}(e) \land \text{argument}(e,x)]$

(29) Voice$^0 \Rightarrow \lambda x . \lambda e . [\text{event}(e) \land \text{argument}(e,x)]$

Both $v^0$ and Voice$^0$ are of type $\langle e,\langle v,t \rangle \rangle$. Voice$^0$ combines syntactically with CauseP or $v$P, both predicates of eventualities (functions of type $\langle v,t \rangle$); $v^0$ in (28a) combines with a root, a predicate of eventualities (also a function of type $\langle v,t \rangle$); $v^0$ in (28b) combines with other predicates of eventualities, namely result phrases or predicational phrases, both of type $\langle v,t \rangle$. Both Voice$^0$ and $v^0$ take as an argument a predicate of eventualities, and can further define that eventuality as an event. Given that Functional Application cannot apply to these syntactic combinations, a translation rule like (30) is necessary to interpret the structures. (Kratzer 1996)
Let $\alpha$ be a branching node with daughters $\beta$ and $\gamma$; if $\beta'$ is of type $\langle e, \langle v, t \rangle \rangle$ and $\gamma'$ is of type $\langle v, t \rangle$, $\alpha' = \beta' \land \gamma'$

Like $v^0$, the nominal and adjectival heads serve to define the lexical category of the root. These lexical category determining functional heads do not take the root as an argument semantically; rather, like with Voice$^0$ and $v^0$, $a^0$ and $n^0$ combine with the root (a predicate of eventualities) via EI, and define the predicate of eventualities as a state. I propose that $a^0$ and $n^0$ are both of type $\langle v, t \rangle$, with the translations of $n^0$ and $a^0$ in (31) and (32).

(31) $n^0 \Rightarrow \lambda e. [\text{state}(e)]$

(32) $a^0 \Rightarrow \lambda e. [\text{state}(e)]$

Given the translations in (31) – (32), $a^0$ and $n^0$ are semantically equivalent. The difference is purely syntactic, in that $n^0$ requires a referential index provided by a determiner, while $a^0$ lacks one.

In addition to the translations for the lexical category determining heads and Voice$^0$, Cause$^0$ is also relevant in the syntactic computations, as schematized in (13) above. Therefore, the translation for the causative head in (33) is provided.

(33) $\text{Cause}^0 \Rightarrow \lambda P_{(v,t)} . \lambda e. \exists e^1. [P(e^1) \land \text{event}(e) \land \text{CAUSE}(e,e^1)]$

Here, the translation of Cause$^0$ is of type $\langle (v,t),(v,t) \rangle$. Unlike the category determining functional heads, the causative head combines with its complement via Functional Application; it existentially closes over the event variable from the translation of its complement, and introduces
a second predicate of eventualities, linking the two subevents with the CAUSE operator, which is a primitive that encodes a causal relationship between two subevents, in addition to a temporal precedence relationship between said subevents.

Finally, the tense head $T_{\text{PAST}}^0$ will be involved in the grammar fragment discussed here; $T^0$ introduces the temporal trace function, which maps an event to its run time, and locates the event with respect to the utterance time. For $T_{\text{PAST}}^0$, the event precedes the utterance time (represented as ‘now’) via the precedence relation. $T_{\text{PAST}}^0$ is of type $\langle \langle v,t \rangle,t \rangle$, as in (34).

(34) \[ T_{\text{PAST}}^0 \Rightarrow \lambda P_{(v,t)} \cdot \exists e. [P(e) \land \tau(e) \ll \text{now}] \]

However, if we consider some assumptions about the semantics of tense, (34) is problematic. As discussed above, the syntactic head $T^0$ collapses the tense and aspect semantics; in event-based approaches to tense and aspect constructions, the simple past tense involves a perfective aspectual operator that lies between the past tense head and the verbal architecture. The perfective aspectual operator associates the event and the reference time, and the past tense head then relates the event time and the reference time to the utterance time. The aspectual head converts the output of the verbal semantics (a predicate of events) to a predicate of times, and the tense operator locates the predicate of times in relation to the utterance time.

For the purposes of this dissertation, I only present the syntactic node $T^0$ so that I can illustrate issues of subject movement assumed in Minimalism/DM. So I use the translation in (34), as a placeholder in the semantics in lieu of a full analysis of tense and aspect semantics in DM.
The syntactic and semantic functions of the syntactic terminals discussed here are summarized in (35). For other functional heads like D⁰ and P⁰, I provide discussion in cases where it is relevant.

(35) The translations and types for some syntactic terminals

<table>
<thead>
<tr>
<th>Syntactic Terminal</th>
<th>Translation</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>√root</td>
<td>λ.e.root'(e)</td>
<td>(v,t)</td>
</tr>
<tr>
<td>John</td>
<td>john'</td>
<td>(e)</td>
</tr>
<tr>
<td>√JOHN</td>
<td>λ.e.john'(e)</td>
<td>(E,t)</td>
</tr>
<tr>
<td>t_n</td>
<td>x_n</td>
<td>(e)</td>
</tr>
<tr>
<td>v₀</td>
<td>λx . λe . [event(e) ∧ argument(e,x)]</td>
<td>(e, (v,t))</td>
</tr>
<tr>
<td></td>
<td>λx . λe . [eventuality(e) ∧ argument(e,x)]</td>
<td>(e, (v,t))</td>
</tr>
<tr>
<td>Voice₀</td>
<td>λx . λe . [event(e) ∧ argument(e,x)]</td>
<td>(e, (v,t))</td>
</tr>
<tr>
<td>n₀</td>
<td>λe . [state(e)]</td>
<td>(s,t)</td>
</tr>
<tr>
<td>a₀</td>
<td>λe . [state(e)]</td>
<td>(s,t)</td>
</tr>
<tr>
<td>Cause₀</td>
<td>λP_{(v,t)} . λe . ∃e'. [P(e') ∧ event(e) ∧ CAUSE(e,e')]</td>
<td>((v,t), (v,t))</td>
</tr>
<tr>
<td>T_PAST</td>
<td>T_PAST ⇒ λP_{(v,t)} . ∃e. [P(e) ∧ τ(e) &lt;&lt; now]</td>
<td>((v,t), t)</td>
</tr>
</tbody>
</table>

3.3.3.2 Translation Rules

The translation rules presented here are mostly of a standard variety. The rule for Functional Application is the typical rule relevant in the semantic computation. The other rules are for special cases where Functional Application does not apply. Predicate Modification is a standard rule for conjunction of elements of like types; Predicate Abstraction, from (27) above, is necessary when operator-variable constructions are present; and Event Identification, repeated from (30), is needed for composing v₀, Voice₀, n₀, and a₀ with their complements. Predicate abstraction will be discussed in the next section, when we apply the model to a fragment of English.

(36) Functional Application (FA)
    Let α be a branching node with daughters β and γ; if β' type ⟨ρ,τ⟩ and γ' type ⟨ρ⟩, α' = β'(γ').
(37) **Predicate Modification (PM)**
Let $\alpha$ be a branching node with daughters $\beta$ and $\gamma$; if $\beta'$ and $\gamma'$ are of type $\langle \rho, \tau \rangle$, $\alpha' = \beta' \land \gamma'$

(38) **Predicate Abstraction (PA)**
Let $\alpha$ be a branching node with daughters $\beta$ and $\gamma$, where $\beta$ is a numerical index $i$ and $\gamma'$ type $\langle \rho \rangle$. Then, $\alpha' = \lambda x_i[\gamma']$

(39) **Event Identification (EI)**
Let $\alpha$ be a branching node with daughters $\beta$ and $\gamma$; if $\beta'$ is of type $\langle e, \langle v, t \rangle \rangle$ and $\gamma'$ is of type $\langle v, t \rangle$ or if $\beta'$ is of type $\langle e, \langle v, t \rangle \rangle$ and $\gamma'$ is of type $\langle E, t \rangle$, $\alpha' = \beta' \land \gamma'$

### 3.4 Applying the model

Now that I have laid out how some relevant syntactic terminals are translated and how the logical language interprets these translations, let’s examine the interpretation of specific syntactic structures. As discussed above, roots are all underlyingly properties of eventualities, but are vague between properties of events and properties of states. The nature of the root in a given context is due to the nature of the functional head with which it combines, and the root cannot take any arguments of its own. The translations of some roots I employ here are given in (40), repeated from (21) above.

(40) $\sqrt{CLOSE} \Rightarrow \lambda e.\text{close}'(e)$
$\sqrt{DOOR} \Rightarrow \lambda e.\text{door}'(e)$
$\sqrt{RED} \Rightarrow \lambda e.\text{red}'(e)$

I begin this section with a discussion of nominal and adjectival phrases, and in the second part of this section I turn to a discussion of verbal components.
3.4.1 Nominal and adjectival heads

First, let us examine the nominal and adjectival heads. As discussed in section 3.3.3.1, the translations of $n^0$ and $a^0$ are semantically identical, repeated here from (31) – (32) above.

(41) $n^0 \Rightarrow \lambda e \cdot \text{state}(e)$

(42) $a^0 \Rightarrow \lambda e \cdot \text{state}(e)$

Given the structures for an $nP$ and an $aP$ and the translations of $n^0$ and $a^0$, the derivations for (43) and (44) proceed in exactly the same manner, as in (45) and (46).

(43) $aP$

\[ a^0 \xrightarrow{\text{\sqrt{RED}}} \]

(44) $nP$

\[ n^0 \xrightarrow{\text{\sqrt{DOOR}}} \]

(45)

<table>
<thead>
<tr>
<th>Translations</th>
<th>Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. $\sqrt{RED} \Rightarrow \lambda e.\text{red}'(e)$</td>
<td>21</td>
</tr>
<tr>
<td>b. $a^0 \Rightarrow \lambda e.\text{state}(e)$</td>
<td>32</td>
</tr>
<tr>
<td>c. $aP' = a^{0'} \land \sqrt{RED}'$</td>
<td>39</td>
</tr>
</tbody>
</table>

Interpretation

<table>
<thead>
<tr>
<th>Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>d. $[[aP']]^{M.I.g} = \lambda e. \text{state}(e) \land \text{red}'(e)$</td>
</tr>
</tbody>
</table>

(46)

<table>
<thead>
<tr>
<th>Translations</th>
<th>Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. $\sqrt{DOOR} \Rightarrow \lambda e.\text{door}'(e)$</td>
<td>21</td>
</tr>
<tr>
<td>b. $n^0 \Rightarrow \lambda e.\text{state}(e)$</td>
<td>31</td>
</tr>
<tr>
<td>c. $nP' = n^{0'} \land \sqrt{DOOR}'$</td>
<td>39</td>
</tr>
</tbody>
</table>

Interpretation

<table>
<thead>
<tr>
<th>Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>d. $[[nP']]^{M.I.g} = \lambda e. \text{state}(e) \land \text{door}'(e)$</td>
</tr>
</tbody>
</table>

The standard conjunction translation rule and the relevant syntactic and semantic rules of the logic serve to conjoin the two predicates denoted by $a^0/n^0$ and the root. As discussed in section
3.1 above, the difference between $n^0$ and $a^0$ is that $n^0$ requires a referential index, which is supplied by $D^0$. Therefore, the characteristic that distinguishes (45) from (46) is not in the interpretation, but rather in the structural capability of (45) to serve as the complement of $D^0$, while (46) lacks this capability. In the next subsections, I show the interpretation of the combination of $nPs$ and $aPs$ with other functional heads to form larger phrases.

### 3.4.1.1 Determiners

In this sub-section, I present the semantics for determiners. For the purposes of this dissertation, I take the conventional stance and assume that all definite DPs are of type $\langle e \rangle$. With respect to quantificational determiners, I integrate the syntax and semantics of quantifiers into a Minimalist syntax like the one assumed in DM.

In a Minimalist architecture with a standard truth-conditional semantics with two basic semantic types $\langle e \rangle$ and $\langle t \rangle$, the type of a quantificational determiner $D^0$ is $\langle \langle e, t \rangle, \langle \langle e, t \rangle, t \rangle \rangle$; the complement of $D^0$ is an NP predicate of type $\langle e, t \rangle$, and the complement of DP is of type $\langle e, t \rangle$ as well. In this model, the DP can be the complement of $V^0$ or the specifier of $v^0$, $T^0$, or the node produced by Predicate Abstraction for quantifier raising, as schematized in (47).
In contrast, the semantic model I develop here has additional types for event, state, and time variables to more precisely account for semantic meaning. In this model, when the DP is quantificational, neither the complement of $D^0$ nor the complement of DP is of type $\langle e,t \rangle$. The complement of $D^0$ is (generally) an $nP$ of type $\langle v,t \rangle$, while the complement of the DP varies. When the DP is the complement of Voice\textsuperscript{1} or $v\textsuperscript{1}$ (i.e., when the DP is the specifier of Voice\textsuperscript{0} or $v\textsuperscript{0}$), the $D^0$ must be of type $\langle (e,t),(e,v,t),(v,t) \rangle$ as shown in (48), or the DP and Voice\textsuperscript{1}/$v\textsuperscript{1}$ will fail to combine due to type mismatch.\textsuperscript{24}

\textsuperscript{24} Beginning in (48), and for the remainder of this dissertation, I use numerical superscripts on projections to indicate intermediate levels of projection. So $v^0$ indicates a head, a zero level projection, and $v^1$ indicates a ‘v-bar’, or first level projection above the head (i.e., the mother of the head). I use this notation instead of the use of an apostrophe for a ‘bar-level’ because the apostrophe is used in this dissertation to indicate ‘translation of’. An XP (in our example here, $vP$) is used to indicate a maximal projection, i.e., $vP$ is the mother of the specifier and $v^0$. When XPs are annotated with numerical superscripts, this indicates adjunctions. For example, $vP$ is the maximal projection, $vP^2$ is the first adjunction of $vP$, $vP^3$ is the second adjunction of $vP$, etc. These indices are included for ease of reference to the structural position in a tree, and do not have any linguistic reality.
When the DP moves to the specifier of T^0 from the specifier of Voice^0, a typical example of A-movement in English, a different situation arises. First, T^0 of type \langle (v,t), t \rangle combines with VoiceP of type \langle v,t \rangle via Functional Application to yield a projection T^1 of type \langle t \rangle. The moving DP leaves a trace of type \langle e \rangle in the specifier of Voice^0, and the trace combines with Voice^1 via Functional Application. When the DP moves to the specifier of T^0, a DP of type \langle (e, (v,t)), (v,t) \rangle as in (48) (or a definite DP of type \langle e \rangle), cannot combine with the T^1 due to type mismatch, as schematized in (49).

(49)  
When the DP moves to the specifier of T^0 from the specifier of Voice^0, a typical example of A-movement in English, a different situation arises. First, T^0 of type \langle (v,t), t \rangle combines with VoiceP of type \langle v,t \rangle via Functional Application to yield a projection T^1 of type \langle t \rangle. The moving DP leaves a trace of type \langle e \rangle in the specifier of Voice^0, and the trace combines with Voice^1 via Functional Application. When the DP moves to the specifier of T^0, a DP of type \langle (e, (v,t)), (v,t) \rangle as in (48) (or a definite DP of type \langle e \rangle), cannot combine with the T^1 due to type mismatch, as schematized in (49).
Note that the structure in (49) would also be problematic due to the fact that the trace would not be bound.

One way out of this situation is if $T^0$ triggers an abstraction structure, so that Predicate Abstraction can apply, as depicted in (50). In this case, the DP cannot be of type $\langle\langle e,\langle v,t \rangle\rangle,\langle v,t \rangle\rangle$ like in (48), but must either be a definite DP of type $\langle e \rangle$, or a quantificational DP of type $\langle\langle e,t \rangle,t\rangle$ in order to combine with TP$^2$ of type $\langle e,t \rangle$. In the case where the DP is quantificational, the $D^0$ would be of type $\langle\langle v,t,\langle\langle e,t \rangle,t\rangle\rangle\rangle$, contrasting with the $D^0$ of type $\langle\langle v,t,\langle\langle e,\langle v,t \rangle\rangle,\langle v,t \rangle\rangle\rangle$ in (48).\footnote{The structure and types in (50) would also apply for scenarios involving covert-movement due to quantifier raising (QR). When quantificational DPs move covertly due to QR, they move from argument position to an A’-position adjoined to TP/CP. If a quantificational DP begins the derivation in subject position like in (50), it must have one semantic type, namely $\langle\langle e,\langle v,t \rangle\rangle,\langle v,t \rangle\rangle$, in its base position in the vP, and a different semantic type $\langle\langle e,t \rangle,t\rangle$ when it is in the specifier of $T^0$ and when it is adjoined to TP/CP for QR. Likewise, if the quantificational DP begins the derivation in object position and undergoes QR to adjoin to TP/CP, it would begin the derivation as type $\langle\langle e,\langle v,t \rangle\rangle,\langle v,t \rangle\rangle$, but would need to end the derivation in its adjoined position as type $\langle\langle e,t \rangle,t\rangle$, thus displaying the same problems as in (50).}

(50)

So we have a situation where a quantificational DP in (48) is of type $\langle\langle e,\langle v,t \rangle\rangle,\langle v,t \rangle\rangle$ in the specifier of Voice$^0$, but when the DP moves to the specifier of $T^0$ in (50), the DP must be of type $\langle\langle e,t \rangle,t\rangle$. How can we reconcile such a situation, where two different types of DPs are needed for the same syntactic element, one type in the verbal projection but another type in the inflectional field? I propose that we use the syntactic notion of the phase (Chomsky 2000, 2001) to our
advantage here. Syntactically, phases mark the boundaries of locality domains, and each locality domain is equated to a cycle of the syntactic computation. The standard Minimalist assumption is that VoiceP and CP are phases. Phases are relevant for locality due to the Phase Impenetrability Condition (Chomsky 2001), which essentially states that an element in a lower phase cannot be the target of an operation in the next phase up unless that element is at the edge of the lower phase, where the ‘edge’ is defined as the head or the specifier of the phase. So for a concrete example, consider the structure in (51), where VoiceP and CP are phases.

(51)  

\[ \begin{array}{c}
\text{CP} \\
C^0 \\
\text{TP} \\
T^0 \\
\text{VoiceP} \\
\text{DP}_1 \\
\text{Voice}^1 \\
\text{Voice}^0 \\
vP \\
\text{DP}_2 \\
v^1 \\
v^0 \\
\sqrt{\text{root}}
\end{array} \]

\text{T}^0 \text{ wants to undergo an AGREE operation with the DP in the specifier of Voice}^0 \text{ in order to check the uninterpretable } \phi \text{-features of T}^0 \text{ (with the resulting movement of DP}_1 \text{ to the specifier of T}^0 \text{). Since T}^0 \text{ is in a different phase than DP}_1 \text{, the only way T}^0 \text{ and DP can enter into the checking relationship is if DP}_1 \text{ is at the edge of the VoiceP phase. In this case, since DP}_1 \text{ is in the specifier of Voice}^0 \text{, it is at the phase edge, and therefore may enter into the relationship with T}^0 \text{.} \]
Now that we have seen how phases are related to locality in Minimalism, consider how they are related to cyclicity. In a Minimalist system where cyclic spell out is assumed, \textsc{Spell Out} occurs at a phase boundary.\footnote{Chomsky (1995) treats \textsc{Spell Out} as a formal syntactic operation that manipulates the syntactic features and prepares them for the interfaces. Throughout this dissertation, when I use \textsc{Spell Out} in small caps, I am referring to the formal operation. When I use spell out in all lowercase, I am referring to the general process, or the point in the derivation where the formal operation occurs.} This essentially means that at the phase boundary, the material in the complement of the phase head is sent to the interfaces.\footnote{According to Chomsky (2001, 2008), \textsc{Transfer} is the formal operation that sends portions of derivations to the interface. For the purposes of this dissertation, I will not make a difference between \textsc{Spell Out} and \textsc{Transfer}.} In terms of this discussion, at the phase boundary at spell out, the material in the complement of the phase head is interpreted by the semantic component of the grammar. As I discussed in Chapter 2, Encyclopedia entries in the form of translations are inserted in the terminals at the interface with the semantics. The translations are then interpreted by the logic $L$ with respect to the model $M$ for the structure corresponding to the phase. Returning to our example in (51) above, at spell out, VoiceP is a phase, with Voice$^0$ as the phase head. Since $vP$ is the complement of the phase head, the translations for the terminals in $vP$ are inserted, and the meaning of the $vP$ would be interpreted. Only the $vP$ is interpreted, and the edge of the phase, namely Voice$^0$ and its specifier, are left uninterpreted until the next cycle of spell out. Since the specifier is left uninterpreted in the VoiceP, the quantificational DP in the specifier does not need a semantic type at that point in the derivation, so type mismatch does not come into play. The semantic type of the quantificational DP does not need to be determined until it is interpreted in the specifier of $T^0$ in the next cycle. This mechanism of delayed interpretation of the phase edge applies to a number of different situations, which I discuss in turn below.\footnote{With A-movement, where arguments move from one argument position to another (e.g., movement of a DP from the specifier of Voice$^0$ to the specifier of $T^0$), it is generally the case that movement ‘reconstructs’ so that it appears that the argument is interpreted in both positions. Although I claim here that an argument is not interpreted until it reaches its ultimate landing spot in the specifier of $T^0$, the trace of the argument is bound syntactically by the moved}
In order to interpret the VoiceP, a quantificational DP would have to be of type \(\langle\langle e, v, t\rangle, \langle v, t\rangle\rangle\). However, when we proceed with the syntactic derivation, \(T^0\) would undergo an \textsc{AgrEE} operation with DP\(_1\), and DP\(_1\) would move to the specifier of \(T^0\). In this scenario, DP\(_1\) would have to be of type \(\langle\langle e, t\rangle, t\rangle\), as discussed above, and we end up with a scenario in which the quantificational DP has to be of two different semantic types, one in the VoiceP phase and one in the CP phase. In order to avoid this issue, I propose that the phase not only has syntactic relevance, but is also relevant for the semantics.

First, consider a sentence where the quantificational DP is the subject, as in (52).

(52) Every boy hugged the dog.

In this case, the quantificational DP \textit{every boy} begins the derivation in the specifier of Voice\(^0\). When the first phase spells out, the semantics must interpret the \(vP\), but the edge of the phase Voice\(^0\) and the DP \textit{every boy} remain uninterpreted. In the next phase, the DP \textit{every boy} moves from the specifier of Voice\(^0\) to the specifier of \(T^0\), as in (53). The DP is then interpreted when the CP phase undergoes spell out. Since the DP is only subject to interpretation once, the DP only receives a single semantic type \(\langle\langle e, t\rangle, t\rangle\), and the semantic type it would need to combine in the specifier of Voice\(^0\) is simply not relevant.\(^{29,30}\) The object DP in (53) is a definite DP of type \(\langle e\rangle\), so it can be interpreted \textit{in situ} in the \(vP\) without type mismatch.

---

\(^{29}\) Recall that according to the semantic model, syntactic terminals do not have semantic types underlyingly; rather, the semantic type of an element emerges from the translation of the syntactic terminal.

\(^{30}\) Note that even in a situation like (i), where a quantificational DP in subject position binds a pronoun in object position, the overt movement of the subject to the specifier of \(T^0\) provides the abstraction structure necessary to bind the pronoun.

(i) [Every boy]\(_4\) loves his\(_4\) mother.
Now, consider the opposite situation, where a quantificational DP is in object position, as in (54).

(54) The boy hugged every dog.

In this case, there are two options for treating the object DP every dog. First, we could assume that the DP is interpreted in situ in the specifier of the vP. In this case, the DP must be of semantic type \(\langle\langle e,\langle v,t\rangle\rangle,\langle v,t\rangle\rangle\). Second, we could assume that QR is required, and the DP every dog moves to adjoin to the CP post-syntactically. This option is a bit more complex for a number of reasons. If we assume cyclic spell out, the DP would have to be of semantic type \(\langle\langle e,\langle v,t\rangle\rangle,\langle v,t\rangle\rangle\) in the vP for the VoiceP to converge, and it would have to be of the different semantic type \(\langle\langle e,t\rangle,t\rangle\) when it adjoins to the CP via a covert application of Predicate Abstraction. In this option, we encounter the same situation that we discussed above surrounding example (48), where the DP requires different semantic types depending on its structural position.
However, this option assumes that all movement of the DP would be covert, directly from the base-generated position of the DP in the specifier of $v^0$ to the CP-adjointed position, as schematized in (55).

(55)

Alternatively, we could propose that in order for the DP to adjoin to the CP covertly, the DP first must adjoin to the VoiceP (covertly) so that it is at the edge of the VoiceP phase and is therefore
accessible to operations in the CP phase, in line with the Phase Impenetrability Condition (Chomsky 2001:13). This scenario is schematized in (56).

(56) CP

In (56), the object DP merges into the specifier of \(v^0\) in the overt syntax. Once the VoiceP is built, the \(vP\) is spelled out. However, I propose that before the \(vP\) is interpreted, the object DP covertly moves from the specifier of \(v^0\) to adjoin to the VoiceP. Since the DP is at the edge of the VoiceP, it is not interpreted until the next higher phase and it does not receive a semantic type until it is translated. Once the CP phase is complete and spelled out, the DP adjoined to VoiceP
moves covertly to adjoin to the CP. Only here is the DP translated, thus receiving a semantic type, in this case \( \langle (e,t) , t \rangle \). In this manner, quantificational DPs in subject and object position have the same semantic type in the approach adopted here.

This system will work equally well for situations where two quantificational DPs are present, one in subject position and one in object position, as in (57).

(57)  Every boy hugged every dog.

The quantificational DP in subject position will have to move to the specifier of \( T^0 \) for syntactic reasons. In cases where the object has wide scope, the quantificational DP in the specifier of \( v^0 \) undergoes a covert movement operation twice, once to adjoin to VoiceP, and then to adjoin to CP. When the subject has wide scope, a further covert movement operation occurs; the subject DP moves from the specifier of \( T^0 \) to a CP-adjoined position above the object DP, i.e., above the DP27 above, as schematized in (58).
In the discussion above, I have shown how quantifiers work in the syntactic and semantic model developed in this dissertation. Since I am more concerned with the nature of the verbal system in the remaining portions of this dissertation, I will only use definite singular arguments (including proper names) of type \( \langle e \rangle \) in subsequent derivations. To illustrate how the definite singular determiner functions in the semantic model I developed above, consider the translation in (59), the structure in (60), and the derivation in (61).

\[
\text{(59) } \quad D_{\text{the.sg}}^0 \Rightarrow \lambda P \in D_{v,y} \cdot \exists x. \exists e^1. [P(e^1) \land e^1 = x]^{31}
\]

\[^{31}\text{Read } \exists x \text{ as ‘the unique } x \text{’}.\]
In the discussion here, I have outlined the semantic nature of determiners required by the model of the syntax assumed throughout this dissertation, where syntactic phases serve as units to be transferred (at spell-out) to the semantics for interpretation. Although I propose that determiners of different semantic types are required in some instances, this does not interfere with the semantic computation, motivated by the cyclic, phase-based nature of the syntax.
3.4.1.2 More on adjectives

In sections 3.3.3.1 and 3.4.1 above, I introduced the semantics of adjectives proposed for the DM framework developed in this dissertation. The translation of the category-determining head \( a^0 \) is repeated in (62), with the basic structure in (63) and corresponding interpretation in (64).

(62) \( a^0 \Rightarrow \lambda e. [\text{state}(e)] \)

(63)

\[
\begin{array}{c}
\text{\( a^0 \)} \\
\text{\( \sqrt{\text{RED}} \)}
\end{array}
\]

(64)

<table>
<thead>
<tr>
<th>Translations</th>
<th>Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ( \sqrt{\text{RED}} \Rightarrow \lambda e. \text{red'}(e) )</td>
<td>21</td>
</tr>
<tr>
<td>b. ( a^0 \Rightarrow \lambda e. \text{state}(e) )</td>
<td>32</td>
</tr>
<tr>
<td>c. ( aP' = a^{0'} \land \sqrt{\text{RED}'} )</td>
<td>37</td>
</tr>
</tbody>
</table>

Interpretation

<table>
<thead>
<tr>
<th>Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>d. ([[(aP')]^{\text{M.C.s}} = \lambda e. \text{state}(e) \land \text{red'}(e))</td>
</tr>
</tbody>
</table>

As discussed previously, the \( a^0 \) does not project a specifier, nor does it require a determiner, so the \( aP \) must enter the derivation in another way. Predicate adjectives are derived by merging the \( aP \) as the complement of a predicational head Pred\(^0\), which in turn projects a specifier. A standard syntactic analysis of a predicational structure associated with Pred\(^0\) is given in (65), based on Baker (2003). We can treat Pred\(^0\) similarly to \( v^0 \), of type \( \langle e, \langle v, t \rangle \rangle \), with the translation in (66). Essentially, Pred allows for an adjective to take an argument, even though the adjective can’t independently have one. This is the crucial distinction between adjectives and...
verbs; an additional functional head (and a structural layer) is necessary for an adjective to have an argument. The derivation for (65) is given in (67).32

(65)  a. The door is red.

       a
      /\  \
     /   \\
    /     \\
   /       \\
  /         \\
 /           \\
/             \\
 vRED

       PredP
        ___/\___
       DP    Pred^1
      /      /  \\
     /      /   \\
    /      /    \\
   /      /     \\
  /      /      \\
 /      /       \\
/     /         \\
/    /           \\
/   /             \\
/  /               \\
/ /                 \\
/                     \\
/                      \\
/                       \\
/                         \\
/                           \\
/                               \\
/                                \\
/                                    \\
/                                        \\
/                                             \\
/                                                 \\
/                                                   \\
/                                                        \\
/                                                           \\
/                                                                \\
/                                                                      \\
/                                                                            \\
/                                                                                           \\
/                                                                                       \\
/                                                                                               \\
/                                                                                                      \\
/                                                                                                           \\
/                                                                                                                   \\
/                                                                                                             \\
/                                                                                                                        \\
/                                                                                                                          \\
/                                                                                                                              \\
/                                                                                                                                  \\
/                                                                                                                                        \\
/                                                                                                                                            \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                                                                                    \\
/                                                                                      }
DP with an attributive adjective in (68), the relevant structure is that in (69), with the derivation in (70).

(68)  the red door

(69)  
```
                DP
               /   \       D^0
              /     \  /   \n            np^2  d0  np
            /     \  /      \
           /      \_/      nP
         ap    np2     door
```

(70)  

<table>
<thead>
<tr>
<th>Interpretations</th>
<th>Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ([\langle ap\rangle]) = (\lambda e. \text{state}(e) \land \text{red}'(e))</td>
<td>20c</td>
</tr>
<tr>
<td>b. ([\langle np\rangle]) = (\lambda e. \text{state}(e) \land \text{door}'(e))</td>
<td>20c</td>
</tr>
<tr>
<td>c. ([\langle np^2\rangle]) = (\lambda e. \text{state}(e) \land \text{door}'(e) \land \text{red}'(e))</td>
<td>20c</td>
</tr>
<tr>
<td>d. ([\langle dp\rangle]) = (\exists e^1. \text{state}(e^1) \land \text{door}'(e^1) \land \text{red}'(e^1) \land e^1 \equiv x)</td>
<td>20b</td>
</tr>
</tbody>
</table>

Now, we should consider other modifiers, like relative clauses. Under a standard analysis for relative clauses, the relative pronoun or a null operator moves from the base position of the argument in the clause and adjoins at the top of the clause, forming an abstraction structure. The operator has a numerical index, which binds the trace of the moved argument, a variable in argument position within the relative clause, as shown in (71).
Under this analysis for (71), TP is of type \( \langle t \rangle \), so RC is of type \( \langle e, t \rangle \) due to Predicate Abstraction in (38). In a logic and model with two types \( \langle e \rangle \) and \( \langle t \rangle \), TP is of type \( \langle t \rangle \), and we would want the RC as a whole to be of type \( \langle e, t \rangle \) due to Predicate Abstraction in (38) so that it could combine with the noun (also of type \( \langle e, t \rangle \)) via a conjunction operation like (37). However, since \( nP \) in this system is of type \( \langle v, t \rangle \), we either need to somehow conjoin two elements of unlike types, or the have a modified predicate abstraction rule like in (72).

(72)  Predicate Abstraction (PA)
Let \( \alpha \) be a branching node with daughters \( \beta \) and \( \gamma \), where \( \beta \) is a numerical index \( i \) and \( \gamma' \) type \( \langle \rho \rangle \). Then, \( \alpha' = \lambda e_i[\gamma'] \)

With a rule like (72), the abstraction rule takes a node of type \( \rho \) and creates a predicate of type \( \langle v, \rho \rangle \). So applying the rule in (72) to the structure in (71), \( T^0 \) is of type \( \langle t \rangle \), so RC is of type \( \langle v, t \rangle \). Thus, RC can combine with \( nP \) via the Predicate Modification rule in (37), because they are both of the same type, \( \langle v, t \rangle \). The structure with corresponding types for the nodes is given in (71').
3.4.1.3 Summing Up

This subsection was not intended to be an exhaustive analysis of nominal and adjectival syntax and semantics. Rather, since the DM framework that I defend throughout this dissertation varies from the conventional system assumed by many DM researchers, it was necessary to explicitly show how the formal syntactic and semantics must be defined for such a framework. This section progressed towards that goal, and now that we have an idea of how DPs work, we can begin to look at the verbal semantics more closely.

3.4.2 The verbal architecture

Now that we know how to interpret arguments, we can begin to discuss the verbal system, focusing specifically on how nominal arguments are introduced into the verbal structure, and how pieces of the verbal structure fit together. Consider the sentence in (73), a standard causative construction in English, with the structure in (74). Note also that I include an overt resultative

---

33 Beginning with Abney (1987), a great deal of research has been conducted investigating the nature of the nominal architecture, both in the GB/MP tradition (e.g., Szabolcsi 1994), and in the DM framework (e.g., Alexiadou 2001).
phrase, since an overt result state is encoded in (73). The nature of the resultative is discussed in greater detail in Chapter 4. The derivation is presented in (75).

(73) John closed the door.

(74) $\text{TP}^3$

$\text{DP}_9$

John

$\text{TP}^2$

9

$\text{TP}^1$

$\text{T}_{\text{PAST}}^0$

VoiceP

$t_9$

$t_{\text{voice}}^1$

Voice$^0$

$\text{CauseP}$

$\text{Cause}^0$

$v_2$

$v_1$

$\text{DP}_7$

$n^0$

$n\text{p}$

$\text{D}_{\text{the.sg}}^0$

$\text{v}\text{door}$

$v_0$

$\text{ResP}$

$t_7$

$\text{Res}^3$

$\text{Res}^0$

$\sqrt{\text{CLOSE}}$
<table>
<thead>
<tr>
<th>Rule</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>( \sqrt{\text{DOOR}} \Rightarrow \lambda e. \text{door}'(e) )</td>
</tr>
<tr>
<td>b.</td>
<td>( n^0 \Rightarrow \lambda e. \text{state}(e) )</td>
</tr>
<tr>
<td>c.</td>
<td>( n^P' = n^P \wedge \sqrt{\text{DOOR}}' )</td>
</tr>
<tr>
<td>d.</td>
<td>( D_{\text{the.sg}}(\sqrt{\text{DOOR}}' \Rightarrow \lambda P \in D_{\text{v},P}. \text{tx}. \exists e'. [P(e') \wedge e' \equiv x] )</td>
</tr>
<tr>
<td>e.</td>
<td>( D_{\text{the.sg}}(n^P') )</td>
</tr>
<tr>
<td>f.</td>
<td>( [[n^P']] \text{M.C.g} = \lambda e. \text{state}(e) \wedge \text{door}'(e) )</td>
</tr>
<tr>
<td>g.</td>
<td>( [[D_{\text{p}}]] \text{M.C.g} = \lambda x. \exists e. [\text{state}(e) \wedge \text{door}'(e') \wedge e' \equiv x] )</td>
</tr>
<tr>
<td>h.</td>
<td>( \sqrt{\text{CLOSE}} \Rightarrow \lambda e. \text{close}'(e) )</td>
</tr>
<tr>
<td>i.</td>
<td>( \text{Res}^0 \Rightarrow \lambda x. \lambda e. [\text{state}(e) \wedge \text{argument}(e, x)] )</td>
</tr>
<tr>
<td>j.</td>
<td>( \text{Res}^1 = \text{Res}^0 \wedge \sqrt{\text{CLOSE}}' )</td>
</tr>
<tr>
<td>k.</td>
<td>( t_7 \Rightarrow x_7 )</td>
</tr>
<tr>
<td>l.</td>
<td>( \text{ResP'} = \text{Res}^1'(t_7) )</td>
</tr>
<tr>
<td>m.</td>
<td>( [[\text{Res}^1']] \text{M.C.g} = \lambda x. \lambda e. [\text{state}(e) \wedge \text{argument}(e, x) \wedge \text{close}'(e)] )</td>
</tr>
<tr>
<td>n.</td>
<td>( [[\text{ResP}']] \text{M.C.g} = \lambda e. [\text{state}(e) \wedge \text{argument}(e, x_7) \wedge \text{close}'(e)] )</td>
</tr>
<tr>
<td>o.</td>
<td>( \sqrt{v^0} \Rightarrow \lambda x. \lambda e. [\text{eventuality}(e) \wedge \text{argument}(e, x)] )</td>
</tr>
<tr>
<td>p.</td>
<td>( \sqrt{v^0}' = \sqrt{v^0} \wedge \text{ResP}'' )</td>
</tr>
<tr>
<td>q.</td>
<td>( v^{15} = \lambda x_7. v^{15} )</td>
</tr>
<tr>
<td>r.</td>
<td>( v^P' = v^{15}(D_{p})' )</td>
</tr>
<tr>
<td>s.</td>
<td>( [[v^{15}]] \text{M.C.g} = \lambda x. \lambda e. [\text{eventuality}(e) \wedge \text{argument}(e, x) \wedge \text{state}(e) \wedge \text{argument}(e, x_7) \wedge \text{close}'(e)] )</td>
</tr>
<tr>
<td>t.</td>
<td>( [[v^{25}]] \text{M.C.g} = \lambda x_7. \lambda e. [\text{eventuality}(e) \wedge \text{argument}(e, x) \wedge \text{state}(e) \wedge \text{argument}(e, x_7) \wedge \text{close}'(e)] )</td>
</tr>
<tr>
<td>u.</td>
<td>( [[v^P']] \text{M.C.g} = \lambda e. [\text{eventuality}(e) \wedge \text{argument}(e, x_7, \exists e. [\text{state}(e) \wedge \text{door}'(e') \wedge e' \equiv x])] \wedge \text{state}(e) \wedge \text{argument}(e, x_7) \wedge \text{close}'(e)] )</td>
</tr>
<tr>
<td>v.</td>
<td>( \text{Cause}^0 \Rightarrow \lambda P_{\text{v},P} \cdot \lambda e. \exists e'. [P(e') \wedge \text{event}(e) \wedge \text{CAUSE}(e, e')] )</td>
</tr>
<tr>
<td>w.</td>
<td>( \text{CauseP} \Rightarrow \text{Cause}^{\text{vP}}(v^P) )</td>
</tr>
<tr>
<td>x.</td>
<td>( [[\text{CauseP}']] \text{M.C.g} = \lambda e. \exists e'. [\text{eventuality}(e') \wedge \text{argument}(e, x_7, \exists e. [\text{state}(e') \wedge \text{door}'(e') \wedge e' \equiv x]) \wedge \text{state}(e') \wedge \text{argument}(e', x_7) \wedge \text{close}'(e') \wedge \text{event}(e) \wedge \text{CAUSE}(e, e')] )</td>
</tr>
<tr>
<td>y.</td>
<td>( \text{Voice}^0 \Rightarrow \lambda x. \lambda e. [\text{event}(e) \wedge \text{argument}(e, x)] )</td>
</tr>
<tr>
<td>z.</td>
<td>( t_0 \Rightarrow x_9 )</td>
</tr>
</tbody>
</table>
The derivation in (75) is fairly straightforward, albeit long and complex, given the previous discussion in this chapter. In the ResP, the resultative head and the root combine via Event Identification, and the DP\(\_\) combines with Res\(\_\) via Functional Application. Then, for the \(\nu\)P, the verbal category determining head and the root combine via adjunction (and the denotations combine via conjunction), and DP\(\_\) moves from the ResP to the \(\nu\)P to combine via Functional Application. The causative head and the \(\nu\)P combine through Functional Application, and Voice\(\_\) and the CauseP combine through Event Identification. Since the VoiceP is a phase
head, instead of DP₀ filling the argument position, a trace is inserted; T₀ combines with the VoiceP through Functional Application, and an abstraction structure is created, which binds the trace in the specifier of Voice₀, and allows the DP₀ to be inserted in the specifier of T₀. Finally, DP₀ and TP² combine via Functional Application, and the derivation is complete, with all variables bound.

The derivation in (75) gives us a basic idea of how the verbal semantics functions in this dissertation. In Chapter 4, as different syntactic configurations are introduced to account for certain data, corresponding changes will be made to the semantics, but the same basic schema will underlie the derivations.

3.4.3 Summing Up
In this section, I illustrated how the semantic model applied to a small fragment of English syntax. It is important to lay this type of groundwork in order to demonstrate that a syntactic framework that assumes the SDMH can be interpreted by a standard logic with respect to a standard model. In the next section, I round out this chapter with a model for the Encyclopedia in DM. In Chapter 4, I use the systems developed in this chapter to analyze additional data, both from English and cross-linguistically, and I show how a theory of syntax that includes the SDMH can provide a unified analysis of certain patterns that required ad hoc stipulations in prior theories.

3.5 The Encyclopedia in DM
In previous sections of this chapter, I focused on developing the foundation for a formal model of syntax and semantics in that complies with the SDMH. This framework will be used to
account for a number of previously problematic argument-structure alternations in Chapter 4. In contrast, in this section I lay the groundwork for a formal account of the Encyclopedia in DM. Instead of accounting for alternations that do exist, this formulation of the Encyclopedia will help us account for why certain alternations do exist while others do not. The classic examples in (76) and (77) illustrate instances of alternations that are not permitted. In (76), both break and destroy denote a change of state of the object in the transitive versions, but only break can appear in the inchoative/intransitive form. Similarly in (77), both destroy and grow denote a change of state in the transitive verbal constructions, but only destroy permits a transitive nominalization.

(76)  
(a) John broke the vase.  
(b) The vase broke.  
(c) John destroyed the vase.  
(d) *The vase destroyed.

(77)  
(a) John destroyed the vase.  
(b) John grew the tomatoes.  
(c) John’s destruction of the vase  
(d) *John’s growth of the tomatoes

A purely syntactic account of the non-alternating variants (76d) and (77d) does not seem feasible within a DM framework; other roots can participate in alternations, so unless semantic characteristics of the roots are encoded in the syntax (which is precluded by the SDMH), no purely syntactic characteristics can be isolated that preclude the alternations for destroy and grow. Therefore, due to the nature of the roots themselves, the alternations must be blocked semantically. This is precisely the analysis provided by other DM researchers (e.g., Embick 2004a; Harley & Noyer 2000). However, no formal account of how the Encyclopedia blocks
these alternations is presented. I begin this section with a discussion of the notion of transitivity introduced by Hopper & Thompson (1990), which utilizes a feature system to define a continuum of transitivity. I then illustrate how Hopper & Thompson’s feature system can be adapted to the Encyclopedia in a DM framework, and show how this feature system, coupled with a principle of grammar, can account for why some alternations fail to obtain.

3.5.1 A typology of transitivity

Hopper & Thompson (1980) present seminal research into the nature of transitivity. According to Hopper & Thompson (1980:251), transitivity in its broadest sense is the property of a clause whereby the action of the clause is transferred from an agent to a patient. Hopper & Thompson developed a typology of features related to transitivity, as illustrated in the table in (78).

(78)

<table>
<thead>
<tr>
<th>Feature</th>
<th>High</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. PARTICIPANTS</td>
<td>2 or more participants, A and O</td>
<td>1 participant</td>
</tr>
<tr>
<td>B. KINESIS</td>
<td>Action</td>
<td>Non-action</td>
</tr>
<tr>
<td>C. ASPECT</td>
<td>Telic</td>
<td>Atelic</td>
</tr>
<tr>
<td>D. PUNCTUALITY</td>
<td>Punctual</td>
<td>Non-punctual</td>
</tr>
<tr>
<td>E. VOLTIONALITY</td>
<td>Volitional</td>
<td>Non-volitional</td>
</tr>
<tr>
<td>F. AFFIRMATION</td>
<td>Affirmative</td>
<td>Negative</td>
</tr>
<tr>
<td>G. MODE</td>
<td>Realis</td>
<td>Irrealis</td>
</tr>
<tr>
<td>H. AGENCY</td>
<td>A high in potency</td>
<td>A low in potency</td>
</tr>
<tr>
<td>I. AFFECTEDNESS OF O</td>
<td>O totally affected</td>
<td>O not affected</td>
</tr>
<tr>
<td>J. INDIVIDUATION OF O</td>
<td>O highly individuated</td>
<td>O non-individuated</td>
</tr>
</tbody>
</table>

Hopper & Thompson use the typology in (78) to classify the transitivity of sentences. The more features that a sentence or clause has in the ‘High’ column of (78), the more transitive it is, and
the closer it is to ‘cardinal transitivity’.\textsuperscript{34} For example, (79a) is much higher in transitivity than (79b) because (79a) has many features in the ‘High’ column of (78), while (79b) has mostly features in the ‘Low’ column of (78), as shown in (80).

(79)  
\begin{itemize}
  \item a. John knocked Sam down.
  \item b. John likes beer.
\end{itemize}

<table>
<thead>
<tr>
<th></th>
<th>John knocked Sam down.</th>
<th>John likes beer.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PARTICIPANTS</strong></td>
<td>High: 2 or more participants, A and O</td>
<td>High: 2 or more participants, A and O</td>
</tr>
<tr>
<td><strong>KINESIS</strong></td>
<td>High: Action</td>
<td>Low: Non-action</td>
</tr>
<tr>
<td><strong>ASPECT</strong></td>
<td>High: Telic</td>
<td>Low: Atelic</td>
</tr>
<tr>
<td><strong>PUNCTUALITY</strong></td>
<td>High: Punctual</td>
<td>Low: Non-punctual</td>
</tr>
<tr>
<td><strong>AFFECTEDNESS OF O</strong></td>
<td>High: O totally affected</td>
<td>Low: O not affected</td>
</tr>
</tbody>
</table>

Using Hopper & Thompson’s typology, we can also compare the transitivity of two sentences involving the same verb. Consider the sentences in (81), with the feature classifications in (82).

(81)  
\begin{itemize}
  \item a. John drank the beer.
  \item b. John drank beer.
\end{itemize}

<table>
<thead>
<tr>
<th></th>
<th>John drank the beer.</th>
<th>John drank some beer.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PARTICIPANTS</strong></td>
<td>High: 2 or more participants, A and O</td>
<td>High: 2 or more participants, A and O</td>
</tr>
<tr>
<td><strong>KINESIS</strong></td>
<td>High: Action</td>
<td>High: Action</td>
</tr>
<tr>
<td><strong>ASPECT</strong></td>
<td>High: Telic</td>
<td>Low: Atelic</td>
</tr>
<tr>
<td><strong>INDIVIDUATION OF O</strong></td>
<td>High: O individuated</td>
<td>Low: O non-individuated</td>
</tr>
</tbody>
</table>

According to (82), the difference in transitivity between (81a) and (81b) relies partially on the feature **INDIVIDUATION**, which is defined by the sub-classification in (83).

\textsuperscript{34} Cardinal transitivity is defined as a subject behaving actively, volitionally, and totally upon a definite or referential object. (Hopper & Thompson 1980:274)
(83)  

<table>
<thead>
<tr>
<th>INDIVIDUATION</th>
<th>NON-INDIVIDUATED</th>
</tr>
</thead>
<tbody>
<tr>
<td>INDIVIDUATED</td>
<td>NON-INDIVIDUATED</td>
</tr>
<tr>
<td>proper</td>
<td>common</td>
</tr>
<tr>
<td>human, animate</td>
<td>inanimate</td>
</tr>
<tr>
<td>concrete</td>
<td>abstract</td>
</tr>
<tr>
<td>singular</td>
<td>plural</td>
</tr>
<tr>
<td>count</td>
<td>mass</td>
</tr>
<tr>
<td>referential, definite</td>
<td>non-referential</td>
</tr>
</tbody>
</table>

The object in (81a) is more individuated than the object in (81b) because the object in (81a) is referential and definite, while the object in (81b) is non-referential and indefinite.

According to Hopper & Thompson, the transitivity features in (78) correlate with semantic and morphological markings, according to the Transitivity Hypothesis in (84) (adapted from Hopper & Thompson 1980:255).

(84)  *Transitivity Hypothesis*

If two clauses (a) and (b) differ in that (a) is higher in Transitivity according to any of the features in (78), then, if a concomitant grammatical or semantic difference appears elsewhere in the clause, that difference will also show (a) to be higher in transitivity.

Let me illustrate how the Transitivity Hypothesis works using the data in (85). With the sentences in (85), (85a) is telic and entails affectedness of the object, although the total affectedness of the object is implicated and not entailed. On the other hand, (85b) is atelic and while it entails affectedness, it also negates the total affectedness implicature, as illustrated in (86). The transitivity features for the data in (85) are given in (87), with some irrelevant features omitted for clarity.
(85)  
   a. John ate the apple.
   
   b. John ate *at* the apple (but he didn’t eat the entire thing).

(86)  
   a. John ate the apple.
   
   Telic: John ate the apple in an hour/*for an hour.
   
   Totally affected: John ate the apple (but he didn’t eat the entire thing).
   
   b. John ate at the apple.
   
   Atelic: John ate at the apple for an hour/*in an hour.
   
   Not totally affected: John ate at the apple for an hour (#until he finished it).

(87)

<table>
<thead>
<tr>
<th></th>
<th><em>John ate the apple.</em></th>
<th><em>John ate at the apple.</em></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Participants</strong></td>
<td>High: 2 or more</td>
<td>High: 2 or more</td>
</tr>
<tr>
<td></td>
<td>participants, A and O</td>
<td>participants, A and O</td>
</tr>
<tr>
<td><strong>Kinesis</strong></td>
<td>High: Action</td>
<td>High: Action</td>
</tr>
<tr>
<td><strong>Aspect</strong></td>
<td>High: Telic</td>
<td>Low: Atelic</td>
</tr>
<tr>
<td><strong>Affectedness of O</strong></td>
<td>High: O affected</td>
<td>Low: O not totally affected</td>
</tr>
</tbody>
</table>

According to the Transitivity Hypothesis, if a grammatical marking related to transitivity obligatorily appears in one of the sentences in (85), it will indicate that (85a) as more transitive. This is indeed the case. Beavers (2010) shows that for a verb like *eat*, which involves incremental theme reading (see Dowty 1991), the transitive variant allows both a completed and an uncompleted reading with respect to the patient, but the patient is realized as an object of a preposition when the patient is not totally affected/eaten. In (85) we have an example of the incremental theme being an object that is consumed (*the apple*); in (85a), the apple can be totally consumed, the event is telic, and the object is a direct object, while in (85b), the apple is not totally consumed, the event is atelic, and the object is an object of a preposition. A similar pattern is observed when the incremental theme is a path, as in (88).
(88) a. John climbed the mountain.

b. John climbed up the mountain (but he never reached the top).

So verbs with incremental themes can display varying transitivity based on the features ASPECT and AFFECTEDNESS OF O, and this is varying transitivity is reflected morphosyntactically on the object.

As I mentioned above, Hopper & Thompson use the features in (78) to classify the transitivity of clauses or sentences. I employ this research on transitivity as a starting point for a typology of encyclopedic features for DM, although Hopper & Thompson’s formulation of the Transitivity Hypothesis does not come into play.

3.5.2 Transitivity and the Encyclopedia

In order to account for how the Encyclopedia prevents certain argument-structure alternations from occurring, we need a formal account of the Encyclopedia. The typology developed by Hopper & Thompson is an attractive candidate for characterizing the Encyclopedia because it is based on features of language that are directly observable, like telicity, volitionality, agency, etc. However, there are some known problems with Hopper & Thompson’s formulation of the Transitivity Hypothesis in (84). Tsunoda (1985) points out three major issues. First, Hopper & Thompson claim that the transitivity features co-vary: whenever two features are paired in the morphosyntax or semantics, both must appear on the same side of the transitivity scale in (78). This seems to hold for e.g. VOLITIONALITY and AGENCY, but for other pairings such as

With other verbs, the conative alternation does not distinguish between affected and totally affected, but rather, affected and not affected. For example with punch, the transitive construction entails that the object has been affected, but nothing about the affectedness of the patient is entailed when the object is oblique.
(i) John punched Bill. (John’s punch landed.)
(ii) John punched at Bill. (John’s punch didn’t necessarily land.)
Volitionality/Agency and Affectedness, co-variance fails to hold. (Tsunoda 1981, 1985) In other words, if a sentence involves a volitional subject, the subject is also agentive. However, if a sentence involves a volitional/agentive subject, the affectedness of the object does not always hold, and conversely, if a sentence involves an affected object, it does not entail that the subject is volitional/agentive. For example, in John climbed the mountain, the subject is volitional and agentive, but the object is not affected, and with The bullet broke the vase, the subject is not volitional/agentive but the object is affected.

In addition, Tsunoda (1981, 1985) shows that some features are not equally ranked with respect to each other as far as transitivity goes; Volitionality and Agency simply are irrelevant to transitivity, while Affectedness is crucial to transitivity. For example, we can have two sentences that are equally ranked with respect to transitivity where differences in the volitionality/agency of the subject has no impact on nature of transitivity, and the affectedness of the object is what classifies the transitivity as high (e.g., John broke the vase and The bullet broke the vase). Similarly, we can have two sentences where the volitionality/agency of the subject mismatches with the degree of transitivity; e.g., The bullet broke the vase and John hit the vase. In the former sentence, the transitivity is high because the object is affected, even though the subject is not agentive/volitional, while in the latter sentence, the transitivity is lower because the object is not necessarily affected, even though the subject is volitional/agentive. In terms of Beavers (2011), the former sentence involves a quantized change while the latter simply

36 Hopper & Thompson give another example where Volitionality seems to be relevant:
   (i) Susan left. (KINESIS: action, ASPECT: telic, PUNCTUALITY: punctual, VOLITIONALITY: Volitional)
   (ii) Jerry likes beer. (PARTICIPANTS: two)
Tsunoda (1981:427 fn9, 428 fn12) explicitly excludes one-place predicates from his discussion, and focuses solely on cases where a transitive case frame is morphosyntactically present, so no discussion of the difference between (i) and (ii) is presented.
involves potential for change, and the difference in transitivity reading is due to the fact that quantized change is higher on Beaver’s Affectedness Hierarchy than the potential for change.

For these reasons, Tsunoda rejects VOLITIONALITY and AGENCY as relevant to his effectiveness features (Tsunoda 1981:427 fn9) for describing a wide variety of case frames crosslinguistically. Finally, as presented by Hopper & Thompson, Affectedness is a binary feature, O totally affected vs. O not affected. The discussion in Tsunoda (1985) primarily focuses on expanding AFFECTEDNESS into a hierarchy of its own, based on a variety of predicate classifications (e.g., effect on patient, perception verbs, pursuit verbs, knowledge verbs, feeling verbs, etc.). Beavers (2011) further refines the affectedness hierarchy, defining affectedness in terms of the nature of the change; quantized change (accomplishments and achievements), non-quantized change (degree achievements), potential for change (surface contact/impact), and unspecified for change (activities and states). Beavers provides precise diagnostics for the different classifications, and develops an explicit semantics and for affectedness, thus expanding on the understanding of one of the primary features that defines transitivity.

Other researchers have also noted these same issues with the Transitivity Hypothesis. Malchukov (2005, 2006) develops a hierarchy of verb classes within the framework of Optimality Theory, and shows how a set of relevant constraints and their respective rankings can account for a variety of case-frames for the different verb types in the hierarchy. Beavers & Zubair (2010) builds on Malchukov’s approach, proposing that two independent systems constrain case alternations based on a volitive/involutive split in Sinhala; a realis/irrealis stem alternation related to the intentions or expectations of certain participants in the event, which interacts with intentional features like volitionality; and a system of inherent case marking, where nominative is a default case, and it occurs in the volative constructions due to the nature of
the events described by volative verbs. The major point of Beavers & Zubair (2010) is that the hierarchies proposed for transitivity features, and perhaps the Transitivity Hypothesis itself, can be reduced to properties of the grammar when the syntax and semantics of certain constructions is examined in greater detail.

Given the issues with the Transitivity Hypothesis noted above, it is important to examine other features proposed by Hopper & Thompson to see how they relate to the issue of transitivity. In this section, I look more closely at the PARTICIPANTS feature independently of Hopper & Thompson’s formulation of the Transitivity Hypothesis. I then propose that a principle of grammar, based on the Monotonicity Hypothesis (Koontz-Garboden 2009), interacts with the PARTICIPANTS feature to determine some aspects of verbal alternation.

Before I move on, I do want to point out one theoretical issue. Hopper & Thompson’s system is used to characterize clauses or sentences, so it cannot be imported wholesale into DM to characterize the Encyclopedia, because we need to characterize the nature of the root. In order to do this, I propose that we assign feature specifications to roots themselves, based on some notion of defaults or prototypes.\(^ {37}\) For example, I propose the default feature specifications for the Encyclopedia Entries of the English roots \(\sqrt{\text{EAT}}\) and \(\sqrt{\text{BREAK}}\) in (89) and (90) respectively.\(^ {38}\)

\[
\begin{array}{ll}
\sqrt{\text{EAT}} & \\
\text{PARTICIPANTS} & 2 \text{ or more participants, A and O} \\
\text{KINESIS} & \text{Action} \\
\text{VOLITIONALITY} & \text{Volitional} \\
\text{AGENCY} & \text{A high in potency} \\
\text{AFFECTEDNESS OF O} & \text{O affected}
\end{array}
\]

\(^{37}\) It is by no means the intention of this dissertation to develop a cognitive theory of prototypicality, nor is the discussion of prototypes in any way related to the notion of prototypes in cognitive psychology (beginning with Rosch et al. 1976) and cognitive linguistics (e.g., Taylor 2003).

\(^{38}\) In the feature specification of a root, any features that are not present in the specification are underspecified by default, or are not relevant to the root in any way (e.g., INDIVIDUATION OF O). Of course, these feature specifications are listed as in the Encyclopedia for the root, and are not present on the root in the syntax.
Now, focusing on the PARTICIPANT feature specifications I propose in (89) and (90), the roots \(\sqrt{\text{EAT}}\) and \(\sqrt{\text{BREAK}}\) are fundamentally different with respect to the number of participants, and thus relevant for argument structure; \(\sqrt{\text{BREAK}}\) requires a single argument, while \(\sqrt{\text{EAT}}\) requires two arguments.\(^{39}\)

However, the difference in PARTICIPANT feature specification for \(\sqrt{\text{EAT}}\) and \(\sqrt{\text{BREAK}}\) cannot by itself tell us why some roots alternate and others do not. We could just as well say that a root like \(\sqrt{\text{EAT}}\) with two arguments specified for its PARTICIPANTS feature could surface with a single argument, just as a root like \(\sqrt{\text{BREAK}}\) with one argument specified can surface with two arguments; but this is not the case. Therefore, we need something to tell us that the features of \(\sqrt{\text{BREAK}}\) permit alternation, while the features of \(\sqrt{\text{EAT}}\) preclude alternation. What mechanism

\(^{39}\) Hopper & Thompson (1980) assume that their features are binary, although as mentioned above, this position seems to have some issues, especially when considering the Affectedness feature. For the roots under discussion here, I assume that the PARTICIPANTS feature is bivalent: 1 Participant or 2 Participants. However, we might propose that the PARTICIPANTS feature actually has a third possible value: 0 Participants. This would permit us to have a three-way distinction in classes of roots; roots like \(\sqrt{\text{DOOR}}\) that typically surface as nouns could have a 0 Participants specification, roots like \(\sqrt{\text{BREAK}}\) and \(\sqrt{\text{RED}}\) have a 1 Participants specification, and roots like \(\sqrt{\text{DESTROY}}\) have a 2 Participants specification. In this system, the roots that typically surface as nouns don’t have any participants specified because they refer to properties, which are then converted to kinds in the semantic derivation so that they can refer, and thus serve as participants themselves. For roots like \(\sqrt{\text{RED}}\) that typically surface as adjectives, the 1 Participants feature could be identified in different ways; in attributive adjectival constructions, the DP that the adjective modifies would serve as the participant, while in predicate adjectival constructions, the external DP would serve as the participant. And although roots like \(\sqrt{\text{BREAK}}\) and \(\sqrt{\text{RED}}\) would have the same feature specification even though they typically surface as different lexical categories in English, this proposal seems to be on the right track intuitively; in some languages (English, Semitic), roots that typically surface as nouns are less easily verbalized than roots that typically surface as adjectives, and there is a lot of overlap between roots that can surface as verbs and adjectives. (Kramer p.c.) So if roots that typically surface as adjectives and verbs have the same specification for the PARTICIPANTS feature, it would make sense that they pattern together. An in-depth analysis of the Participants feature is left for future research.
allows for this? I propose that something like the Monotonicity Hypothesis, expressed in (91), interacts with the PARTICIPANT feature of roots to permit or restrict alternations.

(91) Monotonicity Hypothesis (Koontz-Garboden 2009:80)⁴⁰

Word formation operations do not remove operators from lexical semantic representations.

In order to see how the Monotonicity Hypothesis works, consider the analysis of anticausativization presented by Koontz-Garboden (2009). In this analysis, Koontz-Garboden proposes that in Spanish, the inchoative alternant of romper ‘break’ in (92a) is not basic, but is formed from the causative alternant in (92b).

(92) a. El vaso se rompió.
   the cup REFLEXIVE broke
   ‘The cup broke.’

   b. Juan rompió el vaso.
   Juan broke the cup
   ‘Juan broke the cup.’

Koontz-Garboden, working within a lexical decomposition framework, assumes the underlying lexical semantic representation in (93) for the causative/transitive romper in (92b).

(93) \[ ([\text{romper}]) = \lambda x \lambda y \lambda s \lambda e(\exists v[(\text{CAUSE}(v,e) \land \text{EFFECTOR}(v,y) \land \text{BECOME}(e,s) \land \text{THEME}(s,x) \land \text{not-whole}(s)])] \]

According to Koontz-Garboden, romper names an event \( e \) of a participant \( x \) coming to be in a state \( s \) of being not whole, and that change of state event is caused by an eventuality \( v \) in which

---

⁴⁰ For Koonts-Garboden, the operators referred to in (91) are those that appear in the decompositional semantics in (93), (94), and (96); CAUSE, BECOME, EFFECTOR, and THEME.
another entity $y$ is a participant. For the causative construction in (92b), the two arguments *el vaso* and *Juan* straightforwardly saturate the argument positions $x$ and $y$ respectively, yielding the denotation in (94).

(94) \[
[[Juan rompió el vaso]] = \exists e \exists s \exists v [CAUSE(v,e) \wedge EFFECTOR(v, Juan) \wedge BECOME(e,s) \wedge 
THEME(s, el vaso) \wedge not-whole(s)]
\]

In the inchoative construction in (92a), Koontz-Garboden proposes that the reflexive clitic *se* is a reflexivization operator, taking the underlying lexical semantic representation in (93) and setting both arguments to be the same, following Chierchia (2004a). The reflexivization operator is given in (95), and the resultant lexical semantic representation for *romper* after the reflexivization operator has applied is given in (96).

(95) Reflexivization Operator
\[
[[se]] = \lambda R \lambda x[R(x,x)]
\]

(96) \[
[[romperse]] = \lambda x \lambda s \lambda e[\exists v [CAUSE(v,e) \wedge EFFECTOR(v,x) \wedge BECOME(e,s) \wedge 
THEME(s, x) \wedge not-whole(s)]]
\]

According to Koontz-Garboden (2009:86), “the denotation of the anticausative *romperse* ‘break (intrans)’ is a function from ordinary individuals to states to COS events in which the individual undergoing the change is also the EFFECTOR participant in the event that causes the change of state event.” The Monotonicity Hypothesis (MH) is explicit in Koontz-Garboden’s analysis; the transitive version of *romper* is the underlying form, and the reflexivization word-formation operation, which creates *romperse*, does not eliminate the causation operator from the lexical semantics. An argument is ‘eliminated’ through the reflexivization process, but the argument position in the lexical semantic representation is not.
I believe that Koontz-Garboden’s analysis for *romper* and anticausatives in Spanish, as well as the notion of the MH, is essentially correct. However, I propose that a cross-linguistic difference between English and Romance, specifically due to an ambiguity in English, permits an analysis where English *break* is specified for a single argument in the Encyclopedia, which clearly conflicts with previous research claiming that *break* has two underlying arguments. (Chierchia 2004a; Levin & Rappaport Hovav 1995; *romper* in Koontz-Garboden 2009) These arguments are based on data like Spanish in (92) and unaccusative verbs in Italian, like in (97).

(97)  

a. Il vento ha rotto la finestra.

‘The wind broke the window.’

b. La finestra si è rotta.

‘The window broke.’

c. Gianni ha affondato la barca.

‘John sank the ship.’

d. La barca è affondata.

‘The ship sank.’

In Italian, some unaccusative verbs require the reflexive marker *si* when the construction is intransitive while some do not, but in the transitive variants, *si* is not present. In Spanish, the reflexive marker *se* is always present with the intransitive variant, and the *se* marker is not present in the transitive variant. According to Chierchia (2004a), reflexivization operates on a causative construction, but the causing factor is a stative property of the subject, not an action performed by the subject. So the event structure in the reflexive constructions is markedly different from the event structure in transitive causative constructions without the reflexive
marker. But in both cases, there is a causer for the change subevent (and the resultant state) overtly present syntactically and semantically.

However, Folli (2001) presents some criticisms of Chierchia’s perspective, citing Higginbotham (1997); the basic idea is that there is a fundamental difference between the causal explanation of a change subevent and explicitly indicating a causer of the change subevent. For example, according to Higginbotham, causal explanation answers the question why, not the question what. So in a situation where you drop a stone into a glass of water and say the stone sank, you can ask why the stone sank, but you cannot ask what sank it. “Nothing sank it; it sank of its own accord.” (Folli 2001:145, citing Higginbotham 1997) Based on this notion, Folli (2001) proposes a clear syntactic and semantic distinction between rompere ‘break’ and affondare ‘sink’ in Italian; the former has two underlying arguments, while the latter has one, in line with my proposal that English break has a single argument Encyclopedia.

With verbs like rompere, an overt causer is required; in transitive constructions, the causer is provided, and in intransitive constructions, the si operator indicates an overt result state and ‘the causal component is lost.’ (Folli 2001:152) With verbs like affondare, there is a single underlying argument; since there is no underlying causation, there is nothing for the si operation to function on, but standard causativization operations are available, as evidenced by the transitive constructions that lack si.

Folli, citing Centineo (1995), presents a diagnostic for determining whether a verb has one or two underlying arguments, using the analytic causative with fare ‘make’, as in (98). Verbs with one underlying argument generally allow two meanings, as in (98a); one where the subject of the analytic causative causes the change event (98ai); and one where the subject of the analytic causative causes the causing event, with no overtly present causer argument, and this
causing event causes the change event (98aii). In contrast, verbs with two underlying argument
only allow the latter interpretation (98bi), where there is an unstated causer of the change. Folli
claims that the verbs with a single underlying event allow for both interpretations because even
though the verb may be underlyingly intransitive, causation is an operation freely available to the
syntax, so the meaning in (98aii) is ultimately derivable.

(98)  a. Maria fece affondare la barca.
       Maria made sink the ship
       i. OK ‘Maria made the ship sink.’
       ii. OK ‘Maria had someone sink the ship.’

b. Maria fece rompere la finestra.
       Maria made break the window
       i. OK ‘Maria had someone break the window.’
       ii. #‘Maria got the window to break.’

In addition to verbs like break and sink, Folli presents a third class of unaccusative verbs
that allow constructions both with and without si, as in fondere ‘melt’ in Italian in (99). As
indicated by the fare-test in (100), fondere has a single underlying argument because both
interpretations are available.

(99)  a. Maria ha fuso il cioccolato.
       ‘Maria melted the chocolate.’

b. Il cioccolato (si) è fuso.
       ‘The chocolate melted.’
(100) Maria fece fondere il cioccolato.

OK ‘Maria made the chocolate melt.’
OK ‘Maria had someone melt the chocolate.’

To account for the difference between the affondare and fondere classes of verbs, Folli claims that in the si variants, the process component is lost and si picks out the result state. With verbs like affondare, the si variant does not occur because these verbs typically lack a result state.

The key point that I would like to highlight in Folli’s analysis of Italian is that although verbs may seem to cluster into a single unaccusative class, there are actually three distinct classes of Italian unaccusatives, with inherent differences across classes with respect to event structure and the number of participants presupposed by the verb. I would like to extend Folli’s analysis to examine break in English. The fare-test does not work for English, so we need a different diagnostic to see if break has one or two underlying arguments. I propose that break is generally ambiguous in English; in Higginbotham’s terms, in a sentence like the stick broke, we can ask about the causal explanation (‘How did the stick break?’), but we can also ask about the causer (‘What broke the stick?’). For this reason, I propose that the PARTICIPANTS feature for √BREAK in English is specified as ‘1 participant’, but the standard causation operation can add participants and event structure syntactically. This approach allows us to tackle additional problems pointed out with the assumption that break has a single underlying argument. According to Levin & Rappaport Hovav (1995:85), there are some instances in English where break does not appear in the intransitive variant, like in (101).
His promise/the contract/the world record broke.

Since the transitive version of *break* allows for a wider variety of contexts than the intransitive variant, Levin & Rappaport Hovav claim that *break* has an underlying transitive representation. However, I would like to look at (101) from a different angle. As stated above, I claim that the root √BREAK has a single argument specified for the PARTICIPANTS feature in the Encyclopedia. But due to the Encyclopedic nature of the arguments projected in the syntax, we can’t ask ‘How did the promise/contract/world record break?’ because these arguments need some kind of overt causer to do the breaking; a contract can’t ‘break’ by itself, likewise for a world record and a promise. Therefore, we can only ask ‘Who/what broke the promise/contract/world record?’ But since the si construction is not available in English, the full transitive-causative construction is required.

Given this assumption that the root √BREAK has a single argument specified for the PARTICIPANTS feature in the Encyclopedia, I want to present how the Monotonicity Hypothesis (MH) interacts with the PARTICIPANTS feature. But in order to see how the MH applies in the DM framework I develop here, the MH needs to be reformulated. As it stands, the MH refers not to arguments, but to operators in lexical semantic representations. In the DM framework I develop in this dissertation, roots do not have lexical semantic representations. Rather, they have Encyclopedia entries containing feature specifications defined in terms of the feature typology advanced by Hopper & Thompson (1980). Therefore, I propose that the MH needs to be formulated in terms of the feature specifications of roots, and specifically the PARTICIPANTS feature, which stipulates the number of arguments inherently associated with a root. I propose the formulation of the MH for DM in (102).
The Monotonicity Hypothesis (DM version)

If √root combines with v⁰, derivational processes cannot reduce the valence of the root, where the valence is determined by the PARTICIPANTS feature.

The MH is a constraint at the syntax-semantics interface. It looks at the syntactic environment, and based on this environment, it constrains what can occur semantically. But since semantic argument positions rely on the presence of syntactic functional heads, the MH has the effect of constraining the syntax. Now, consider how (102) applies to √BREAK and √EAT in English. The root √BREAK has one underlying argument, as defined by the PARTICIPANTS Encyclopedic feature in (90). So if √BREAK combines with v⁰, a single argument can be realized, in the specifier of v⁰. In addition, the vP can be causativized; given that English is a Voice Bundling language, adding the causative head also entails adding Voice⁰, and since an argument merges in the specifier of Voice⁰, causativization involves the addition of an argument syntactically and semantically. In contrast, the root √EAT involves two arguments according to the PARTICIPANTS feature in (89). So if √EAT combines with v⁰, two arguments must be realized, and this is what we encounter when eat appears in verbal contexts in English, with one argument in the specifier of v⁰ and one in the specifier of Voice⁰.41,42 I do not assume that the Participants

41 Of course, contexts exist with eat where the object argument is omitted in the syntax, as in (i).
   i. John ate already.
   ‘John ate the contextually relevant meal already.’
In these cases, the argument is tacitly present in the semantic representation, so the relevant verbal functional head must be present in the syntax in order for the argument to be projected. However, in these cases, the argument is not overtly expressed, so I assume it is a variety of pro, a phonologically null free variable/pronoun in the syntax. Intransitive variants of verbs like eat are clearly different from intransitive variants of unaccusative verbs like break; we can ask how something broke, or what broke it, but with eat, we can only ask what was eaten, and this question directly targets an argument position, the object position, so we can assume that the position (and an argument) are present syntactically.
features (or any Encyclopedic features, for that matter) are present in the narrow syntax. Thus, these features are different than the features generally posited for morpo-syntax in Minimalism, where features interact with each other to drive the syntactic or morpho-phonological output. Rather, these features examine the output of the syntactic computation, and mismatches between the syntax and the Encyclopedia can have an effect on whether the syntactic derivation is considered licit.

Now, we must examine how the MH in (102) applies to the cases of romper and romperse discussed by Koontz-Garboden. First, given Koontz-Garboden’s analysis, √ROMPER is fundamentally different than what I have proposed for √BREAK in English; the Encyclopedic feature specification of √ROMPER would include a specification of ‘2 participants’ for the PARTICIPANTS feature.

For transitive instances of romper like in (92b), the analysis is straightforward. Since √ROMPER combines with v₀, two arguments must be present, and these two arguments are merged in the specifier of v₀ and the specifier of Voice₀. However, how do we reconcile Koontz-Garboden’s analysis of sentences involving romperse with the formulation of the MH in (102)? I believe we can employ Koontz-Garboden’s same analysis, modified slightly to accommodate the DM framework presented in this dissertation. Since √ROMPER combines with v₀, two arguments must be present. The object el vaso is merged in the specifier of v₀, and Cause₀ is merged into the derivation. Next, I propose that the reflexive marker se is an overt instantiation of a special version of Voice₀, which is similar to the Voice₀ found in passive constructions in that it fails to

---

42 This type of interaction of the syntax and semantics in argument projection is different than GB notions like the Theta Criterion (in its various formulations) in specific ways. First, the Theta Criterion specifically references levels of representation in GB; a one-to-one match between arguments and thematic positions, at both D-Structure and S-Structure. So in GB, there are (at least) two versions of break: breakTransitive which must always surface with two arguments and breakIntransitive which must always surface with one. Second, the Theta Criterion is a condition on the syntax (or the syntax-lexicon interface), while the system for DM that I present here is a condition on the syntax-semantics interface.
check Case on the object in the specifier of \(v^0\), but which is different than the passive version of Voice\(^0\) in that it maintains an argument position (i.e., a specifier). Since Case on *el vaso* is not checked in the specifier of \(v^0\), the DP must move to the specifier of Voice\(^0\), where T\(^0\) can check Nominative Case on *el vaso*. The DP would then move to the specifier of T\(^0\) for EPP reasons.

The structure for this analysis is given in (103).

(103)

Given this analysis, we can derive the reflexive analysis of anticausatives in Spanish; something like the reflexivization operator in (95) is the translation of a special form of *se*, distinct from passive *se*, overtly present in the syntax. And even though a single argument is present, what counts is that both argument positions are present, and the single argument saturates both positions. This analysis can also account for the fact that many ‘inherently reflexive’ verbs in English can appear with a single argument. For example, consider the root \(\sqrt{\text{SHAVE}}\), with the feature specification given in (104).

(104)

<table>
<thead>
<tr>
<th>(\sqrt{\text{SHAVE}})</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PARTICIPANTS</td>
<td>2 participants</td>
</tr>
<tr>
<td>KINESIS</td>
<td>Action</td>
</tr>
<tr>
<td>AFFECTEDNESS OF O</td>
<td>O affected</td>
</tr>
</tbody>
</table>
Since √shave has two underlying arguments in its feature specification, data like (105) is not surprising. However, data like (106) is difficult to account for.

(105)  a. John shaved Bill.
       b. John shaved himself.

(106) John shaved.

‘John shaved himself.’

Given the interpretation of (106) as underlingly transitive and reflexive, we could assume that some kind of reflexive operator is present in (106), similar to the Spanish cases with se discussed above. However, reflexivization in English is much different than in Spanish, primarily with respect to where the reflexivization is marked. In Spanish, the se particle marks reflexivization on the verbal/inflectional heads, but in English, reflexive marking appears almost entirely on the arguments in the form of overt anaphors. Therefore, I analyze English reflexives like (105b) somewhat differently than what Koontz-Garboden proposed for Spanish. I do assume that movement is involved, and I do assume that shave involves two underlying arguments. But instead of a syntactically present reflexivization operator driving the movement and the interpretation of the two argument positions as pertaining to the same argument, I assume a movement analysis of anaphora following (Hornstein 2001), where John+self is generated in object position and John moves to subject position. The issue is, –self is a morphologically bound form, so the pronominal (with the appropriate agreement) is spelled out with –self.

Given this approach to overt reflexives, how do we account for ‘inherent reflexives’ like in (106)? I assume an analysis similar to that for eat presented above; I stipulate that shave can
select as an object a phonetically empty pronominal free variable \textit{pro}, and the reference of \textit{pro} is by default set to the subject due to the nature of \textit{shave}. I don’t know if this characteristic of \textit{shave} should be marked Encyclopedically, e.g. with a \textsc{reflexive} feature or a ‘reflexive’ annotation on the \textsc{participants} feature. But it is clear that such an analysis of \textit{shave} is necessary given the meanings involved in (105) – (106).

Based on the analysis presented here, the difference in between \textit{break} and \textit{destroy} can be reduced to different specifications for the feature \textsc{participants} of the roots and the \textsc{monotonicity} Hypothesis. The causative alternation is permitted with √\textit{break} since the root has one argument specified for the \textsc{participants} feature in the Encyclopedia, and a second argument position can be freely added through causitivization. With √\textit{destroy}, I assume that the \textsc{participants} feature has two arguments specified, so both must be present in the syntactic and semantic representations due to the \textsc{mh}, and √\textit{destroy} cannot participate in the causative-inchoative alternation.\footnote{An alternate analysis is to follow Chierchia (2004a), Levin & Rappaport Hovav (1995), and Koontz-Garboden (2009) in the conclusion that \textit{break} and \textit{destroy} are fundamentally the same with respect to the number of arguments specified for them (i.e., they are both underlyingly transitive), and propose another factor conditions the lack of alternation for \textit{destroy}. For example, Levin & Rappaport Hovav (1995:105) propose that “If the eventuality described by a verb has an external cause, the verb is basically transitive; moreover, if this eventuality can occur without the direct intervention of an agent, then the external cause does not have to be expressed in the syntax,” where this latter condition is correlated with “spontaneous occurrence”. However, the examples are not entirely clear-cut. One of the examples that Levin & Rappaport Hovav use is in relation to the verb \textit{cut}. In (i), agents or instruments can serve as subjects, and when an instrument is involved, it implies that the instrument is used by a volitional agent (Levin & Rappaport Hovav 1995:103).

(i)  The baker/That knife cut the bread.
However, if a knife falls off of a shelf and cuts the bread, the instrument reading in (i) is acceptable as well, and the forces that made the knife fall do not have to involve a volitional agent. Likewise, if I am walking on the beach and I step on a piece of glass and it cuts my foot, I can utter (ii) without any kind of volitional agent being involved.

(ii)  The glass cut my foot.
Finally, Levin & Rappaport Hovav (1995:103) claim that natural force subjects are not permitted with \textit{cut} in (iv), although I find this sentence completely acceptable. And clearly, natural force subjects can appear with \textit{destroy}.

(iii) *The lightning cut the clothesline.
So given this discussion, maybe the condition that constrains alternation is “spontaneous occurrence.” For example, we could claim that a verb like \textit{shatter} can spontaneously occur, and thus it can alternate. But it’s not clear that something could not spontaneously be destroyed. If something shatters, to me it counts as destroyed, so I don’t see why a sentence like \textit{The vase destroyed} is not an acceptable characterization of an event where a vase shatters.}
The approach to the Encyclopedia presented here is employed to account for additional argument-structure alternations in Chapter 4. In Chapter 5, I sketch an analysis of argument-structure alternations in nominalizations that employs the ideas developed in this section.

### 3.6 On thematic roles

Thematic roles have been a central component of linguistic theory for decades, spanning a variety of different frameworks under a number of different names (e.g., Thematic Relations for Gruber 1965; Case Roles in Case Grammar, Fillmore 1968; Theta-Roles for Chomsky 1981 *et seq.*; θ-structure in LF, Bresnan 2001). Until now, I have mentioned little about the thematic relations and what part they play in the DM framework I develop in this dissertation. If we look back at the translations for the functional heads $v^0$ and Voice$^0$ I presented in Section 3.3 above, I completely eliminated notions of thematic roles, and I indicated arguments in the translations simply as ‘argument’, as in (107) repeated from (28) - (29) above.

\[(107)\]

a. $v^0 \Rightarrow \lambda x . \lambda e . [\text{event}(e) \land \text{argument}(e, x)]$

b. $v^0 \Rightarrow \lambda x . \lambda e . [\text{eventuality}(e) \land \text{argument}(e, x)]$

b. Voice$^0 \Rightarrow \lambda x . \lambda e . [\text{event}(e) \land \text{argument}(e, x)]$

This is in contrast to the semantics of the neo-Davidsonian tradition, where each argument is characterized according to the role it plays in the sentence. In presenting the translations in (107), I am essentially concurring with Hale & Keyser (1993) and many others\(^{44}\) in assuming that thematic roles are epiphenomenal, and thematic relations instead emerge from the position of the arguments in the syntax. For the functional heads in (107), it is fairly transparent that the

\[^{44}\text{For example, see Dowty (1991), Borer (2005b), Pylkkänen (2008), Ramchand (2008), Harley (2005).}\]
argument will take on the nature of the subevent introduced for that head. So consider our example of a causative structure from (74) above, which is repeated in (108) (omitting the irrelevant projections for clarity).

(108) a. John closed the door.

```
b. VoiceP
   DP
      John Voice
         CauseP
           Cause vP
              DP
                 the door v √CLOSE
```

In (108b), the subject DP *John* is merged into the specifier of *Voice*\(^0\). Since the subevent associated with *Voice*\(^0\) is a causing subevent, *John* is treated as the argument of the causing subevent. The thing that participates in a causing subevent is generally an agent or a causer of some kind, so these types of thematic relations emerge from the syntax and semantics themselves, and do not need to be stipulated independently. Likewise with *the door*, the object DP merged into the specifier of *v*\(^0\). In this case, the door is the argument of the closing subevent, it is the thing that closes. Since it is the thing that is acted upon and affected, *the door* is treated as a patient or theme. But again, this meaning emerges from the syntax and semantics independently of some theory of thematic relations.

When we have a sentence where it is clear that there are two subevents, it’s easy to see how each argument can serve as the argument of a different subevent. However, how do we
account for situations where there are multiple arguments but a single subevent? For example, what about when we have a stative predicate as in (109)?

(109) John likes Mary.

Dowty (1991) presents one theory of thematic relations focusing on the notion of thematic Proto-Roles. According to Dowty, these Proto-Roles are sets of lexical entailments that classify arguments with respect to predicates. For example, Proto-Agent entailments include VOLITION, SENTIENCE/PERCEPTION, CAUSATION, and MOVEMENT, while Proto-Patient entailments include CHANGE OF STATE, INCREMENTAL THEME, CAUSALLY AFFECTED, and STATIONARY RELATIVE TO ANOTHER PARTICIPANT.

In Dowty’s system, arguments are lexicalized with respect to the verb according to the principle in (110).

(110) **Argument Selection Principle** Dowty (1991:576)

In predicates with grammatical subject and object, the argument for which the predicate entails the greatest number of Proto-Agent properties will be lexicalized as the subject of the predicate; the argument having the greatest number of Proto-Patient entailments will be lexicalized as the direct object.

So in order to apply Dowty’s system, consider a verb like *eat*. One argument of *eat*, the eater, has at least the Proto-Agent entailments VOLITION, SENTIENCE/PERCEPTION, CAUSATION, and the eater has none of the Proto-Patient entailments. The other argument of *eat*, the thing being eaten, has none of the Proto-Agent entailments (or maybe only SENTIENCE/PERCEPTION in some cases), but has several Proto-Patient entailments, including at lease CHANGE OF STATE, INCREMENTAL...
**Theme, Causally Affected.** So given these entailment patterns, the eater is lexicalized as the subject argument and the thing that is eaten is lexicalized as the object argument.

Dowty’s system is intended for a representational (i.e., non-derivational) syntactic framework, where a predicate is listed along with a set of its arguments. The Argument Selection Principle then looks at the entailments of the arguments, and ranks the arguments with respect to the Proto-Agent and Proto-Patient entailments, which tells us how the arguments relate to the predicate. So for Dowty, the Argument Selection Principle constrains possible elements, and combinations of elements, in the lexicon. The framework that Dowty assumes is fundamentally different than that assumed in Minimalism/DM, where the list of arguments is part of the lexical array that serves as input to the derivation. These arguments are not in any way linked to the predicate before the syntactic derivation (i.e., the arguments are not linked to the predicate in the lexicon). Rather, these arguments end up being related to the predicate due to the syntactic position in which they are projected.

From the discussion above, it is clear that Dowty’s system cannot be imported wholesale into a DM framework. However, for the purpose of this dissertation, I assume that a system like that developed by Dowty is compatible with the DM framework I have developed. Dowty proposes that the thematic relations of a predicate result from the lexical entailments associated with the predicate. I propose the thematic relations associated with a predicate result from the lexical entailments that the root provides in the form of the Encyclopedic feature specification. For example, consider our example of `\text{\textasciitilde}break` from (90), repeated in (111).
Dowty’s system wouldn’t say anything about √break since it doesn’t address predicates with a single argument. But the feature specification still involves an affected, non-volitional argument that changes state, which corresponds to the conventional notion of a Theme thematic role. And when break only has one argument, as in the vase broke, the argument has a Theme role. We can even supplement the feature specification in (111) with some of the Proto-Patient entailments proposed by Dowty, like in (111’).45

45 Many of the encyclopedic features proposed by Hopper & Thompson (1980) overlap with the lexical entailments enumerated by Dowty (1991), although Dowty has more argument-based entailments than Hopper & Thompson have argument-based features. In order to bring the systems of Hopper & Thompson and Dowty more into alignment, we could propose some of Dowty’s features (e.g., SENTIENCE/PERCEPTION, CHANGE OF STATE, and INCREMENTAL THEME) be incorporated into Hopper & Thompson’s feature specification. For the purpose of this dissertation, I do not pursue such an implementation.
The causative subevent clearly involves causation, thus the specification of the *CAUSATION ALONE* feature. Since causation is involved, the argument that satisfies the *Participants* feature is interpreted as a causer, and potentially an agent, based on the nature of the argument. Note that I did not include a specification for *Kinesis* as ‘Action’, because in cases like Spanish *romperse* and Italian *si* constructions discussed above, it could be the case that a state (a property of the object) is the cause.

Roots with two underlying arguments are a bit different, since the subject is specified underlyingly by the root. The Encyclopedic feature specification for such roots, like √DESTROY in (113), contains patient-related features/entailments, and agent/causer entailments arise due to the nature of the argument projected in the specifier of Voice⁰. It is important to note that even with roots like √DESTROY, even though the two arguments are specified underlyingly according to the *Participants* feature, Voice⁰ still needs to be explicitly present in the syntax in order to project the external argument and so the eventive nature of Voice⁰ emerges in the semantics.

<table>
<thead>
<tr>
<th>√DESTROY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Participants</strong></td>
</tr>
<tr>
<td><strong>Kinesis</strong></td>
</tr>
<tr>
<td><strong>Affectedness of O</strong></td>
</tr>
</tbody>
</table>

With verbs with multiple subevents like transitive *break* and *destroy*, the event structure encoded in the verbal semantics simply mirrors the entailment patterns due to the one to one correspondence between subevents and arguments; the subject is projected in the causing
subevent and has the **Causation** entailment, while the object is projected in the breaking
subevent and had the **Change of State** and **Causally Affected** entailments.

Now, consider the stative predicate *like* in (109), repeated in (114).

(114) John likes Mary.

According to Dowty (1991:579), psychological predicates such as *like* involve an *Experiencer*
and a *Stimulus*, where the Experiencer perceives the Stimulus, and the Stimulus provokes some
kind of reaction in the Experiencer. Following Dowty, I propose the Encyclopedic feature
specification for √**LIKE** in (115).

(115)

<table>
<thead>
<tr>
<th>√LIKE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PARTICIPANTS</strong></td>
<td>2 or more participants</td>
</tr>
<tr>
<td><strong>KINESIS</strong></td>
<td>Non-action</td>
</tr>
<tr>
<td><strong>SENTIENCE/PERCEPTION</strong></td>
<td>Subject sentient</td>
</tr>
<tr>
<td><strong>STIMULUS</strong></td>
<td>Object causes reaction of subject</td>
</tr>
</tbody>
</table>

So in the stative cases, the root specifies two underlying arguments and the thematic roles of the
arguments are determined by the feature specification of the root and not the subevent
configuration.

The purpose of this section was to show how an available theory of thematic roles can be
adapted to the system I have developed for the Encyclopedia in DM. The benefit of this type of
system is that we do not need to stipulate certain thematic roles and thematic hierarchies to
account for the thematic relations in a number of predicate types. Rather, thematic relations
emerge from the lexical entailments associated with roots, and in some cases, the structures in
which roots are embedded. Furthermore, the thematic roles do not have to be stipulated as part of
the compositional semantics, since the lexical entailments are just that, entailments that are not explicitly encoded in the semantics.

3.7 Conclusion

In this chapter, I laid out the technical foundations of a DM framework with an explicit model theoretic semantics and an explicit model for the Encyclopedia. I began the chapter with a discussion of syntactic matters, such as the syntax of the lexical category determining heads in DM, and the syntax of causation. Then, I presented a formal semantic model for DM. There are two key innovations of this semantic model over previous semantic implementations of DM. First, the semantic model here complies with the SDMH, where roots (in the syntax) have no syntactico-semantic features. And given the SDMH, I provide a clear characterization of the syntactic and semantic nature of roots. Second, the semantic model is a true semantic model in the technical sense of the term, which is an innovative step in its own right in the canon of DM research. I concluded the chapter with a discussion of the Encyclopedia and thematic roles in DM, which will be crucial to my analysis of some data in Chapter 4.
Chapter 4: Applications of the framework to causative alternations

Now that I have sketched a framework for the syntax-semantics interface that complies with the tenets of Minimalism and DM and satisfies the formal rigors of model-theoretic semantics, I will expand on the empirical coverage of the framework, focusing on argument structure alternations related to causation. In section 4.1, I focus on the causative head itself, proposing that two different versions of the causative head are potentially available, and these heads are distinguished by the type of complement they select, either predicates of events or predicates of states. This contrasts with the syntactic selectional constraints that Pylkkänen (2008) proposes for the causative head. I believe that Pylkkänen’s intuitions are fundamentally accurate, but some of the data is not entirely clear, and I show how her implementation of a typology of the causative head is not compatible with a DM framework that assumes the SDMH. In section 4.2, I turn to two phenomena, Case checking and head movement, and I discuss how these phenomena function within the DM framework outlined in this dissertation. In section 4.3, I expand the analysis of the syntax-semantics interface of the verbal system that I began in Chapter 3 with a fragment of English. Specifically, I show how the analysis of causation developed in section 4.1 applies nicely to a variety of contexts, both in English and cross-linguistically.

4.1 The causative head

In Chapter 3, I presented the basic verbal architecture assumed throughout this dissertation. There, I proposed that a causative head $\text{Cause}^0$ intervenes between $v^0$ and $\text{Voice}^0$ in English, following Pylkkänen (2008) and Kratzer (2004). However, I only considered a small fragment of English, and crosslinguistic data suggests that the nature of $\text{Cause}^0$ is more complex than
illustrated in Chapter 3. For instance, Pylkkänen (2008) proposes two possible sources of
crosslinguistic variation related to Cause$^0$ in terms of parametrization:

*Attachment site of Cause$^0$*

Languages allow for different attachment sites for Cause$^0$: the √root, the vP, or the full
‘phase’, which is essentially a VoiceP with an external argument.

*Voice Bundling*

Languages may allow *Voice Bundling*, where Cause$^0$ and Voice$^0$ are coalesced into a
single syntactic element, or they prohibit Voice Bundling, and Cause$^0$ and Voice$^0$ appear
as separate heads.

In the remainder of this section, I explore these parameters further. I focus on some of the
cross-linguistic data that Pylkkänen examined, and I show that Pylkkänen’s attachment-site
parameter is too narrow to account for all of the data. Then, I propose a modification of the
attachment-site parameter that captures Pylkkänen’s data more fully. This modified parameter
also is in line with the the SDMH, and I will employ this parameter in my analysis of a broader
fragment of English (in section 4.2) and of some cross-linguistic data (in section 4.3).

**4.1.1 Selectional characteristics of Cause$^0$**

According to Pylkkänen (2008), one component of crosslinguistic variation with respect to
causative constructions is due to the nature of the causative head itself. In different languages,
Cause$^0$ syntactically selects one of three maximal projections as a complement, the √root, the vP,
or the full ‘phase’. Data illustrating these three different potential attachment sites of Cause$^0$ are
discussed in turn below.
4.1.1.1 Cause\(^0\) selects the VoiceP

Pylkkänen argues that data from Venda and Luganda give evidence for Cause\(^0\) selecting a phase. Pylkkänen claims that the high applicative head is the same semantic type as VoiceP (namely \(\langle e, \langle s, t \rangle \rangle\))\(^{46}\) and combines with the lower verbal structure through Event Identification.\(^{47}\) In both of these Bantu languages, the high applicative may appear between the causative head and the root, and both languages allow lower-scope agentive modification of the agent embedded beneath Cause\(^0\).

(1) \textit{Venda} \hfill Pylkkänen (2008:118-119)

a. -tshimbila  ‘walk’

b. -tshimbila-dz-a  ‘make walk’ \hspace{1em} \text{CAUSE}

c. -tshimbila-el-a  ‘walk for’ \hspace{1em} \text{APPL}

d. -tshimbila-i-z-a  ‘make [walk for]’ \hspace{1em} \text{APPL-CAUSE}

(2) \textit{Luganda}

a. -tambula-  ‘walk’

b. -tambu-za-  ‘make walk’ \hspace{1em} \text{CAUSE}

c. -tambul-ir-a-  ‘walk for’ \hspace{1em} \text{APPL}

d. -tambul-i-z-a-  ‘make [walk for]’ \hspace{1em} \text{APPL-CAUSE}

\(^{46}\) In Pylkkänen’s work, the domain of the semantic type \(s\) is the set of eventualities.

\(^{47}\) A primary test for high applicative status is whether the applicative can appear with an unergative verb. Pylkkänen’s (2008:18) logic is that low applicatives denote a relation between the direct and indirect object, so if an unergative verb lacks a direct object, the low applicative simply cannot appear. On the other hand, the high applicative denotes a relation between the set of events and the set of individuals; therefore, only high applicatives occur with unergative verbs. See Pylkkänen (2008:12-16) for an introduction to applicatives more generally.
In order to evaluate Pylkkänen’s analysis, we must examine the structures that she proposes more closely. Since the applicative can appear with the causative in Venda and Luganda, we should first examine the structure for the high applicative. For the Venda and Luganda data involving a high applicative in (4), Pylkkänen proposes the structure in (5).

(4)  

**Luganda**

a. Mukasa ya-som-e-dde Katonga ekitabo

Mukasa 3SG.past-read-APPL-PAST Katonga book

‘Mukasa read Katonga a book.’

**Venda**

b. Nd-o-tandul-el-a tshimu ya mukegulu

1SG-PAST-survey-APPL-FV old-woman the field

‘I surveyed the field for the old woman.’
According to Pylkkänen (2008:12), the high applicative should be treated as a Phase like VoiceP, as it introduces an additional argument. Therefore, the data in (1d) and (2d) confirms Pylkkänen’s claim that Cause selects a Phase in some languages. However, from the data in (1b) and (2b), we have reference to the causative head selecting the ‘verb’, but the structure isn’t entirely clear. If (5) is an accurate representation of the structure of an applicative embedded in a standard transitive construction like we find in (4), we could assume that (6) is an accurate representation of the transitive construction itself, and the structure in (6), a VoiceP with an external argument (a Phase), is the complement of Cause\(^0\) in (3).

(6) 

In (1b) and (2b), we have an instance of Cause\(^0\) selecting an unergative verb. Assuming (5) is the proper structure for a high applicative in a transitive construction, a high applicative in an unergative construction like (7) has the corresponding structure in (8), and the base unergative has the structure in (9).

(7)  

"Mukasa walked for Katonga."
This structure in (9) then serves as the complement of Cause\(^0\) in sentences involving constructions like (1b) and (2b), as illustrated in (10).

(10)  

a. Katonga ya-tambu-za-dde Mukasa

Katonga 3SG.past-walk-CAUSE-PAST Mukasa

‘Katonga made Mukasa walk.’

b. CauseP

Cause\(^0\) VoiceP

Mukasa Voice\(^0\) walk

Given this data, we have evidence of Cause\(^0\) selecting a VoiceP (a Phase) with both transitive and unergative constructions in Venda and Luganda.\(^{48}\) Coupled with the ability of Cause\(^0\) to select the high applicative, the data confirms Pylkkänen’s claim that Cause\(^0\) selects a Phase in some languages, Luganda and Venda being exemplars.

With respect to the Venda and Luganda data presented above, Pylkkänen does not discuss the nature of the verbal component below the applicative head and the Voice head. In (5) and (8), the applicative head is of type \(\langle e, (s,t) \rangle\) and combines with the lower structure via Event

\(^{48}\) Venda and Luganda do not show evidence of unaccusative causatives, which is the primary diagnostic that Pylkkänen uses to determine the Voice Bundling characteristics of a language (Pylkkänen 2008:87).
Identification; thus, the structure below the applicative head must be of type \(\langle s,t \rangle\), with a semantics like \(\lambda e. \text{read}(e) \land \text{theme}(e, \text{book})\) for (5) (Pylkkänen 2008:26). Likewise for the Voice head in (6). The lower structure could conceivably be a Phase, a \(vP\), or a \(\sqrt{\text{root}}P\), as all three structures have the same semantic type in Pylkkänen’s system. But we can conclude that the structure is not a \(VoiceP\) or other Phase because it does not contain an agentive argument. And of course, the SDMH predicts that the \(\sqrt{\text{root}}P\) (i.e., the root and a complement) is not a permitted syntactic structure because the root lacks selectional capabilities. Then in strict DM terms, the structure below \(\text{Appl}^0\) in (5) and (8) and below \(\text{Voice}^0\) in (6) must be a \(vP\).\(^{49}\)

One issue with the argument that Pylkkänen presents for the causative head taking a \(VoiceP\) complement lies in the Luganda data itself. According to McPherson & Paster (2009), Luganda is quite different than the way it is presented by Pylkkänen. McPherson & Paster (henceforth M&P) focuses on four different morphological affixes in Luganda, causative, applicative, resultative, and passive. Several different combinations of affixes are attested, but I will focus on the ones relevant to Pylkkänen’s claim.

First, M&P assumes a different morphological extension for causative than Pylkkänen, as shown in (11).

\[
\begin{array}{|l|l|l|}
\hline
\text{Feature} & \text{Causative} & \text{Applicative} & \text{Reciprocal} \\
\hline
\text{Pylkkänen} & -sa- & -ir- & -gana- \\
\text{M&P} & -is- & -ir- & -agan- \\
\hline
\end{array}
\]

Second, M&P makes different claims about affix ordering than Pylkkänen does, as illustrated in (12).

\(^{49}\) Pylkkänen does not address this issue directly, but from the English data that I discuss below, Pylkkänen implies that the causative head is verbal and can select the \(\sqrt{\text{root}}P\) (Pylkkänen 2008:110-114).
From (12), M&P claims that the causative embedded inside the applicative is acceptable, contrary to Pylkkänen’s data. M&P claims that the applicative embedded inside the causative is not acceptable (except in certain cases, where there is a different allomorph [iz] of the causative; see M&P 2009:59-60 for discussion), also contrary to Pylkkänen’s data.

Finally, M&P presents data on strings involving the causative and passive together. According to these data, the causative embedded inside the passive is attested, while the passive inside the causative is not. Concerning the latter structure, if the passive inside the causative is not acceptable, it seems to contradict Pylkkänen’s data. Since the passive is generally considered a reflex of Voice\(^0\), if the passive cannot appear inside of the causative, we would in turn assume that the passive VoiceP cannot be the complement of the causative head in these constructions. And given Pylkkänen’s explicit claim that the causative head selects VoiceP, the data presented in M&P seems to be in direct conflict with Pylkkänen’s data. We could propose that multiple instances of the causative are present in Luganda, but that would entail a complete revision of the analysis of the causative in Luganda, which is outside of the scope of this dissertation.

Given the data presented by M&P, it seems that Pylkkänen’s claim that the causative head selects VoiceP in Luganda is incorrect. Rather, the causative head in Luganda appears to select the stem, which I assume is a vP (i.e., a root and its argument).

4.1.1.2 Cause\(^0\) selects a vP

In contrast to Venda and Luganda, Pylkkänen claims that in Bemba, another Bantu language, Cause\(^0\) takes a vP complement. Evidence for this claim is provided by adverbials; non-agentive
manner adverbs can modify the caused verbal phrase, but agentive ones may not, as displayed by the contrast between (13a) and (13b-c) (Pylkkänen 2008:115, citing Givón 1976). According to Pylkkänen, agentive adverbials must adjoin to VoiceP, so the failure of agentive adverbials to modify the verbal element below the scope of the causative head allows us to conclude that Cause$^0$ selects vP, but not VoiceP in Bemba.

(13)  

   1SG.PAST-run-CAUSE  Mwape  fast  
   ‘I made Mwape run quickly.’  
   *‘I quickly made Mwape run.’

   1SG.PAST-him-learn-CAUSE  to-speak  Bemba  on-purpose  
   ‘I, on purpose, made him learn to speak Bemba.’  
   *‘I made him on purpose learn to speak Bemba.’

c. Naa-butwiish-ya  umuana  ukiwitemenwa.  
   1SG.PAST-run-CAUSE  the boy  willingly  
   *‘I made the boy run willingly.’  
   ‘I willingly made the boy run.’

However, if we follow the same logic with Bemba as we did for Venda and Luganda above, a verb like run with its argument should be a VoiceP and not a vP.

In addition to the conceptual argument, we have evidence for transitive causatives in Bemba from Chongo Kula (2000:236), as in (14).\(^{50}\)

---

\(^{50}\) Chongo Kula (2000), following Bresnan & Mchombo (1987), uses verb-object agreement and passivization as tests for transitivity, although these tests are not presented.
In Pylkkänen’s system, the root phrase is the verb and its internal argument, and the combination of $v^0$ with the root phrase, ultimately projecting the $vP$, simply introduces the category feature, but no additional arguments are introduced. Only the VoiceP introduces the external argument in Pylkkänen’s framework, so if a causative head can combine with a transitive verbal structure, the verbal structure must be minimally a VoiceP. In applying Pylkkänen’s system to the data in (14), it appears that Pylkkänen’s generalization about causation in Bemba may not be correct, and the causative in fact takes a VoiceP complement in addition to a $vP$ complement.

Another argument that Pylkkänen makes for Cause$^0$ selecting a $vP$ in Bemba is related to the high applicative. First, Pylkkänen argues that the high applicative head is the same syntactically and with respect to its functional semantics as Voice$^0$; they both add an event argument and an individual argument to the derivation, they both take a $vP$ complement, they both are of type $\langle e, \langle v, t \rangle \rangle$. In addition, Cause$^0$ takes a $vP$ complement, so since both Cause$^0$ and Appl$^0$ take a $vP$ complement, the high applicative should not be able to scope below a causative. Pylkkänen (2008:116) presents the data in (15) as evidence for this claim. In (15a), the
benefactive is diagnosed as a high applicative, since it combines with unergatives, and in (15b), the high applicative head cannot scope below the causative head.

(15)  
    Mwape PAST-work-BEN Mutumba  
    ‘Mwape worked for Mutumba.’  
b. *Naa-tem-en-eshya Mwape Mutumba iciimuti  
    1SG.PAST-cut-BEN-CAUSE Mwape Mutumba stick  
    ‘I made Mwape cut Mutumba a stick.’

However, Chongo Kula (2000:237) provides a different perspective on the morpho-syntax of Bemba. First, according to Chongo Kula there are two types of causatives in Bemba, the ‘long causative’, which involves the affixation of the causative morpheme -ish-, as in (16), and the ‘short causative’, which involves spirantization/palatalization of the final consonant of the root, as in (17).

(16)  
a. imb-a ‘sing’ imb-ish-a ‘cause to sing’  
    sing-FV sing-CAUSE-FV  
b. Mwape aa-imb-a  
    Mwape PAST-sing-FV  
    ‘Mwape sang.’  
c. Mwape Mutumba aa-imb-ish-a  
    Mwape Mutumba PAST-sing-CAUSE-FV  
    ‘Mwape made Mutumba sing.’
(17)  pit-a ‘pass’   pish-a ‘cause to pass’
       pass-FV           pass.CAUSE-FV

In addition to causatives, Chongo Kula presents applicatives in Bemba, as shown in (18), with minor differences in transcription compared to (15) above.

(18)  a. imb-a ‘sing’   imb-il-a
       sing-FV           sing-APPL-FV

       b. Mwape aa-imb-il-a    Mutumba
           Mwape PAST-sing-APPL-FV    Mutumba

       ‘Mwape sang for Mutumba.’

Finally, Chongo Kula provides evidence of the applicative inside of the causative in Bemba in (19).

(19)  applicative -il-
       stem-FV           stem-APPL-FV           stem-APPL-CAUS-FV
       a. lil-a ‘cry’        lil-il-a           lish-ish-a
       b. lek-a ‘stop’       lek-el-a           lesh-esh-a
       c. imb-a ‘sing’       imb-il-a           imb-ish-ish-a
       d. lipil-a ‘pay’      lipil-il-a         lipil-ish-ish-a

In these cases, even though the causative morpheme is present, it causes spirantization/palatalization of the applicative affix, as shown in (19), similar to the process in
the short causative in (17). If the applicative were outside of the causative, the applicative affix would have no reason to spirantize.

We know that this is an applicative embedded under a causative and not a double causative, as shown in (20), because it always has the causative-applicative meaning and never a double causative meaning, as in (21).

(20) imb-ish-ish-a *imb-il-ish-a
     sing-APPL-CAUSE-FV    sing-APPL-CAUSE-FV

(21) Naa-imb-ish-ish-a     Mwape      Mutumba
     1sg.PAST-sing-APPL-CAUSE-FV    Mwape      Mutumba
     I made Mwape sing for Mutumba
     # I made Mwape make Mutumba sing

The verbs in (19) require a full VoiceP, and they can appear with the applicative in the scope of the causative, so the structure for these cases is as illustrated in (22); the vP is the complement of the applicative head and the object occurs in the specifier of v⁰; the ApplP is the complement of Voice⁰ and the benefactor is in the specifier of Appl⁰; and the VoiceP is the complement of Cause⁰, with the causee generated in the specifier of Voice⁰. Of course, the causer appears in the specifier of a second Voice⁰ above Cause⁰.
As mentioned above, Chongo Kula (2000:237) also illustrates a separate class of causatives in Bemba, intransitive causatives or ‘short causatives’, which are not characterized by a distinct causative morpheme, but rather by the spirantization/palatalization of the final stop in the stem.

(23)  

<table>
<thead>
<tr>
<th></th>
<th>Word 1</th>
<th>Meaning 1</th>
<th>Word 2</th>
<th>Meaning 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>lub-a</td>
<td>‘lost’</td>
<td>lufy-a</td>
<td>‘cause to be lost’</td>
</tr>
<tr>
<td>b</td>
<td>leep-a</td>
<td>‘long’</td>
<td>leefy-a</td>
<td>‘cause to be long’</td>
</tr>
<tr>
<td>c</td>
<td>end-a</td>
<td>‘walk’</td>
<td>ensh-a</td>
<td>‘cause to walk/move’</td>
</tr>
<tr>
<td>d</td>
<td>pit-a</td>
<td>‘pass’</td>
<td>pish-a</td>
<td>‘cause to pass’</td>
</tr>
<tr>
<td>e</td>
<td>kul-a</td>
<td>‘grow’</td>
<td>kush-a</td>
<td>‘cause to grow’</td>
</tr>
<tr>
<td>f</td>
<td>pook-a</td>
<td>‘burst’</td>
<td>poosh-a</td>
<td>‘cause to burst’</td>
</tr>
<tr>
<td>g</td>
<td>lung-a</td>
<td>‘hunt’</td>
<td>lunsh-a</td>
<td>‘cause to hunt’</td>
</tr>
</tbody>
</table>
h. kos-a ‘hard’  kosh-a ‘cause to become hard’

i. pon-a ‘fall’  pony-a ‘cause to fall’

j. kom-a ‘be deaf’  komy-a ‘cause to be deaf’

In these cases, the predicates are either stative or unergative, so Cause\(^0\) would take a stative (like a result phrase or a PredP) complement. So from the data presented by Chongo Kula, it appears that in Bemba, Cause is not restricted to a vP complement, but can take a VoiceP complement or an ApplP complement as well.\(^{51}\)

### 4.1.1.3 Cause\(^0\) selects a √rootP

Pylkkänen (2008) relies on data from English and Japanese to argue for the causative head selecting a √rootP. First, consider the English data; I postpone discussion of the Japanese data until section 4.3.3.

Pylkkänen, citing von Stechow (1996), uses adverbial scope to diagnose functional structure of the English verbal system from the data in (24) (see also Dowty 1979:252, who cites McCawley 1971, 1973 and Morgan 1969). The data shows that the adverb may modify the causing event (agent’s action) and the result state, but not the caused event.

(24) John opened the door again.  Pylkkänen (2008:112)

a. Agent’s action is repeated

OK ‘John did something again and as a result the door opened.’

\(^{51}\) It is also interesting to note that even the overt causative morpheme triggers spirantization on the applicative morphemes in (13). Chongo Kula (2000) provides an analysis of the morpho-phonological spirantization/palatalization process.
b. *Caused event is repeated*

   ‘John did something and as a result the door opened again.’

c. *Resultant state is repeated*

   ‘John did something and as a result the door returned to its previous state of being open.’

Specifically, the argument goes that if an intermediate verbal head intervened between Cause\(^0\) and the √rootP, there would be three sites for attachment of an adverbial like again; the VoiceP, the vP, and the √rootP. Typical predicate decomposition analyses (e.g., Levin & Rappaport Hovav 1995; Rappaport Hovav & Levin 1998) assume this three-tiered approach: [CAUSE [BECOME [door opened]]]. But given the data in (24), there are only two potential attachment sites for adverbs; attachment of the adverb to the VoiceP (above Cause\(^0\)) yields a modification of the causing event and the interpretation in (24a), while attachment of the adverb to the √rootP (below Cause\(^0\)) is interpreted as modification of the result state, with the interpretation in (24c).

However, the diagnostic based on the interpretations in (24) seems to be based on intuition, and not clear tests. For example, we can imagine a situation where John pushes a button, and as a result, the door opens. Meanwhile, someone is monitoring the door on a video monitor. If John has pressed the button before, the person watching the monitor can utter (24) when he/she sees the door begin to open. In this case, it seems that the situation in (24b) holds, but the intuitions are not very clear. Now, consider the data in (25).

(25) John opened up the window again.\(^{52}\)

---

\(^{52}\) The data involving prepositional resultatives is not equally acceptable by all speakers. In a search of the Corpus of Historical American English (Davies 2010-), cases where the up particle is adjacent to the verb occur much more often than cases where a full DP (as opposed to a pronoun) appears between the verb and the particle (close up the x, n=124; open up the x, n=287; close the x up, n=7; open the x up, n=8). Instances where the pronoun it appears...
The question I would like to ask is whether the syntactic difference between (24) and (25) creates any type of semantic difference. First, we know that *open* entails some kind of result state, as in (26), but it is also clear that *open* does not signify a maximal point on the scale of openness, with or without the *up* particle, as in (27).

(26)  
   a. *John closed the window, but it didn’t close at all.
   b. *John closed up the window, but it didn’t close at all.

(27)  
   a. John opened the window a little bit.
   b. John opened up the window a little bit.

In (28), *open* and *close* are telic, as indicated by the *in* readings, and the available *for* readings are not those that indicate atelicity; rather, the *for* readings denote the length of the result state, as in (29).

(28)  
   a. John opened the window in/for a couple seconds/an hour.
   b. John opened up the window in/for a couple seconds/an hour.
   c. John closed the window in/for a couple seconds/an hour.
   d. John closed up the window in/for a couple seconds/an hour.

(29)  
   *Atelic for-reading*
   a. John swept the floor for an hour. (The sweeping event lasted an hour.)

   *Result state for-reading*
   b. John closed the store for an hour. (The store was in a closed state for an hour.)

__between the verb and the particle also appear more often than when a full DP lies between the verb and the particle (*close it up*, n=23; *open it up*, n=81).__
In (30) – (31), when we allow for longer opening/closing subevents by varying the object, the telicity facts become clearer; both constructions allow for telic readings, and for readings are available that denote the length of the result state.

(30)  a. John opened the window in/OK for a second.
    b. John opened up the window in/OK for a second.
    c. John closed the window in/OK for a second.
    d. John opened up the window in/OK for a second.

(31)  a. They opened the stadium in/for an hour.
    b. They opened up the stadium in/for an hour.
    c. They closed the store in/for an hour.
    d. They closed up the store in/for an hour.

Given the data regarding open and close, both an opening/closing subevent and a result state are encoded semantically. Ideally, we would like the semantics to be paralleled in the syntax. In this case, it would seem that the structure in (32) is minimally required for open and close.

(32)  VoiceP
    CauseP
    vP
    ResP
Given the fact that both the versions with and without the *up* particle behave the same semantically, I propose that they both have the same structure in (32), as detailed in (33). In this case, the DP moves from the specifier of Res\(^0\) to the specifier of \(v^0\) so that it can saturate the argument of the \(vP\).

(33) VoiceP
   \[\text{John} \quad \text{Voice}^1\]
   \[\text{Voice}^0 \quad \text{CauseP}\]
   \[\text{Cause}^0 \quad \text{vP}\]
   \[\text{DP}_{4} \quad \text{v}^1\]
   \[\text{v}^0 \quad \text{ResP}\]
   \[\text{t}_4 \quad \text{Res}^1\]
   \[\text{Res}^0 \quad \sqrt{\text{CLOSE}}\]

In (35) I propose the same semantic derivation representation for *open/close*, both with and without the *up* particle. Since the DP is merged in the ResP but moves to the vP, it can be identified as the participant in both predicates. Likewise, the root moves through Res\(^0\) to \(v^0\), so it is identified as the state argument in the ResP and the event argument in the \(vP\). In cases where the *up* particle is present, the particle is a clitic that adjoins to the root in its movement to \(v^0\).\(^{53}\)

\(^{53}\) In the marked cases where the *up* particle is separated morphologically from the root spell-out (e.g., *John opened the door up*), I assume that both the resultative particle and the root are technically heads; they c-command each other, but there is no asymmetric c-command. Therefore, there is no ordering relationship between the two, and the root can move directly to \(v^0\), skipping over Res\(^0\). In cases where the *up* particle appears adjacent to the spell-out of
The particle seems to overtly mark a result state, but since the result state is entailed by the opening/closing subevent, the particle serves as a morphological emphatic marker and is not relevant to the semantics. I interpret the resultative particle up as a stativizer of type \langle e,(v,t) \rangle; it combines with the root (type \langle v,t \rangle) via Event Identification to yield a predicate of states that can take an argument of type \langle e \rangle. The translation rule for Res\(^0\) is given in (34). The derivation for (33) is presented in (36), omitting the arguments to focus on the meaning of the remainder of the composition.

(34)  \[ \text{Res}^0 \Rightarrow \lambda x . \, \lambda e . \, [\text{state}(e) \land \text{argument}(e,x)] \]

<table>
<thead>
<tr>
<th>Translations/Interpretations</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [ \sqrt{\text{CLOSE}} \Rightarrow \lambda e . , \text{close}'(e) ]</td>
</tr>
<tr>
<td>b. [ \text{Res}^0 \Rightarrow \lambda x . , \lambda e . , [\text{state}(e) \land \text{argument}(e,x)] ]</td>
</tr>
<tr>
<td>c. [ \text{Res}^{1r} = \text{Res}^{in} \land \sqrt{\text{CLOSE}'} ]</td>
</tr>
<tr>
<td>d. [ \text{ResP}' = \text{Res}^{1r}(\text{DP}') ]</td>
</tr>
<tr>
<td>e. [ [\text{Res}^{1r}]_{\text{M,C,g}}^\text{MC} = \lambda x . , \lambda e . , [\text{state}(e) \land \text{argument}(e,x) \land \text{close}'(e)] ]</td>
</tr>
<tr>
<td>f. [ [\text{ResP}']_{\text{M,C,g}}^\text{MC} = \lambda e . , [\text{eventuality}(e) \land \text{argument}(e,X) \land \text{close}'(e)] ]</td>
</tr>
<tr>
<td>g. [ \sqrt{0} \Rightarrow \lambda x . , \lambda e . , [\text{eventuality}(e) \land \text{argument}(e,x)] ]</td>
</tr>
<tr>
<td>h. [ \sqrt{1'} = \sqrt{0'} \land \text{ResP}' ]</td>
</tr>
<tr>
<td>i. [ \sqrt{P'} = \sqrt{1'}(\text{DP}'_1) ]</td>
</tr>
<tr>
<td>j. [ [\sqrt{1'}]_{\text{M,C,g}}^\text{MC} = \lambda x . , \lambda e . , [\text{eventuality}(e) \land \text{argument}(e,X) \land \text{state}(e) \land \text{argument}(e,X) \land \text{close}'(e)] ]</td>
</tr>
<tr>
<td>k. [ [\sqrt{P'}]_{\text{M,C,g}}^\text{MC} = \lambda e . , [\text{eventuality}(e) \land \text{argument}(e,X) \land \text{state}(e) \land \text{argument}(e,X) \land \text{close}'(e)] ]</td>
</tr>
</tbody>
</table>

I believe that the issues with interpretation of again modification with open/close is due to the event structure of these predicates; Pylkkänen assumes that the reading where again modifies the opening/closing subevent is not available, as in (24) above, repeated here.

the root, I have to assume that the particle functions like a clitic and must be carried along with the root, even though inflectional morphology can appear between the root and the particle.
(24) John opened the door again.  

Pylkkänen (2008:112)

a. *Agent’s action is repeated*

OK: ‘John did something again and as a result the door opened.’

b. *Caused event is repeated*

*‘John did something and as a result the door opened again.’*

c. *Resultant state is repeated*

OK: ‘John did something and as a result the door returned to its previous state of being open.’

However, it’s not entirely clear that the readings in (24) are correct. According to Dowty (1979:252), a sentence like (24) has two primary readings, as in (36).

(36) John opened the door again

a. ‘John has performed the action of opening the door at least once before.’

b. ‘John has brought it about that the door is again in an open state, though he need not have opened it on an earlier occasion.’

In (36a), the *again* modification modifies the causing subevent. But in the reading in (36b), the door is in an open state and has been in an open state before. Therefore, an opening subevent must have also occurred before. So in (36b), *again* modification targets both the opening subevent and the open state, but not the causing subevent. Since the opening subevent entails the open state, it is hard to tease these readings apart. It is clear that both the opening subevent and the open result state are encoded syntactically; in (37a), *quietly* can modify the opening subevent,
so in that case, it must adjoin to the vP, and in (37b), *a little bit* modifies the result state, so it must adjoin to ResP.

(37)  a. John opened the door quietly.
     b. John opened the door a little bit.

In (33), the VoiceP and the vP are present syntactically, and assuming Pylkkänen’s analysis of the causative head, Cause$^0$ must be present between the VoiceP and the vP to link the two subevents. Thus, contrary to Pylkkänen’s claims, we have evidence of Cause$^0$ selecting the vP in English zero causatives.

The structure in (33) involves the vP selecting a stative complement. I assume that we also have instances where the v$^0$ selects a root complement, like with the activity predicate in (38).

(38) John swept the floor.

In (38), both *John* and *the floor* are participants in the sweeping event, but since there is no overt result state, no resultative projection should be present. The structure for (38) is given in (39).

(39)

```
VoiceP
  John
  Voice^2
    Voice^1
    vP
      DP
      the floor
        v^0
        √SWEEP
```
However, when *sweep* appears in an adjectival resultative construction like in (40), the resultative state must be overtly encoded, in this case as an *aP*, as illustrated in (41).

(40)  John swept the floor clean.

(41)

In (41), the object DP originates in the predicational structure so that the DP can be identified as a participant in the clean state. It then moves to the *vP*, and in this position can be identified as a participant in the sweeping subevent. Note that in the syntactic structure in (41), $\sqrt{\text{Sweep}}$ adjoins to $v^0$. In these situations, I propose that the root is inserted directly in $v^0$, similar to the process of Manner Incorporation proposed by Hale & Keyser (2002; see also Harley 2005). Once the
The derivation for (41) up to the vP is given in (42), again eliminating the computation of the argument’s denotation and the abstraction structure required for movement.

(42)

<table>
<thead>
<tr>
<th>Translations/Interpretations</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ( \sqrt{\text{CLEAN}} \Rightarrow \lambda e.\text{clean}'(e) )</td>
</tr>
<tr>
<td>b. ( a' \Rightarrow \lambda e.\text{state}(e) )</td>
</tr>
<tr>
<td>c. ( aP' = a'_{v} \land \sqrt{\text{CLEAN}}' )</td>
</tr>
<tr>
<td>d. ( [[aP']]^{M,C,g} = \lambda e.\text{state}(e) \land \text{clean}'(e) )</td>
</tr>
<tr>
<td>e. ( \text{Pred}'' \Rightarrow \lambda x. \lambda e. [\text{argument}(e,x)] )</td>
</tr>
<tr>
<td>f. ( \text{Pred}' = \text{Pred}'' \land aP' )</td>
</tr>
<tr>
<td>g. ( \text{PredP} \Rightarrow \text{Pred}'(\text{DP}') )</td>
</tr>
<tr>
<td>h. ( [[\text{Pred}']] = \lambda x. \lambda e. [\text{state}(e) \land \text{clean}'(e) \land \text{argument}(e,x)] )</td>
</tr>
<tr>
<td>i. ( [[\text{PredP}']] = \lambda e. [\text{state}(e) \land \text{clean}'(e) \land \text{argument}(e,X)] )</td>
</tr>
</tbody>
</table>

\( v^0 \Rightarrow \lambda x. \lambda e. [\text{eventuality}(e) \land \text{argument}(e,x)] \)

\( v^1' = v^0' \land \text{PredP}' \)

\( vP' = \text{DP}'(v^1') \)

\( [[v^1']]^{M,C,g} = \lambda x. \lambda e. [\text{eventuality}(e) \land \text{argument}(e,x) \land \text{state}(e) \land \text{clean}'(e) \land \text{argument}(e,X)] \)

\( [[vP']]^{M,C,g} = \lambda e. [\text{eventuality}(e) \land \text{argument}(e,X) \land \text{state}(e) \land \text{clean}'(e) \land \text{argument}(e,X)] \)

Thus far, I have showed that the causative head can select an eventive vP in English. We also have evidence that the causative head can select a Phase in English as well. Consider the case of analytic causatives, as in (43).

(43) John made Mary open the door.

---

This type of syntactic insertion is unconventional, so it deserves some additional discussion. We might assume that the adjunction of the root to \( v^0 \) violates the Extension Condition (Chomsky 1995). However, I propose that the insertion of the root in \( v^0 \) when \( v^0 \) is merged into the greater structure is like head movement, which creates an adjunction structure, and the Extension Condition does not hold for adjunction (Chomsky 1995:327). This issue is discussed in greater detail in section 4.2.2 below.
We know that the portion of the sentence *Mary open the door* is minimally a VoiceP if we assume the analysis of English zero causatives above. And clearly, sentences like (43) with *make* involve causation. Since the verb *open* is not inflected, it follows that only a single tense head is present in the sentence, requiring a stacking of two VoicePs, as in (44), with √MAKE inserted directly in the higher Voice⁰ via adjunction.

(44)

We also have tentative evidence that the causative head can also select stative predicates in English. In (45), we have an analytic causative with an adjectival resultative. The presence of *make* signals causation, but *Mary* is not necessarily involved in the causing subevent (e.g., ‘John got his oil changed in his car and as a result Mary became happy).

(45)  John made Mary happy.

Now, consider (46).

(46)  John made Mary happy in an hour.

In (46), *in an hour* can modify the causing subevent (‘John attempted to make Mary happy for one hour, and at the hour point Mary became happy’). But in (46), it implies a fairly
instantaneous transition to the *happy* state, and it can’t generate an incremental theme reading (i.e., (46) cannot mean ‘John did something and for an hour Mary participatied in a *happy* subevent, becoming more and more happy for an hour, culminating in some *happy* state’). There is an interval reading available for (46); ‘John does something and between the points when Mary became knowledgable of John’s actions and when Mary became happy, one hour elapsed.’ However, it is an accidental reading and must be overtly supplied for the reading to emerge.

In (47), when a *for* modifier is present, the default reading is that Mary’s resultant *happy* state lasts an hour.

(47) John made Mary happy for an hour.

I think that readings where the *make* subevent and the *happy* state coincide temporally are available (e.g., ‘John did something for an hour and for the duration of that hour of time, Mary was in a *happy* state’), but in these cases, again the temporal correspondence is accidental, and must be overtly supplied in order for that reading to arise (e.g., ‘Mary is often not happy, but she really likes John, so for the one hour Mary and John were together, she was in a happy state’).

On the other hand, it is often quite common for the causing subevent and the *happy* subevent to *not* correspond temporally (e.g., ‘John got his oil changed in his car, and when his mother Mary found out four days later, she became happy’).

Given the facts presented above, I propose the structure in (48) for (45).
In order to account for the semantics of (45), I propose that instead of parametrizing Cause\(^0\) with respect to its syntactic selectional characteristics as Pylkkänen does, Cause\(^0\) is better described as parametrized based on its semantic nature. In Chapter 3, I defined the translation of Cause\(^0\) as in (49).

(49)  \[\text{Cause}^0 \Rightarrow \lambda P_{\langle v,t \rangle} . \lambda e . \exists e^1 . [P(e^1) \land \text{event}(e) \land \text{CAUSE}(e,e^1)]\]

In this translation, Cause\(^0\) is of type \(\langle \langle v,t \rangle, \langle v,t \rangle \rangle\); it existentially closes over the eventuality variable from the translation of its complement, and introduces a second predicate of eventualities, linking the two subevents with the CAUSE operator. Given the definition of cause in (49), it can combine with any element of type \(\langle v,t \rangle\), so not only can it combine with elements like \(\nu P\), which indicate that the predicate of eventualities is one of events, but it can combine with elements like PredP, which indicate that the predicate of eventualities is one of states. The derivation of (48) is given (50).
It is important to point out some of the differences between analytic causatives and manner resultatives. Analytic causatives generally can take a VoiceP (eventive) complement or a PredP (stative) complement, while manner resultatives are more restricted in requiring a vP complement. In addition, the analytic causative involving *make* can combine with a complement of generally any content, so long as the content is consistent with the context and the matrix subject is capable of causing the condition in the complement clause. For example, (34) is only coherent if Mary is capable of closing the door, and if John is capable of causing Mary to close the door (and the door must be closable). In other words, a number of presuppositions must hold in order for (43) to be true. Contrast (43) with (51).
(51)  #John made the ant sign the Declaration of Independence.

The sentence in (51) is only interpretable in a context where an ant is capable of writing, and is capable of signing the historical document in question; since neither of these is the case, there is a presupposition failure, but the sentence is still interpretable.

  Manner resultatives have similar but stronger presuppositional requirements. For example, in (52), not only must the metal be capable of becoming flat and John must be capable of hammering, but hammering must be capable of causing the metal to become flat.

(52)  John hammered the metal flat.

Presupposition failures can occur at any of these points, as in (53); these are not failures in the overall semantic computation, but in how the computation works together with real world knowledge.

(53)  a.  #The feather hammered the metal flat.
      (Feathers typically can’t hammer.)

b.  #John hammered the metal happy.
     (Metal can’t be happy.)

c.  #John hammered the metal green.
     (Hammering typically can’t make metal green.)

d.  #John swept the metal flat.
     (Sweeping typically can’t make metal flat.)
The difference between *make* and the manner verbs is due to the presuppositions associated with the manner verbs; each manner verb has presuppositions related to how they bring about the result in question. However, with *make*, no manner component is present, so the only presupposition is that the result state is brought about in some underspecified way.

### 4.1.1.4 Selectional characteristics of Cause\(^0\): Summing Up

Pylkkänen’s (2008) influential analysis of causatives assumes that the selectional capability of the causative head is parametrized cross-linguistically; in some languages, Cause\(^0\) selects a root phrase, in some it selects a \(vP\), and in some it selects a Phase (i.e., a VoiceP). However, I showed that Pylkkänen’s system undergenerates. Pylkkänen claims that the causative head in Bemba selects \(vP\), but the data suggests that Cause\(^0\) in Bemba selects VoiceP as well. Pylkkänen also claims that Cause\(^0\) in English selects a root phrase, but we have evidence that the causative head selects stative phrases, \(vPs\), and VoicePs in English. Therefore, I proposed that two separate causative heads are available to the syntax, one that selects predicates of events (VoicePs and \(vPs\)) and one that selects predicates of states (PredPs).

Two questions about my proposal immediately come to mind. First, is the system proposed here truly one of a parameter? It appears that we do have instances of languages where the causative head selects eventive predicates (e.g., Luganda and Bemba), and we have languages where the causative head selects both eventive and stative predicates (e.g., English). But is this due to the nature of the causative head in these languages, or are other factors responsible for these patterns? For example, in Luganda and Bemba, can we simply assume that the causative head cannot select stative predicates? From the data in (54) – (55), this is clearly not the case.
(54)  *Bemba* (Chongo-Kula 2000:237)

a. lub-a ‘lost’ lufy-a ‘cause to be lost’

b. leep-a ‘long’ leefy-a ‘cause to be long’

c. kom-a ‘be deaf’ komy-a ‘cause to be deaf’

(55)  *Luganda* (Pylkkänen 2008:41)

Mukasa ya-siize ekisenge bulu

Mukasa 3SG.PAST-paint.PAST wall blue

‘Mukasa painted the wall blue.’

If the system is one of parametrization, we would also expect to find languages where the causative head only selects stative predicates but not eventive predicates. I have not done a thorough search of the literature to determine if such languages exist, but in their absence, we cannot propose a parameter surrounding the causative head. Rather, we must just assume that two versions of the causative head are available.

Given the discussion and additional data presented above, it appears that Pylkkänen’s approach to the causative head, where the selectional properties of Cause\(^0\) are parametrized, is not accurate. Pylkkänen claims that Cause\(^0\) can select \(\sqrt{\text{root}}\)P, vP, or VoiceP, depending on the language. For example, Pylkkänen claims that Cause\(^0\) selects VoiceP in Venda and Luganda, but the data shows that Cause\(^0\) can also select vP, at least in Luganda. Similarly, Pylkkänen claims that in Bemba, the causative head selects vP, but I have presented data that shows the causative head can select VoiceP as well in Bemba. Finally, Pylkkänen claims that in English, Cause\(^0\) selects \(\sqrt{\text{root}}\)P, but I have shown that Cause can select VoiceP, vP, and PredP in English, and Cause\(^0\) selecting \(\sqrt{\text{root}}\)P is generally incompatible with the SDMH. In the system I have outlined
here, the causative head can freely select an eventive predicate (vP or VoiceP) or a stative predicate (PredP), and the vP can select a stative predicate or a root, so the various instances of causation in Bemba, Venda, and Luganda (and English) can be generated.

4.1.2 Voice Bundling

Pylkkänen (2008) proposes that the causative head is also parametrized with respect to a property that she calls *voice bundling*; voice bundling languages instantiate Voice and the causative function on the same head (56), while non-voice bundling languages have separate syntactic heads for Voice and Cause (57).

(56) VoiceP
    \[\text{[Voice}^0, \text{Cause}^0]\]
    \[vP\]

(57) VoiceP
    \[\text{Voice}^0\]
    \[\text{CauseP}\]
    \[\text{Cause}^0\]
    \[\text{vP}\]

According to Pylkkänen, languages that have voice bundling (like English) do not permit unaccusative causatives; since Cause$^0$ and Voice$^0$ are instantiated on the same head, causation cannot be realized without Voice$^0$ and its corresponding external argument. This claim is generally substantiated, as evidenced by (58).
(58)  

a. *John slept the baby.

b. *John arrived Mary.

In languages without Voice Bundling, unaccusative causatives are licit because \( \text{Cause}^0 \) can occur independently of \( \text{Voice}^0 \); Finnish desiderative constructions and Japanese adversity causatives are cited as exemplifying unaccusative causatives. I don’t take issue with Pylkkänen’s notion of Voice Bundling as a property of the grammar. However, Pylkkänen’s implementation of the semantics of Voice Bundling is problematic from the perspective of the semantic model developed in Chapter 3. Pylkkänen assumes a stepwise application of the denotations of the causative and voice heads, as illustrated in (59).

(59)  

\[
\text{VoiceP} \\
\text{Step 2: (Voice (CauseP))} \\
\text{Step 1: (Cause (vP))} \\
\text{[Cause}^0, \text{Voice}^0]\text{ vP} \\
\triangle
\]

Now, recall the process by which the semantics functions, described in Chapter 3. First, the syntactic terminals are translated into the logical language at the syntax-semantics interface, and the logical types of the terminals are read off of the translations. Translations are expressions of the logic. Next, for a branching node with two daughters, the translation rules indicate what semantic operation is necessary to yield the translation of the branching node given the translations (and logical types) of the two daughters. Given two expressions of the logic that combine via a semantic operation, syntactic rules then indicate the logical type of the resultant
expression of the logic. Finally, semantic rules interpret expressions of the logic. Consider the translations of Voice\(^0\) and the causative head in (60).

(60)  
\[\begin{align*}
\text{a. Voice}^0 & \Rightarrow \lambda x . \lambda e . \text{[event(e) } \land \text{ argument(e,x)]} \\
\text{b. Cause}^0 & \Rightarrow \lambda P_{(v,t)} . \lambda e . \exists e^1 . [\text{P(e}^1\text{) } \land \text{ event(e) } \land \text{ CAUSE(e,e}^1\text{)]} 
\end{align*}\]

Voice\(^0\) is of type \(\langle e,\langle v,t \rangle \rangle\) and the causative head is of type \(\langle \langle v,t \rangle,\langle v,t \rangle \rangle\). We don’t have a translation for the complex voice/cause head, and the two heads cannot combine directly due to type mismatch. Therefore, we need a new translation rule to account for Voice Bundling within the model. The translation rule I propose is given in (61).

(61) Voice Bundling

Let \(\alpha\) be a branching node with daughters \(\beta\) and \(\gamma\); if \(\beta\) is a complex head consisting of Voice\(^0\) and Cause\(^0\) and \(\gamma’\) is of type \(\langle v,t \rangle\), \(\alpha’ = \text{Voice}^0_\alpha \land \text{[Cause}^0_\gamma(\gamma’)]\)

This translation rule identifies which semantic operations are relevant both in combining the causative head with its complement, and in combining Voice\(^0\) with the CauseP. The translations of Voice\(^0\) and the two causative heads, and the syntactic and semantic rules of the logic, remain unaffected. And in this way, Voice Bundling is instantiated as a formal component of the semantics, and not only as a syntactic parameter.

4.2 On Case and head movement

In the discussion above, I have generally ignored two important syntactic operations, Case checking and head movement. In this section, I discuss both of these phenomena in turn.
4.2.1 Case checking

Structural Case checking, the syntactic process of licensing abstract nominative and accusative Case, has been a central component of syntactic theory in the Government & Binding and Minimalist traditions (Chomsky 1981, 1995, 2001). Within Minimalism, structural Case checking hinges on two functional heads; $\tau^0$ is responsible for checking nominative Case, while the upper verbal head $vP$ is responsible for checking accusative Case. I will not delve into the exact mechanisms proposed for Case checking, but for the purposes of this dissertation, let’s assume that the functional head checks the Case of the closest DP in its c-command domain. So within a Minimalist framework, the basic Case-checking relations are schematized in (62).

(62)

In the prototypical DM framework, the same basic mechanism holds for structural Case checking, with minor variations in labeling: $v^0$ in Minimalism is Voice$^0$ in DM, and $V^0$ in Minimalism is $v^0$ in DM. However, in the DM framework employed in this dissertation, an additional functional layer headed by Cause$^0$ appears between the VoiceP and the vP. In this configuration, we have a symmetrical system, with two functional projections TP and CauseP dominating two verbal projections associated with subevents, VoiceP and vP (although I discuss the status of Voice$^0$ in greater detail in section 4.2.2 below). Ideally, we would want to take
advantage of this symmetry, and propose that instead of Voice$^0$ being responsible for accusative Case checking, Cause$^0$ is responsible for checking accusative Case, as schematized in (63).

(63)

```
TP
   T$^0$
   VoiceP
     DP$_1$
     Nominative
     Voice$^0$
     CauseP
        Cause$^0$
        vP
           Accusative
           DP$_2$
           v$^0$
           vroot
```

However, if we assume that Cause$^0$ is responsible for checking accusative Case, we must in turn require the causative head, and the repercussions of the appearance of this head, in all transitive constructions. More specifically, we must assume that the two events introduced by Voice$^0$ and v$^0$ are distinct, and the causative head defines the causal relationship between the two. The question is, is this set of assumptions warranted?

To illustrate, consider instances of semelfactives in (64), which are generally described as punctual.

(64)  John kicked Mary.

Although semelfactives are agentive and thus ‘causative’ in some sense, it is difficult to say how these can be decomposed into a causing subevent and a caused subevent. Rather, there is a singular kicking event, of which John is the agent and Mary is the theme. A similar situation holds for achievement verbs like in (65) and stative verbs like in (66); these sentences are
transitive, but they involve experiencer subjects and not agentive subjects. In these sentences, there is a single event, of which John is the experiencer and the object is the theme.

(65) John noticed the painting.

(66) John loves Mary.

Therefore, we can conclude that for some verb classes involving transitive constructions, no causative head is present, and thus, the causative head is not responsible for checking accusative Case. In such instances, Voice$^0$ combines directly with the vP via Event Identification as described in Chapter 3, with the Case checking schema in (67).

(67) \[
\begin{array}{c}
TP \\
\text{T}^0 \quad \text{VoiceP} \\
\text{DP}_1 \\
\text{Nominative} \\
\text{Accusative} \\
\text{DP}_2 \\
\text{ϕ} \\
\text{vP} \\
\sqrt{\text{root}}
\end{array}
\]

Another issue related to Case checking is whether Voice$^0$ is present in intransitive constructions as well as with transitives, as argued by Harley (1995), Collins (1997), and Embick

---

Ramchand (2008) employs a strongly decompositional approach to the derivation of verb classes. Although Ramchand’s overall approach to the syntax-semantics interface shares some of the assumptions proposed in this dissertation, the system that Ramchand develops differs in many details from the framework I have presented. One difference is especially worthy of note in reference to the discussion here; Ramchand assumes that the sentences in (64) – (66) each involve (at least) two subevents, the highest subevent being associated with initiation, with the specifier position containing the initiator DP (Ramchand 2008:45). The subevent introduced by the initiation head is always a state, so in all cases where the initiation head is present, a state causes a process. It is difficult to understand how this is the case. For example, in a sentence like John broke the stick, what is the initiation state that causes the breaking process? Is it something like potential energy, and the fact that John exists and is capable of breaking a stick is the initiating state?
(2004) (see also Alexiadou & Anagnostopoulou 2004). It has also been argued that the intransitive alternants of verbs like dry, cool, flatten, and blacken involve causation (Chierchia 2004a, Levin & Rappaport Hovav 1995; see also Kratzer 2004). In these cases, the assumption is that a Voice and/or causation projection appears above the base projection in which the root and argument are generated, but Voice⁰ fails to project an argument (i.e., fails to project a specifier), so it cannot check Case on the argument; therefore, T⁰ checks Nominative Case on the argument, and the argument moves to the specifier of T⁰ for EPP reasons, as schematized in (68). In the section on head movement below, I present additional evidence for the claim that Voice⁰ and Cause⁰ are present in at least some intransitive contexts.

(68)

TP

T⁰
VoiceP

Voice⁰

CauseP

Cause⁰

νP

Nominative

DP²

ν⁰

V-root

In this section, I examined the functional heads present in different constructions proposed in this chapter, focusing on what functional heads are involved with Case checking. Although with the appearance of Cause⁰ as another possible candidate for checking accusative

---

56 In Minimalism, movement of the subject from the Specifier of Voice⁰ to the specifier of T⁰ is generally associated with an ‘edge’ feature, which essentially reduces to the proposal that in some languages, a DP needs to be at the left edge. This edge feature is often called an ‘EPP feature’, from the Extended Projection Principle in GB (Chomsky 1995). The edge is formalized in Minimalism in the Phase Impenetrability Condition (Chomsky 2001).
Case, I will continue to assume, along standard Minimalist lines, that Voice\(^0\) checks accusative Case, and finite T\(^0\) is responsible for checking Nominative Case in English.

### 4.2.2 On head movement

Head movement is an operation integrally tied into the nature of the verbal and inflectional architecture (Larson 1988, Pollock 1989). With the introduction of the DM architecture proposed in this dissertation, we must reexamine what constrains head movement and how head movement applies in a variety of cases. I frame the discussion of head movement in terms of a number of assumptions, several of which are fairly uncontroversial. For example, the assumption that head movement proceeds in a head-to-head fashion (Travis 1984), and the assumption that head-movement is an adjunction operation (e.g., Baker 1988; see also Matushansky 2006), are adopted without further discussion. Another important assumption is that head movement is driven by morphological requirements (Pollock 1989; Chomsky 1995), whether or not head movement occurs post-syntactically (Chomsky 2000, 2001 claims that head movement may be a PF operation, and this claim is supported by Boeckx & Stjepanovic 2001; Parrott 2001 proposes that head movement occurs at the morphological level within a DM framework). In the standard minimalist formulation of the verbal architecture in (69), we have an relevant example of head movement; V\(^0\) moves to \(v^0\) to satisfy the morphological requirements of \(v^0\).

\[(69)\]

\[
\begin{array}{c}
\text{DP}_1 \\
\downarrow \\
\text{vP} \\
\downarrow \\
\text{vP} \\
\downarrow \\
\text{V}^0 \\
\text{DP}_2 \\
\end{array}
\]
In the DM framework proposed in this dissertation, Voice\textsuperscript{0} is like v\textsuperscript{0} in (69), therefore having morphological requirements that drive the movement of lower heads.

As discussed in section 3.1.1, one assumption limited to the DM framework regarding roots is that a root must combine with a lexical category determining head. Roots have no underlying lexical category specification, so if a root fails to gain a lexical category specification, it would make sense that the derivation would crash at the PF interface—a root without a lexical category feature is illegible to the morphphonological system. We could define a requirement for roots in (70), and the root must raise via head movement to the closest lexical-category determining head, as in (71). However, as I show below, the root will always combine with a lexical-category determining head due to the morphological requirement of the lexical heads themselves, so the root requirement in (70) is unnecessary.

(70) \textit{Root Requirement} \\
A root must be specified for lexical category at the PF interface.

\begin{equation}
(71)\ aP/nP/vP
\end{equation}

A final assumption that I would like to consider is the generalization in (72), which constrains head movement, such that once a head moves to adjoin to a functional head, the resultant complex head may not move to adjoin to a lexical head.

(72) \textit{Proper Head Movement Generalization} (Baker 2003:306) \\
It is impossible to move from a functional category into a lexical category.
With these considerations in mind, let’s look at some specific data to see how these assumptions constrain the morphosyntactic output. In the standard causative construction in (73), the root raises to Res\(^0\), the resultant complex head raises to \(v^0\), the resultant complex head raises to \(\text{Cause}^0\), and that resultant complex head raises to \(\text{Voice}^0\), forming the complex head as illustrated in (74).

(73)  *John closed the door.*

In addition to the head-movement operation illustrated in (74), an analytic causative construction involving the same structure can also satisfy the requirements of the relevant heads, as in (75).
Here, the morphological requirement of $v^0$ is satisfied by the root, and the insertion of the analytic causative verb *make* in Voice$^0$ satisfies the morphological requirements of that head. However, how does $\sqrt{\text{MAKE}}$ receive its lexical category specification in this configuration? If Voice$^0$ is a lexical head like $v^0$, and therefore capable of specifying the lexical category of roots inserted into it, then the head movement operation in (74) violates the Proper Head Movement Generalization, because it proceeds from a lexical head $v^0$ to a functional head Cause$^0$ and back to a lexical head Voice$^0$. On the other hand, if Voice$^0$ is a functional head, how is it capable of assigning a lexical category to a root? Following Riemsdijk (1998) and Haider (2001), I propose that Voice$^0$ is a *semi-lexical* head; it has the same basic shape as $v^0$, introducing an argument and a subevent, but it is still functional in the sense that Voice$^0$ is an inflectional feature and not a
lexical/derivational one (Kratzer 1996; 2004). Therefore, Voice\(^0\) can assign a verbal lexical category feature to \(\sqrt{\text{MAKE}}\) in (75). For a sentence like (76) with a prepositional resultative, I assume the structure is the same as in (75), but in this case, there is an overt preposition in the resultative head.\(^{58}\)

(76) John made the door close up.

Now, consider the sentence in (77), all with the interpretation ‘John made the door close (up).’

(77) a. *John made close the door.
   b. *John made close up the door.
   c. *John made close the door up.

I assume that these sentences would all have the structure in (75); in these cases, the issue lies not in the structure, but in issues surrounding Case. If the complex head \(\sqrt{\text{root}} + \text{Res}\(^0\)) raises to \(\nu\(^0\)) but the DP \(\text{the door}\) fails to raise to the specifier of \(\nu\(^0\)), the DP cannot check Case, thus resulting in ungrammaticality.

\(^{57}\) In the literature, semi-lexical heads are present in light-verb constructions, such as get-passives (Alexiadou 2011), so although proposing that Voice\(^0\) is a semi-lexical head is a stipulation, it is not without precedent.

\(^{58}\) In the configuration in (75) for the sentence in (76), there are two possible options for head movement, the one illustrated in (75), where \(\sqrt{\text{close}}\) moves to \(\text{Res}\(^0\)) and the resultant complex head moves on to \(\text{Cause}\(^0\)) and Voice\(^0\), and the case where \(\sqrt{\text{close}}\) moves directly from its base generated position to \(\nu\(^0\)), leaving the resultative particle in place, as in (i).

(i) They opened the store up for two hours.
This latter option is available because the resultative particle is exactly that, a particle, and not an affix (or the formal features signifying an affix), which would require head adjunction to be legible at the PF interface (due to a ‘stranded-affix’ constraint \(a la\) Lasnik 1981). Furthermore, if \(\sqrt{\text{close}}\) moved to \(\text{Res}\(^0\)) in cases like (i), it could not subsequently move out of \(\text{Res}\(^0\)) to a higher head but strand the particle; with head movement, it is impossible to extract either the adjoining element or the target element separately (Matushansky 2006:72).

As discussed above, when the \(\text{up}\) particle appears adjacent to the spell-out of the root, we need to assume that the particle functions like a clitic and must be carried along with the root, even though inflectional morphology can appear between the root and the particle. Alternatively, we might posit that in these instances, the \(\text{up}\) particle is not a head, but is an innate part of the root. I leave this issue to future research.
In the resultative constructions discussed in section 4.1, the head movement operations function in a similar manner to standard verbal constructions. In the adjectival resultative in (78), the root receives its lexical category specification from \(a^0\); since \(a^0\) is an adjectival head and not a verbal head, it cannot raise to satisfy the morphological requirement of Voice\(^0\). Therefore, the manner root √HAMMER must be inserted in Voice\(^0\) as a last-resort operation to satisfy the morphological requirement of Voice\(^0\); the lexical category requirement of √HAMMER is satisfied by Voice\(^0\), as outlined above.\(^{59}\)

(78)  *John hammered the metal flat.*

\[
\begin{array}{c}
\text{VoiceP} \\
\downarrow \\
\text{John} \\
\downarrow \\
\text{Voice}^1 \\
\downarrow \\
\text{Voice}^0 \\
\downarrow \\
\text{CauseP} \\
\downarrow \\
\text{Cause}^0 \\
\downarrow \\
\text{PredP} \\
\downarrow \\
\text{DP} \\
\downarrow \\
\text{Pred}^1 \\
\downarrow \\
\text{Pred}^0 \\
\downarrow \\
\text{aP} \\
\downarrow \\
\text{a}^0 \\
\downarrow \\
\text{√FLAT}
\end{array}
\]

In addition to the analytic causative with the prepositional resultative or the adjectival resultative, we also have evidence of an analytic causative embedding another causative, as in (79). In this case, the upper voice head checks Case on *Mary*, and for some reason, the complex

\(^{59}\) For a sentence like *John flattened the metal*, the structure would be the same as in (74).
head in the lower \( \text{Voice}^0 \) cannot raise to the upper \( \text{Voice}^0 \), so the analytic causative \( \sqrt{\text{MAKE}} \) must be inserted in order to satisfy the morphological requirement of the upper \( \text{Voice}^0 \).

(79)  

John made Mary close the door.
To conclude this section on head movement, I present some evidence for the claim that Voice\(^0\) (and Cause\(^0\)) is present in some intransitive constructions. First, consider a basic intransitive sentence involving a change of state in (80).

(80) The door opened.

From this sentence alone, it is difficult to tell whether a single verbal layer is involved, as in (81), or whether a VoiceP that fails to project a specifier and external argument merges above the vP, as in (82).

(81) \[
\begin{array}{c}
\text{TP} \\
\text{T}\^0 \rightarrow \vP \\
\text{DP} \rightarrow \text{the door} \rightarrow \text{v}\^0 \rightarrow \sqrt{\text{OPEN}}
\end{array}
\]

(82) \[
\begin{array}{c}
\text{TP} \\
\text{T}\^0 \rightarrow \text{VoiceP} \\
\text{Voice} \rightarrow \text{vP} \\
\text{DP} \rightarrow \text{the door} \rightarrow \text{v}\^0 \rightarrow \sqrt{\text{OPEN}}
\end{array}
\]

Now, consider an intransitive occurrence of a manner causative in (83).

(83) The door swung open.
Even though this sentence is intransitive, Voice⁰ is required to host the manner root √SWING, as depicted in (84).

(84)

```
VoiceP
   /\            \
  /   \          /\  \\
Voice⁰  CauseP  √SWING  Cause(c,s)⁰  PredP
     |      |       |       |      |
     DP    Pred⁰ aP
           |      |
           a⁰  √OPEN
```

For the purposes of this dissertation, I will assume that since (83) requires the projection of Voice⁰, all intransitive sentences will involve a VoiceP like in (82), albeit the Voice⁰ in (82) and (84) is a defective one that fails to project a specifier.⁶⁰

With the conclusion of this section, I have described in detail the syntax that I propose that is in line with the SDMH advanced in this dissertation. This syntactic groundwork will serve as the basis for discussing additional data in section 4.3 below, specifically addressing some crosslinguistic issues with argument structure alternations.

---

⁶⁰ With this being the case, no additional translation rules or semantic rules are necessary because both Voice⁰ and CauseP are type (v,t), so the Predicate Modification translation rule and the corresponding semantic rule suffice to allow for the semantic composition.
4.3 Expanding the analysis of the verbal system

In this section, I expand my analysis of the verbal architecture by examining some verbal alternations crosslinguistically. Specifically, I examine some cases where alternations have been analyzed from the perspective of ‘flavors’ of $v^0$ (Folli & Harley 2005, 2006, 2007; Harley 2009). The intuition behind the ‘flavors’ analysis is that there are multiple different types of $v^0$, the functional head responsible for introducing the external argument into the derivation. Each different type of $v^0$ restricts the characteristics of the arguments they introduce (e.g., some flavors of $v^0$ permit intentional arguments, some do not). In addition, each different type of $v^0$ selects a different kind of structural complement, where certain structures correlate with eventive predicates and some correlate with stative ones. I believe that the underlying intuition involved in these analyses is fundamentally correct, but I propose a different implementation of these analyses that is compatible with the SDMH and the semantic model developed in Chapter 3.

4.3.1 Subject-consumption alternations

Much recent research in the DM tradition has looked to further specify the nature of the verbal system, with many proposals focusing on differentiating between various types, or ‘flavors’ of $v^0$ (Harley 2009; Folli & Harley 2005, 2006, 2007). A number of different verbal heads have been introduced (e.g., $v_{cause}$, $v_{do}$, $v_{become}$, $v_{be}$), each generally annotated with a primitive predicate familiar from the predicate decomposition literature (Dowty 1979; Jackendoff 1990; Levin & Rappaport-Hovav 1995, 1998, 2005; Rappaport-Hovav & Levin 1998). These heads are naturally correlated with respective subevents in the semantics, such that the decomposition in the syntax parallels the event structure semantically. Folli & Harley (2005) propose a distinction between $v_{cause}$ and $v_{do}$ to account for alternations like those in (85), which involve verbs of consumption
that alternate based on the nature of the subject. I term these alternations *subject-consumption alternations.*

(85)  

**English**

a. The groom ate the wedding cake.

b. *The sea ate the beach.

c. The sea ate away the beach.

**Italian**

d. Lo sposo ha mangiato la torta nunziale.

   The groom has eat.PST the cake nuptial.

e. *Il mare ha mangiato la spiaggia.

   The sea has eat.PST the beach

f. Il mare si è mangiato la spiaggia.

   The sea REFL is eat.PST la spiaggia

In (85), we see that some verbs of consumption alternate in the way the object/patient is realized depending on the nature of the subject; in (85a) and (85d), the subject is intentional, i.e., it has volition, and a normal direct object is present. In (85b) and (85e), the subject is not volitional, and a standard direct object is not available, while in (85c) and (85f), a non-volitional subject is acceptable if the object appears with a resultative secondary predicate. In English, the secondary predicate is generally a preposition for this type of alternation, while in Italian, it is an adjectival participle; the participle in (85f) can be diagnosed as adjectival because it agrees in gender and number with the subject, as in (86).
a. Gianni si è mangiato una mela.
   John is eat.PST.MASC an apple.

b. Maria si è *mangiato/mangiata una mela.
   Mary is *eat.PST.MASC/eat.PST.FEM an apple.

c. Gianni e Maria si sono *mangiato/mangiati una mela.
   John and Mary are *eat.SG.PST/eat.PLU.PST an apple.

Note also, the ‘be’ auxiliary is used with the non-volitional subjects in Italian, which generally reflects an unaccusative syntax (Burzio 1986). To account for these differences, Folli & Harley assume that, for verbs of consumption, two different forms of $v^0$ are present; $v_{DO}$ occurs with volitional subjects and selects a standard DP complement, while $v_{CAUSE}$ occurs with non-volitional subjects and selects a small clause complement. The structure for a standard verb of consumption is given in (87). In English, bare prepositional heads are available for resultative secondary predication, as in (88). But in Italian, Folli & Harley propose that *si is an overt instantiation of $v_{CAUSE}$ in Italian as illustrated in (89), and the verbal participle is generated inside the small clause. Adjectival resultatives like that in (89) generally involve a result state, similar to adjectival resultatives in English, as in (90) and as discussed in Section 4.1.1.3.61

---

61 In the literature on grammatical aspect, several researchers interpret the participle as the output of a root that has combined with a stativizing functional head, which lends credence to the interpretation of the Italian data in (86) as involving a result state (see Alexiadou et al. 2004b for summary and discussion).
(87)  *John ate the apple.*

```
  v_{DO}
   /
  DP       v_{DO}
  /    
John  eat  DP  the apple
```

(88)  *The sea ate the beach away.*

```
  v_{CAUSE}
  /
DP  v_{CAUSE}
 /   
the sea  eat
  
     SC
     /
    DP  P
    the beach  away
```

(89)  *Il mare si è mangiato la spiaggia.*

```
  v_{CAUSE}
  /
DP  v_{CAUSE}
 /   
il mare  si
     SC
     /
    DP  V
    la spiaggia  mangiato
```

(90)  *John hammered the metal flat.*
Several issues with Folli & Harley’s analysis immediately arise upon further scrutiny. First, they explicitly ignore the initial merge position of the *eat* root, either assuming that the root can be inserted via a process of Manner Incorporation (*a la* Hale & Keyser 2002) in $v_{\text{DO}}/v_{\text{CAUSE}}$, or can be inserted into the head of a ‘Process’ VP head between $v_{\text{DO}}/v_{\text{CAUSE}}$ and the DP/SC (Folli & Harley 2005:12). However, the position of the root has a major impact on the interpretation of the structure. If the root is inserted directly into $v_{\text{DO}}/v_{\text{CAUSE}}$, both the subject and the object would be generated in the projection of the root, which is clearly in contention with the notion that the external argument should be separated from the verb, and the internal argument and the external argument are generated inside distinct projections (Kratzer 1996; Chomsky 1995).

If the root is inserted as the head of a process VP that intervenes between the projection headed by $v_{\text{DO}}/v_{\text{CAUSE}}$ and the DP/SC, we have a different set of issues. Folli & Harley claim that $v_{\text{DO}}$ selects a DP or SC complement, while $v_{\text{CAUSE}}$ only selects a SC complement. But if a process VP intervenes, it is not clear how $v_{\text{DO}}/v_{\text{CAUSE}}$ can transmit its selectional characteristics through the process VP. We would have to postulate that the process VP inherits the selectional characteristics from $v_{\text{DO}}/v_{\text{CAUSE}}$ and imparts these characteristics to its complement. However, this would involve look-ahead, as the process VP would have to know whether it was going to combine with $v_{\text{DO}}$ or $v_{\text{CAUSE}}$ before it combined with its own complement.

The final issue with Folli & Harley’s proposal lies in the nature of $v_{\text{DO}}/v_{\text{CAUSE}}$ themselves. According to Folli & Harley, $v_{\text{DO}}$ selects only intentional arguments. Intentionality is a semantic/encyclopedic characteristic, and not a syntactic one, so the intentionality restriction would have to apply in the semantic computation. We don’t want to insert the intentionality restriction into the translation of $v_{\text{DO}}$ because that would introduce the intentionality component

\footnote{Both possibilities are potentially valid for the English data, but are completely ruled out in the Italian data, since the root, which is realized as an adjectival participle, appears inside of the Small Clause in (89).}
into the denotation as in (91), and since the intentionality restriction only applies to certain contexts, introducing the intentionality restriction into the translation is not desired. Alternately, we could have a two-part translation like in (92), but again, this would only be relevant to for a subset of instances of Voice\textsuperscript{0}.

\begin{align*}
(91) \quad & \text{Voice}^0 \Rightarrow \lambda x . \lambda e . [\text{event}(e) \land \text{argument}(e,x) \land \text{intentional}(x)] \\
(92) \quad & \text{Voice}^0 \Rightarrow \lambda x . \lambda e . [\text{event}(e) \land \text{argument}(e,x)] \text{ iff } x \text{ is intentional;} \\
& \text{Voice}^0 \Rightarrow \text{undefined otherwise.}
\end{align*}

Additional issues arise when we consider the stipulated complementation patterns for \(v_{\text{do}}\); Folli & Harley assume that \(v_{\text{do}}\) (or an intervening \(v_{\text{process}}\)) can select either a DP complement or a SC complement. However, a SC and a DP are of two different semantic types, type \(\langle v, t \rangle\) and type \(\langle e \rangle\) respectively. Therefore, two different versions of \(v_{\text{do}}\) would be needed.

I think the intuitions presented by Folli & Harley are generally correct, and the issues are simply a matter of implementation. In my analysis, I maintain the idea that with verbs of consumption, standard transitive constructions involve an eventive and a stative component. In English resultatives, the marking is an overt spell out of the result head, but in Italian, the situation is more complex.

Formally, my analysis is as follows. In English, subject-consumption constructions with an intentional subject have the standard multi-layered syntax in (93) without a causative projection. The root raises through Res\textsuperscript{0} to \(v^0\) to get a lexical category specification, and the complex head then raises to satisfy the morphological requirement of Voice\textsuperscript{0}.

\footnote{In (91) and (92), I assume a translation rule for \(v_{\text{do}}\) based on the translation of Voice\textsuperscript{0} defined in Chapter 3.}
(93)  *John ate the apple.*

In English subject-consumption constructions with a non-intentional subject, the relevant structure is a prepositional resultative, as in (94). There is no conventional eating subevent, thus the absence of a vP, and √EAT functions more as a manner verb, as indicated by the fact that the roots gets its lexical category feature from Voice⁰.⁶⁴

---

⁶⁴ Given the analysis presented here, Voice⁰ serves to identify the lexical category of the root in (94), so one question to ask is: why can’t it identify the lexical category of the root in all instances? In short, it can. However, in most cases, it doesn’t because the lexical category of the root is fixed by other lexical category determining heads lower in the derivation.
(94) The sea ate the beach away.

However, prepositional resultatives like in (94) are not available in Italian, so the alternative is an adjectival resultative structure like in (95). I propose that the root initially merges with \( v^0 \) and the internal argument is generated in the specifier of the verbal head. Then, an adjectival head, where the participial morphology is generated, selects the \( vP \); participial \( a^0 \) serves as a stativizer, following Anagnostopoulou (2004). The auxiliary is then merged above the \( aP \), resulting in the selection of the \( essere \) auxiliary, since the embedded structure is unaccusative. The reflexive morpheme \( si \) is generated in \( Cause^0 \), following Folli & Harley. The auxiliary must raise via head-movement to \( T^0 \), and since \( si \) is a clitic, it attaches to the left of the auxiliary. Since the participle is generated outside of the projection of the \( vP \), but the DP object \( la spiaggia \) is generated inside the \( vP \), the object cannot agree with the participle, so the participle instead agrees with the subject.
(95) \textit{Il mare si è mangiato la spiaggia.}

This structure also allows us to account for cases where the Italian causative is passivized, as in (96). In (96), we know that the participle is adjectival, as it agrees with the DP \textit{la spiaggia} in gender.\footnote{In the analysis presented in (95) and (96), the adjectival participle agrees with the subject in both cases. The participle does not c-commands the subject, and the subject is never in a spec-head relation with the participle, so it is difficult to see how agreement could obtain. I assume that the participle needs to morphologically agree with some element, and lacking any other mechanisms, the participle agrees with the subject by default.}
When the sentence is passivized, the passive Voice$^0$ lacking a specifier is required. I propose that when passive Voice$^0$ appears, the causative head *si* is absorbed. I motivate this by assuming that Italian is a Voice bundling language (e.g., it lacks non-analytic causatives of unergatives); when Voice$^0$ is not morphologically marked, as in transitive constructions, the causative morphology can surface, but when Voice$^0$ is passive, it must be morphologically marked, and Voice$^0$ morphology trumps the causative morphology. Although I assume that
Italian is a Voice bundling language, I present the Cause⁰ and Voice⁰ as separate heads in (95) and (96) for clarity of exposition.

In subject-consumption constructions like (95) and (96) where the subject is not intentional, I propose that these types of constructions are forced not due to syntactic constraints on the intentionality of the subjects, but rather, by factors related to the Encyclopedia. Consider the Encyclopedia entry for √EAT in (97), based on the discussion of the Encyclopedia in Chapter 3.

(97)

<table>
<thead>
<tr>
<th>√EAT</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PARTICIPANTS</td>
<td>2 or more participants, A and O</td>
</tr>
<tr>
<td>KINESIS</td>
<td>Action</td>
</tr>
<tr>
<td>CHANGE OF STATE</td>
<td>O changes state</td>
</tr>
<tr>
<td>VOLITIONALITY</td>
<td>Volitional</td>
</tr>
<tr>
<td>AFFECTEDNESS OF O</td>
<td>O affected</td>
</tr>
</tbody>
</table>

Typically, the encyclopedia requires that the features of the root are conveyed in the syntax, as we saw for the PARTICIPANTS feature in Chapter 3. However, I propose that in some cases, such as with the English and Italian resultative structures presented here, mismatches between the syntax and the Encyclopedia can be repaired by overt marking in the syntax. The Encyclopedia entry for √EAT requires a volitional, intentional subject due to the VOLITIONALITY feature, so when a non-intentional subject is involved, this fact must be indicated syntactically. In other words, the structure in (93) converges syntactically even in cases where the subject is non-intentional, but the issue lies in the interface with the semantics; for √EAT, the structure with a non-intentional subject must be different from the structure with an intentional subject in order for the semantics to ‘see’ the distinction. The notion of ‘different structure’ can be defined in terms of markedness; the standard transitive construction is the unmarked case, so deriving a
different structure counts as ‘marked’ in some way. The overt resultative marker in English, and
the adjectival resultative construction in Italian, produces a marked derivation from that of the
standard transitive syntax, and this difference is required for the semantics to converge when
\textit{\textsc{\textbf{V}}} \textsc{eat} has a non-intentional subject.

It has been pointed out that the judgments on the data in (85) are not clear, and there are
indeed cases where (85b) and (85e) are acceptable. If this is the case, then the analysis presented
above can account for these facts as well. For the English sentence in (85b), the same structure as
in (93) would be present. We would have to assume that English can simply vary as to whether
the result head is spelled out. As for (85e), if such sentences are available in Italian, we could
assume the same structure for (85e) in (93). I propose that the difference between (85c) and (85e)
lies in the nature of resultatives in Italian. The structure in (93) is acceptable when no overt
resultative is present. But since Italian lacks prepositional resultatives, if the result state is to be
overtly spelled out, it must be through a different means than spelling out the result head. In
these cases, the result can be overtly encoded with the adjectival projection. If this line of
analysis is correct, we can assume that Italian overtly marks when the causative head selects a
stative complement by spelling out the causative head as \textit{si}.

4.3.2 Causatives of directed motion

Constructions involving directed motion have traditionally been likened to resultatives due to the
clear syntactic and semantic similarities between the two constructions (e.g. see Stowell 1983;
Jackendoff 1990; Levin & Rappaport Hovav 1995, among many others). For example, both the
resultative in (98a) and the directed-motion constructions in (98b-c) entail something about the
result state of \textit{the cart}. 
Several different avenues have been proposed to account for the data, including lexicalist (Jackendoff 1990; Weschler 2005) and syntactic (Travis 1994; Borer 1998; Chomsky 1981; Stowell 1983) positions.

Folli & Harley (2006) propose an analysis for causatives of directed motion based on their analysis of verbs of consumption (Folli & Harley 2005) and the notion of ‘flavors’ of $v^0$. They show that causatives of directed motion do not revolve around a functional projection that triggers telicity, as proposed by Travis (1994) and Borer (1998) because telicity is not required in such constructions, as shown in (99).

(99) a. John rolled the cart into the room #for 5 minutes/in 5 minutes.

b. John rolled the cart around the room #in 5 minutes/for 5 minutes.

Rather, Folli & Harley ascribe telicity to the nature of the path; telic readings involve paths with an endpoint (99a), while atelic readings involve a path with no specific endpoint (99b). For both caused and uncaused directed-motion constructions, Folli & Harley assume that the lower part of the structure contains a prepositional small clause (following Chomsky 1981 and Stowell 1983), since the prepositional phrase in no way entails a ‘result state’. In (98b), Folli & Harley propose that the small clause is the complement of an unaccusative verbal head (i.e., the head fails to project an argument and check Case), while in (98c), the small clause is the complement of a causative (transitive) head, which both projects an argument and checks Case. The structures for (98b-c) are given in (100).
This type of analysis accounts for auxiliary selection facts in Italian and Dutch, as pointed out by Folli & Harley (citing Hoekstra 1984). In (101), the ‘be’ auxiliary occurs, indicating an unaccusative structure. Folli & Harley claim that the PP in these cases is an argument embedded in a small clause, and is interpreted as a directed-motion resultative. The structure in (100a) corresponds to the sentences in (101).

(101) a. Italian

Gianni é corso nel bosco in un minuto/#per ore.

John is run into the woods in a minute/in one minute.
b. Dutch

Jan is in het bos gerend.

Jan is in the woods run

‘Jan ran into the woods.’

In (102), the auxiliary corresponding to ‘have’ appears, which is typically indicative of an unergative construction in languages with auxiliary selection. In these cases, the prepositional phrase of motion further specifies the nature of an activity, and the PP is structurally a modifier. The corresponding structure is given in (103).  

(102)   a. Italian

Gianni ha corso nel bosco per ore/#in un minuto.

John has run in the woods for hours/in one minute.

b. Dutch

Jan heeft in het bos gerend.

Jan has in the woods run

‘Jan ran in the woods.’

(103)

\[ 
\text{v}_{\text{CAUSE}} \\
\text{v}_{\text{CAUSE}} \\
\text{DP} \quad \text{v}_{\text{CAUSE}} \quad \text{PP} \\
\text{John} \quad \text{run} \quad \text{into the store} 
\]

\footnote{Folli & Harley do not discuss the placement of the modifier PPs in these structures, so for the purposes of this example, I assume a simple adjunction structure.}
An issue that is more difficult to address is related to the nature of the subject in directed motion constructions. Folli & Harley claim that verbs of directed-motion vary along two dimensions, whether they take an agent or non-agent subject (i.e., intentional or non-intentional argument), and whether the PP-path is presupposed by the root. Consider the data in (104).

(104)  a. [+Agent, +Path]
   Mary walked to the store.

   b. [-Agent, +Path]
   The log rolled along the beach.

   c. [+Agent, -Path]
   The bullet whistled through the window.

   d. [-Agent, -Path]
   The train shuddered into the station.

First, it is not entirely clear how Folli & Harley (2006:143-144) characterize roots as [+Agent, especially considering the bullet in (104c), which is clearly non-intentional. The characterization of roots as ±Path is also not very intuitive; according to Folli & Harley (2006:144), only roots that presuppose a Path argument are characterized as +Path. The diagnostic for whether a Path is presupposed is given in (105). Only roots that presuppose paths, like walk and roll, allow traces in the underlying position of the Path.
(105) a. How far did Sue walk?
   b. How far did the log roll?
   c. *How far did the bullet whistle?
   d. *How far did the train shudder?

Folli & Harley claim that if a verb root has a [+Agent] feature, it can be inserted into the causative head in a structure like (100b), and this will describe the causative subevent in the corresponding semantics. So with a root like whistle in (106), whistling is the causing subevent, as the Agent’s whistling causes the dog to come to the Agent.

(106) Mary whistled Rover to her side.

On the other hand, Folli & Harley claim that if a root has a +Path specification, it can be inserted into the causative head and it will describe the motion subevent. For example, in (107), the root roll describes the motion subevent; i.e., it describes how the ball moves.

(107) Bill rolled the ball down the hill

What about verbs with both [+Agent] and [+Path] features like walk or jump? In (108), jump describes the motion subevent (i.e., jumping describes what the action figure is doing) and not the causing subevent (John is not jumping and causing the action figure to do something). But in cases like (109) involving walk, the verb root describes the causing action; by walking (and holding onto the bike), John caused the bike to go to the store.

(108) John jumped the action figure across the table.
(109) John walked the bicycle to the store.
The case with *walk* is more complex, however. You might think that *walk* can also describe the motion subevent, as in (110); John helped Mary walk across the stage.

(110) John walked Mary across the stage.

However, (110) could be uttered if Mary was not walking, for example, if she was in a wheelchair, and only John was walking. So it seems that *walk* describes the accompanying event in (110) but not a causing subevent, as Mary could be walking on her own power, and John is just accompanying her. A similar reading is typical in (111), where John and Mary are walking to a specified destination or on a specified path, and neither is assisting the other, but John is accompanying Mary.

(111) John walked Mary home/to the store/around the park.

One major problem with the analysis of +Agent, +Path verbs is related to the fact that the same structure is proposed for roots like *walk*, where the walking describes the causing subevent, and verbs like *jump*, where the jumping describes the motion subevent. If the root is inserted into the same syntactic position in both the cases, how do we know which subevent the root modifies? Folli & Harley acknowledge this problem (2006:151-152), but assume that the Encyclopedia can filter out the undesired readings. For example, in (109), bicycles cannot generally walk, so the Encyclopedia forces the reading where *walk* refers to the causing subevent. In (108), we can assume that John is not jumping across the table, so *jump* refers to the motion subevent. But when we take compositionality into account, Folli & Harley’s argument breaks down. Consider the structure in (112), which Folli & Harley assume for causatives of directed motion, repeated from (100b) above.
First of all, there is only one verbal projection, so it is impossible to see how two subevents could be present given this structure (although the small clause could be assumed to describe a stative subevent). Second, even if there were two subevents, it is difficult to see how the root could be interpreted as describing the motion subevent when it is generated within the projection of the vP, which is the causative subevent.

In order to maintain a transparent syntax-semantics interface in the spirit of DM research, I propose that two different structures are involved for the two interpretations of the verb root in directed motion causatives. Before we consider causatives of directed motion, first consider the structure in (113), which Folli & Harley propose for instances of uncaused directed motion, repeated from (100a) above.
Harley & Folli assume a small-clause structure as the complement of the verbal head, where both the DP and the PP are considered to be ‘arguments’ of the verb because they are generated inside the verbal projection. The impetus for assuming that the PP is an argument is due to data involving constituent ordering like in (114), where the PP that describes the directed motion always appears inside the PP that describes the wider context for the directed motion event.

(114)  a. John danced around the room at the party.
       b. *John danced at the party around the room.
       c. *John danced on Wednesday around the room.

In (113), it’s unclear how \textit{v}_{\text{BECOME}} combines with SC compositionally. Second, \textit{v}_{\text{BECOME}} does not project a specifier and cannot check Case on John, so T^0 must check Case on John, and John must move to the specifier of T^0 for EPP reasons.\textsuperscript{67} Since John is never in the projection of \textit{v}_{\text{BECOME}}, it cannot be an argument of the verb.

As an alternative to (113), I propose the structure in (115) for uncaused directed motion contexts. This structure preserves Folli & Harley’s intuition that the PP is in the projection of the verb, but allows for a straightforward semantic composition.

\textsuperscript{67} The projection of T^0 and the checking of Case on John is not discussed by Folli & Harley, but this is the standard Minimalist analysis.
In (115), I propose that non-caused directed motion sentences are structurally unaccusative (as shown to be the case by Folli & Harley 2006:135-136), so a projection of Voice⁰ lacking a specifier is merged atop the vP; the root moves via adjunction to the verbal head then to Voice⁰. Since Voice⁰ does not project a specifier, it cannot check Case on John, so Case checking on John is accomplished by T⁰, with EPP-driven movement of John to the specifier of T⁰.

In (115), P⁰ is different from Res⁰ discussed above in that it is an event modifier and not a stativizer. The translation of P⁰ and the interpretation of the PP are given in (116), simplifying the denotation of the DP. Notably, v¹ semantically combines with the PP via Event Identification, since v¹ is of type ⟨e,⟨v,t⟩⟩ and the PP is of type ⟨v,t⟩; all other computations are unremarkable. The derivation for the vP in (115) is provided in (117).
Given the structure in (115) and the derivation in (117), the causative of directed motion where the verb root describes the motion subevent is generated by simply adding projections of Cause$^0$ and Voice$^0$ to the structure in (115), with the resulting structure in (118) and derivation in (119), omitting the computation of the TP. Here, the root moves via adjunction to $v^0$, and the resultant complex head moves through Cause$^0$ to Voice$^0$; Voice$^0$ checks Case on the action figure, and T$^0$ checks Case on John.
John jumped the action figure across the table.

Translations and Interpretations

<table>
<thead>
<tr>
<th>Translations</th>
<th>Formulas</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ( v^0 \Rightarrow \lambda x \cdot \lambda e \cdot [\text{event}(e) \land \text{argument}(e,x)] )</td>
<td></td>
</tr>
<tr>
<td>b. ( \sqrt{\text{JUMP}} \Rightarrow \lambda e. \text{jump}'(e) )</td>
<td></td>
</tr>
<tr>
<td>c. ( v^1 = v^0 \land \sqrt{\text{JUMP}} )</td>
<td></td>
</tr>
<tr>
<td>d. ( \text{to} \Rightarrow \lambda x. \lambda e. \text{across}'(e,x) )</td>
<td></td>
</tr>
<tr>
<td>e. ( \text{the table} \Rightarrow \lambda x. \exists e'. [\text{state}(e') \land \text{table'}(e') \land e' \equiv x] )</td>
<td></td>
</tr>
<tr>
<td>f. ( PP' = \text{across}'(e,x) )</td>
<td></td>
</tr>
<tr>
<td>g. ( v^2 = v^1 \land PP' )</td>
<td></td>
</tr>
<tr>
<td>h. ( \text{the action figure} \Rightarrow \lambda x. \exists e'. [\text{state}(e') \land \text{action figure'}(e') \land e' \equiv x] )</td>
<td></td>
</tr>
<tr>
<td>i. ( vP' = v^2'(\text{the action figure'}) )</td>
<td></td>
</tr>
<tr>
<td>j. ( [[v^1']]^{\text{M,C,g}} = \lambda x. \lambda e. [\text{event}(e) \land \text{argument}(e,x) \land \text{jump}'(e)] )</td>
<td></td>
</tr>
<tr>
<td>k. ( [[PP']]^{\text{M,C,g}} = \lambda e. \text{across}'(e, \lambda x. \exists e'. [\text{state}(e') \land \text{table'}(e') \land e' \equiv x]) )</td>
<td></td>
</tr>
<tr>
<td>l. ( [[v^2']]^{\text{M,C,g}} = \lambda x. \lambda e. [\text{event}(e) \land \text{argument}(e,x) \land \text{walk}'(e) \land \text{across}'(e, \lambda x. \exists e'. [\text{state}(e') \land \text{table'}(e') \land e' \equiv x])] )</td>
<td></td>
</tr>
<tr>
<td>m. ( [[vP']]^{\text{M,C,g}} = \lambda e. [\text{event}(e) \land \text{argument}(e, \lambda x. \exists e'. [\text{state}(e') \land \text{action} \ldots ]) )</td>
<td></td>
</tr>
</tbody>
</table>
On the other hand, in structures where the verb root describes the causing subevent, the structure in (120) is the relevant one. We can assume that the root is generated via Manner Incorporation directly in Voice\(^0\) like in the adjectival resultative cases discussed above.\(^{68}\)

Syntactically, Voice\(^0\) checks Case on the bicycle and \(T^0\) checks Case on John. Again, \(v^0\) semantically combines with the PP via Event Identification. The semantic derivation for (120) is given in (121). For the Manner Incorporation process, where the root is inserted into Voice\(^0\), the relevant translation rule is Event Identification.

---

\(^{68}\) Alternately (for causatives of directed motion and for the adjectival resultatives), the root could be generated as the complement of Voice\(^0\), and the resultant Voice\(^1\) would then merge with CauseP. The difference has no semantic effect, so I leave a characterization of the precise syntactic mechanisms for future research.
(120) John walked the bicycle to the store.

(121) Translations and Interpretations

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>$v^0 \Rightarrow \lambda x . \lambda e . [\text{event}(e) \land \text{argument}(e,x)]$</td>
</tr>
<tr>
<td>b.</td>
<td>$v^{1'} = v^0 \land PP'$</td>
</tr>
<tr>
<td>c.</td>
<td>to $\Rightarrow \lambda x . \lambda e . \text{to'}(e,x)$</td>
</tr>
<tr>
<td>d.</td>
<td>the store $\Rightarrow \text{ix. } \exists e'. [\text{state}(e') \land \text{store'}(e') \land e' = x]$</td>
</tr>
<tr>
<td>e.</td>
<td>$PP' = \text{to'}(\text{the store'})$</td>
</tr>
<tr>
<td>f.</td>
<td>the bicycle $\Rightarrow \text{ix. } \exists e'. [\text{state}(e') \land \text{bicycle'}(e') \land e' = x]$</td>
</tr>
<tr>
<td>g.</td>
<td>$vP' = v^{1'}(\text{the bicycle'})$</td>
</tr>
<tr>
<td>h.</td>
<td>$[[PP']]^{MC-g} = \lambda e . \text{to'}(e, \text{ix. } \exists e'. [\text{state}(e') \land \text{store'}(e') \land e' = x])$</td>
</tr>
<tr>
<td>i.</td>
<td>$[[v^{1'}]]^{MC-g} = \lambda x . \lambda e . [\text{event}(e) \land \text{argument}(e,x) \land \text{to'}(e, \text{ix. } \exists e'. [\text{state}(e') \land \text{store'}(e') \land e' = x])]$</td>
</tr>
<tr>
<td>j.</td>
<td>$[[vP']]^{MC-g} = \lambda e . [\text{event}(e) \land \text{argument}(e, \text{ix. } \exists e'. [\text{state}(e') \land \text{bicycle'}(e') \land e' = x]) \land \text{to'}(e, \text{ix. } \exists e'. [\text{state}(e') \land \text{store'}(e') \land e' = x])]$</td>
</tr>
</tbody>
</table>

- $\text{Cause}'' \Rightarrow \lambda P_{V(\lambda)} . \lambda e . \exists e'. [\text{P}(e') \land \text{event}(e) \land \text{CAUSE}(e,e')]$
- $\text{CauseP} \Rightarrow \text{Cause'}(vP')$
- $\text{Voice}'' \Rightarrow \lambda x . \lambda e . [\text{event}(e) \land \text{argument}(e,x) \land \text{walk'}(e)]$
- $\text{Voice'} = \text{Voice}'' \land \text{CauseP'}$
In this section, I examined causatives of directed motion, focusing specifically on the DM-style analysis proposed by Folli & Harley (2006). I believe that Folli & Harley’s intuitions about the structure of the directed-motion causatives are essentially accurate, so I re-worked the structures so as to be compatible with the SDMH. As a result, we not only have a syntactic analysis of causatives of directed motion, but we have an analysis of the compositional semantics as well.

### 4.3.3 Japanese causatives

Japanese causatives have been the focus of numerous studies investigating the syntax-morphology and the syntax-semantics interfaces. In this section, I first discuss the difference between analytic causatives and lexical causatives in Japanese. I then examine two analyses of Japanese causatives in the DM framework (Harley 2008; Pylkkänen 2008), which propose an underlying structural difference to account for the analytic/lexical dichotomy. Finally, I propose an analysis based on the proposals by Harley and Pylkkänen that is consistent with the SDMH.
4.3.3.1 Analytic and lexical causatives

In Japanese, productive analytic causatives are formed by adding the affix -(s)ase- to the primary verb root, as illustrated in (122).

(122) Taroo-ga Hanako-o ik-ase-ta

    Taro-NOM Hanako-ACC go-CAUSE-PAST

‘Taro made Hanako go.’

Analytic causatives in Japanese are different from those in English, in that Japanese analytic causatives employ this causative morpheme, while English utilizes the verb make. However, Japanese and English analytic causatives are similar, in that they both are interpreted compositionally and have the general meaning ‘X made Y do something’.

Analytic causatives in Japanese differ from so-called ‘lexical causatives’ in a number of ways. First, various morphological forms are used to make the unaccusative/causative distinction. Verbs are divided into at least nine classes based on their unaccusative/lexical causative morphology, as shown in (123).


<table>
<thead>
<tr>
<th>Class</th>
<th>Affixes</th>
<th>Unaccusative</th>
<th>Lexical Causative</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>-ar/-e-</td>
<td>ag-ar-u</td>
<td>ag-e-ru</td>
</tr>
<tr>
<td>II</td>
<td>-re/-s-</td>
<td>hazu-re-ru</td>
<td>hazu-s-u</td>
</tr>
<tr>
<td>III</td>
<td>-ri/-s-</td>
<td>ta-ri-ru</td>
<td>ta-s-u</td>
</tr>
<tr>
<td>IV</td>
<td>-e/-as-</td>
<td>kog-e-ru</td>
<td>kog-as-u</td>
</tr>
<tr>
<td>V</td>
<td>-i/-os-</td>
<td>ok-i-ru</td>
<td>ok-os-u</td>
</tr>
<tr>
<td>VI</td>
<td>∅/as-</td>
<td>nar-u</td>
<td>nar-as-u</td>
</tr>
<tr>
<td>VII</td>
<td>∅/e-</td>
<td>ak-u</td>
<td>ak-e-u</td>
</tr>
<tr>
<td>VIII</td>
<td>-e-/∅</td>
<td>kir-e-ru</td>
<td>kir-u</td>
</tr>
<tr>
<td>IX</td>
<td>-ar-/∅</td>
<td>matag-ar-u</td>
<td>matag-u</td>
</tr>
</tbody>
</table>

For a given root, it is not predictable from the semantics whether it has a lexical causative, nor can the class of the root be predicted from the nature of the root. The classification
of the roots into classes is solely determined by the morphology. The ‘listed’ flavor of these causatives led to labeling these types of causatives as ‘lexical’, in contrast to the productive analytic causatives with sase.

Japanese lexical causatives differ from analytic causatives in other ways as well. For example, Japanese lexical causatives (124a) and unaccusative/lexical causative pairs appear in idioms (124b-c), while analytic causatives are only interpreted compositionally.

(124) a. Lexical Causative

kama-o kak-e- (Class i; from Harley 2008)
sickle-ACC splash on
‘trick into confessing’
(Note that the intransitive variant kak-ar- does not participate in this idiom.)

b. Unaccusative

te-ga kuwa-war-
hand-NOM join
‘be altered’

c. Lexical Causative

te-o kuwa-e-
hand-ACC add
‘alter’

In addition, lexical causatives show semantic drift (125), and participate in non-productive nominalizations (126), further distinguishing them from the productive analytic causatives.
(125) hone-o or-u  (Class viii; from Miyagawa 2010)
    bone-ACC break-Present
    ‘exert oneself’

(126) lexical causative  (Class ix; from Miyagawa 2010)
    a. hasam-u ‘to catch between’
       nominalization
    b. hasami ‘scissors’

Furthermore, Japanese lexical causatives can have the ‘adversity’ reading in addition to the
standard causative reading in (127), while analytic causatives never have the adversity reading
(although see the discussion of (131) below).

(127) Taroo-wa niku-o kog-asi-ta
    Taro-TOP meat-ACC burn-CAUSE-PAST

   Causative reading
    Taro scorched the meat.

   Adversity reading
    The meat got scorched to Taro’s detriment.

Another distinction that can be drawn between lexical causatives and analytic causatives
is that lexical causatives behave uniformly as monoclausal constructions, while analytic
causatives show properties of being monoclausal and biclausal, depending on the test used. For
example in the lexical causative in (128), the -te- phrase, an adjunct, may only be controlled by the subject; only Taro, but not Hanako, got wet.\textsuperscript{69}

(128) Taroo-wa nure-te Hanako-o hi-(y)as-ita

\begin{tabular}{l}
Taro-TOP \textit{wet-te} Hanako-ACC cool-CAUSE-PAST
\end{tabular}

Reading: ‘Taro, getting wet, cooled Hanako.’
Impossible: ‘Taro cooled Hanako, (Hanako) getting wet.’

Contrast (128) with (129), where the adjunct may be controlled by the causer Taro or the causee Hanako, which points to two possible attachment sites for the adjunct, and thus two clauses.\textsuperscript{70}

(129) Taroo-wa arui-te Hanako-o ik-ase-ta

\begin{tabular}{l}
Taro-TOP \textit{walk-te} Hanako-ACC walk-CAUSE-PAST
\end{tabular}

Reading: ‘Taro, walking, made Hanako go.’
Impossible: ‘Taro made Hanako go, Hanako walking.’

However, analytic causatives behave monoclauously in that they signify a single tense domain. In other words, in analytic causatives, a single tense morpheme defines the temporal reference for both the causing event and the caused event, and it is not possible to include two different tense markers, one for each subevent.\textsuperscript{71} (Harley 2008)

\textsuperscript{69} Similar patterns emerge in English non-finite control adjuncts, which are Voice-level (Hornstein 2001). For example, in (i), the only available reading is one where the seeing event occurred before John ate, not before Bill ate.

\begin{enumerate}
\item (i) John saw Bill before eating.
\end{enumerate}

\textsuperscript{70} Likewise in the English analytic causative in (i), John or Bill could be the agent of the eating event.

\begin{enumerate}
\item (i) John made Bill call Mary before eating.
\end{enumerate}

\textsuperscript{71} Harley cites research showing that productive causatives pattern bi-clauously with respect to adverbials (Shibitani 1990), anaphora (Terada 1991; Dubinski 1994), and disjunction (Kuroda 2003), but I omit discussion of these phenomena here, given the fact that the analysis I have presented clearly shows the difference between lexical causatives, with a single VoiceP, and analytic causatives, with multiple VoicePs. Harley also claims that Japanese analytic causatives behave monoclauously with respect to negative polarity and tense, although she provides no data
One issue that confounds the distinction between analytic causatives and lexical causatives is related to the nature of roots. Some select only a lexical causative, some select an analytic causative, and some select either, as shown in (130).

(130)  Only Lexical Causative

a. ak- ‘open intransitive’  ak-e ‘open transitive’  *ak-sase

Only Analytic Causative

b. ik- ‘go’  ik-(s)ase ‘cause to go’

Both Lexical Causative and Analytic Causative

c. taore- ‘fall down’

Lexical Causative

Analytic Causative

taore-s ‘push down’  taore-sase ‘cause to fall down’

If a root selects both analytic causative and lexical causative morphology, the lexical causative variant generally has an idiomatic meaning, has the adversity reading, etc., while the variant with the analytic causative does not.

An additional confounding factor in the lexical/productive causative distinction is that some roots appear to have the adversity reading with the -(s)ase- causative morpheme, as in (131).

(131)  Taroo-ga  yasai-o  kusar-ase-ta

Taro-NOM  vegetable-ACC  rot-CAUSE-PAST

The vegetables rotted to Taro’s detriment.

to this end. The analysis I have presented for analytic causatives is consistent with this claim, since only a single TP is projected, and both negation and tense are tied to TP (or the inflectional field more widely).
The -(s)ase- morpheme typically signals an analytic causative, which is incompatible with the adversity reading, so the adversity reading in (131) is unexpected. However, only verb roots that do not have ‘lexical causative’ morphology (i.e., roots that do not fall into one of the classes in (123) above) can have the adversity reading with the -(s)ase- causative. Therefore, Miyagawa (1989) analysed these cases as a sort of ‘elsewhere’ case; only verbs that do not form the lexical causative with one of the paradigms in (105) use the -(s)ase- affix to form the lexical causative. For example, the root ak- ‘open’ has specified lexical causative morphology -e-, so -e- will always be inserted in lexical causative contexts. We can think of this in terms of blocking; since ak- is specified for lexical causative morphology, this specification blocks the insertion of the -(s)ase- morphology. On the other hand, kusar- ‘rot’ does not have specified lexical causative morphology, even though it has the lexical causative meaning, so in cases like this, -(s)ase- is inserted as the lexical causative morpheme. Finally, -(s)ase- is always inserted in analytic causative environments because no root is specified for analytic causative morphology. For roots that take the default -(s)ase- lexical causative morphology, the typical readings involved with lexical causatives (e.g., idiomatic readings, adversity causative readings, etc.) are always available, like in (131) above.

There are some cases where the lexical causative and the analytic causative may appear in a single sentence in Japanese. A double causative of this type may only appear if the inner causative is a lexical causative (132a), although the lexical causative can take the -(s)ase- form like in (132b).

(132) a. Hanako-ga Taro-ni doa-o ak-e-sase-ta

   Hanako-NOM Taro-DAT door-ACC open-e-CAUSE-PAST

   ‘Hanako made Taro open the door.’
b. Hanako-ga Taroo-ni yotei-o  
Hanako-NOM Taro-DAT Schedule-ACC  
aw-(s)ase-sase-ta  
match-CAUSE-CAUSE-PAST  
‘Hanako made Taro match the schedule.’

Two instances of an analytic causative -sase- may not appear in a sentence, as shown in (133a); rather, the two instances are reduced to a single instance, as in (133b). (All data in (132)-(133) is taken from Miyagawa 2010.)

(133)  a. *Sensei-ga Hanako-ni kodomo-o yakkuri taore-sase-sase-ta  
teacher-NOM Hanako-DAT child-ACC slowly fall.down-CAUSE-CAUSE-PAST  
‘The teacher made Hanako make the child fall down slowly.’

b. Sensei-ga Hanako-ni kodomo-o yakkuri taore-sase-ta  
teacher-NOM Hanako-DAT child-ACC slowly fall.down-CAUSE-CAUSE-PAST  
‘The teacher made Hanako make the child fall down slowly.’

Several researchers (Baker 1988; Miyagawa 1999; Harley 2008; Pylkkänen 2008) conclude that the distinctions between lexical causatives and analytic causatives in Japanese all reduce to a structural difference between these two constructions, namely the location where the causative head is merged into the structure. In the next subsection, I outline two influential analyses of Japanese causatives in the DM framework, and in section 4.3.3.3 I show how these analyses can be refined to be compatible with the model-theoretic semantics developed in this dissertation.
4.3.3.2 Japanese causatives in DM

Harley (2008) and Pylkkänen (2008) provide two recent analyses of Japanese causatives within the DM framework. Any analysis of Japanese causatives has two primary issues to account for, i) the fact that sometimes -sase-, which typically signals an analytic causative, can actually function as a lexical causative morpheme, and ii) the syntactic differences between the lexical and analytic causatives. I examine how Harley (2008) and Pylkkänen (2008) address these two issues in turn below.

In order to account for the cases where -sase- functions as a lexical causative, both Harley (2008) and Pylkkänen (2008) follow Miyagawa (1999, 2010) in concluding that the -sase- form of the lexical causative is simply the elsewhere case for roots that do not encode the lexical causative in the manner of one of the classes defined by Jacobsen (1992). The Elsewhere Principle is formalized within DM in terms of competition and blocking. At the interface with the morpho-phonological component of the grammar, Vocabulary Items compete for insertion in a terminal; the Vocabulary Item with the most compatible features and no incompatible features is inserted, and it blocks the insertion of a Vocabulary Item with fewer compatible features. For the purposes of this discussion, assume that a √rootP with a lexical causative head complement are present in the syntax, and several forms of the causative morpheme compete for insertion in the causative head. The morphological form of the causative with the most compatible features is the one that matches the listed causative form for a root in one of Jacobsen’s various classes.

Going back to our examples above, if the root is ak- ‘open’ is present in the derivation, a number of Vocabulary Items will compete for insertion in Cause⁰, including the set {-e-, -s-, -as-, -sase-}. The root √ak is a Class I root in (123), so it needs a Class I causative affix. The causative affix -e- has a Class I feature, the affix -s- has a Class II/III feature, the affix -as- has a
Class IV feature, and the \textit{-sase-} affix lacks a class feature. Only \textit{-e-} has a compatible feature (and both \textit{-s-} and \textit{-as-} have incompatible features), so \textit{-e-} wins the competition and is inserted in the causative head, blocking the insertion of any other Vocabulary Items. Conversely, the root \textit{√KUSAR} ‘rot’ does not have specified lexical causative morphology (i.e., it does not belong to one of the classes in \textit{(123)}), even though it can have the lexical causative meaning. In cases like this, different Vocabulary Items will compete for insertion in \textit{Cause}^{0}, including \{\textit{-e-}, \textit{-s-}, \textit{-as-}, \textit{-sase-}\}. The causative affix \textit{-e-} has a Class I feature, the affix \textit{-s-} has a Class II/III feature, the affix \textit{-as-} has a Class IV feature. Since the root lacks a Class feature, all of the affixes \{\textit{-e-}, \textit{-s-}, \textit{-as-}\} are incompatible with the root. But the \textit{-sase-} affix lacks a Class feature, so it is compatible with the root \textit{√KUSAR}, and \textit{-sase-} is inserted as the elsewhere case for the lexical causative. The insertion of any of the other lexical causative morphological forms is blocked because these can only be inserted if specified for a given root, i.e., if the root and the affix have compatible features.

The competition and blocking approach for dealing with the lexical causative \textit{-sase-} is in line with more general DM approaches to morphological phenomena (e.g., Embick 2000, 2007; Embick & Marantz 2008; Embick & Noyer 2007), so I will not address the issue further in this dissertation.

Next, let’s consider how Harley (2008) accounts for the differences between analytic and lexical causatives described in section 4.3.3.1. Harley posits that there are two fundamentally different structures for lexical and analytic causatives, as presented in \textit{(134)} and \textit{(135)} respectively.
Harley’s analysis accounts nicely for the facts described in the previous sub-section.

Since the lexical causative head is the first (innermost) verbal head, it makes sense that lexical
causatives are involved with idiomaticity, semantic drift, and the adversity reading (which is in itself idiomatic), since this verbal head delimits the scope of idioms according to Marantz (1997). Therefore, I think that the fundamental dichotomy that Harley proposes is accurate. However, the structures that Harley proposes clash with the system assumed in this dissertation. Let me explain.

The structures in (134) and (135) are consistent with the structures that Harley proposes in her other work in the DM framework (e.g., Harley 2009, Folli & Harley 2005, 2006, 2007). In these structures, the root can form a unit with an argument, and \( v^0 \) and \( \text{Voice}^0 \) get conflated. This conflation presents certain problems from the perspective of event structure. For example, Harley claims that the structure in (135) would be sufficient for an analytic causative embedding a lexical causative with \( \sqrt{\text{break}} \):

“In a syntactic causative of a lexically causative verb, that lower \( v^0 \) slot would be filled by whatever causative morpheme is appropriate to the lexical causative root, of course, as in, e.g., \( \text{kow-as-ase} \), \( \left[ [\text{break-CAUSE}]vP1-\text{CAUSE}]vP2 \), ‘cause (someone) to break (something)’.” (Harley 2008:41)

An analytic causative embedding a lexical causative with \( \text{break} \) is given in (136a), with the structure in (136b).

(136) a. Hanako-ga Taro-ni doa-o kow-as-ase-ta

\[
\begin{array}{llll}
\text{Hanako-NOM} & \text{Taro-DAT} & \text{door-ACC} & \text{break-CAUSE-CAUSE-past} \\
\end{array}
\]

‘Hanako made Taro break the door.’
In (136b), the lower vP must encode two subevents, the causing subevent with Taro as the agent and the breaking subevent (not taking into account the result state). For Harley’s system, where the √P ‘rootP’ is capable of conveying the breaking subevent, and the vP can convey the causing subevent, this configuration is acceptable. However, if we assume an isomorphism between v₀/Voice₀ heads and subevents as I argued for in Chapter 3, the structure in (136b) is not sufficient to support the necessary semantics in the transparent model of the syntax-semantics interface developed in this dissertation.

The system proposed by Pylkkänen (2008) is fundamentally equivalent to that proposed by Harley, with minor differences to account for the fact that Pylkkänen assumes a causative head in addition to the verbal and Voice heads. A different issue arises with Pylkkänen’s (2008) analysis of lexical causatives, however. Pylkkänen proposes that for lexical causatives, Cause₀ combines directly with the √rootP. And in Japanese, lexical causatives of unergatives are permitted, contrasting with English, as illustrated in (137).
(137) John-ga Mary-o nak-asi-ta
    John-NOM Mary-ACC cry-CAUSE-PAST
    ‘John made Mary cry.’

Since the root is unergative, the causee (the argument of *cry*) cannot be generated in the √rootP, as only objects/patients are generated in the √rootP, in line with the Unaccusative Hypothesis (Perlmutter 1978; Burzio 1986; Hale & Keyser 2002). But Pylkkänen is committed to the analysis of Cause⁰ selecting the √rootP, so the causee argument cannot be generated in the specifier of a Voice⁰ generated between the √root and the CauseP. Therefore, Pylkkänen proposes that the causee is generated in the specifier of Cause⁰, as illustrated in (138).

(138)

```
  ...            CauseP
      DP        Cause¹
                  causee
                 Cause⁰    √root
```

This analysis is problematic, because given Pylkkänen’s denotation of Cause⁰ in (139), the causee cannot combine semantically with Cause¹ due to type mismatch.

(139) $\text{Cause}^0: \lambda f_{(s,t)} \cdot \lambda e . \exists e'.[f(e') \land \text{CAUSE}(e,e')]$

Cause⁰ begins the derivation as type $\langle\langle s,t\rangle,\langle s,t\rangle\rangle$ (in Pylkkänen’s type-theory). Once Cause⁰ combines with √root of type $\langle s,t\rangle$, the resultant Cause¹ is of type $\langle s,t\rangle$, and the causee argument is of type $\langle e\rangle$, so there is no way in which Cause¹ and the causee argument can compose semantically without proposing some kind of null type-shifter.
Although I believe that the analyses presented by Harley (2008) and Pylkkänen (2008) are essentially correct, issues remain in both systems regarding how to interpret the semantics based on the syntactic output. In the next subsection, I propose a revised analysis of Japanese causatives that allows for a straightforward computation of the semantics of said causatives.

4.3.3.3 A revised analysis of Japanese causatives

In this section, I propose an analysis of Japanese causatives that is compatible with the model of the syntax- semantics interface developed in this dissertation. This analysis is based on the fundamental insight of Harley (2008) and Pylkkänen (2008) that the difference between Japanese analytic causatives and lexical causatives is reduced to the attachment site of the causative head. However, the analysis that I present complies with the SDMH, and thus provides a straightforward and transparent mapping from the syntax to the semantics.

First, let’s examine lexical causative/inchoative pairs in (140). With the inchoative sentence in (140a), I propose that the inchoative morpheme appears in an intransitive Voice⁰ without an external argument that takes a vP complement, like in (141), with the derivation in (142).

(140)  a. Inchoative

    niku-ga  kog-e-ta
    meat-NOM  burn-INCH-PAST

    ‘The meat scorched.’
b. *Lexical Causative*

Taroo-ga  niku-o  kog-asi-ta

Taro-NOM  meat-ACC  burn-CAUSE-PAST

(141)

```
  VoiceP
     /\    /
   vP  Voice^0
      /
     e

     /
    DP
   /\   /
 niku v^1
     /
\sqrt{KOG} v^0
```

(142)

<table>
<thead>
<tr>
<th>Translations</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. niku (\Rightarrow) (\exists x. \lambda e. [\text{state}(e') \land \text{meat}'(e') \land e' \equiv x])</td>
</tr>
<tr>
<td>b. (\sqrt{KOG} \Rightarrow \lambda e. \text{burn}'(e))</td>
</tr>
<tr>
<td>c. (v^0 \Rightarrow \lambda x. \lambda e. [\text{event}(e) \land \text{argument}(e, x)])</td>
</tr>
<tr>
<td>d. (v^1 = v^0 \land \sqrt{\text{BURN}'})</td>
</tr>
<tr>
<td>e. (vP' = v^1(DP'))</td>
</tr>
<tr>
<td>f. (\text{Voice}^0 \Rightarrow \lambda e. [\text{event}(e)])</td>
</tr>
<tr>
<td>g. (\text{VoiceP}^0 = \text{Voice}^0 \land vP')</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>h. ([v^1]^M.C. = \lambda x. \lambda e. [\text{event}(e) \land \text{argument}(e, x) \land \text{burn}'(e)])</td>
</tr>
<tr>
<td>i. ([vP']^{M.C.} = \lambda e. [\text{event}(e) \land \text{argument}(e, \exists x. \lambda e'. [\text{state}(e') \land \text{meat}'(e') \land e' \equiv x]) \land \text{burn}'(e)])</td>
</tr>
<tr>
<td>j. ([\text{VoiceP}']^{M.C.} = \lambda e. [\text{event}(e) \land \text{argument}(e, \exists x. \lambda e'. [\text{state}(e') \land \text{meat}'(e') \land e' \equiv x]) \land \text{burn}'(e)])</td>
</tr>
</tbody>
</table>

The structure in (141) and the derivation in (142) are remarkable in two ways. First, the \(vP\) introduces the \(e\) subevent, and since no causative head intervenes between \(\text{Voice}^0\) and the \(vP\), there is no way to link two separate subevents introduced by \(v^0\) and \(\text{Voice}^0\). So the subevent
referred to by \( \text{Voice}^0 \) is the same subevent referred to by the \( \text{vP} \). Second, since the voice head here is ‘defective’ in that it does not project a specifier, its translation does not include an argument position. So when the semantics are computed, the event argument supplied by \( \text{Voice}^0 \) is redundant. In this manner, we can implement a system for inchoative voice heads such that the head has semantic content without having any practical effect on the semantic composition.

Now turning to the causative sentence (140b), the lexical causative appears in a causative head that takes a \( \text{vP} \) complement, like in (143), with the derivation in (144).

(143)

\[
\begin{aligned}
&\text{VoiceP} \\
&\text{DP} & \text{Voice}^1 \\
&Taro & \text{CauseP} & \text{Voice}^0 \\
&\text{vP} & \text{Cause}^0 & \text{asi} \\
&\text{DP} & \text{v}^1 & \text{niki} \\
&\text{\( \sqrt{\text{KOG}} \)} & \text{v}^0 & \text{niki}
\end{aligned}
\]

(144)

<table>
<thead>
<tr>
<th>Translations</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. ( \text{niki} \Rightarrow \text{tx}. \exists e'. [\text{state}(e') \land \text{meat}'(e') \land e' = x] )</td>
</tr>
<tr>
<td>b. ( \sqrt{\text{KOG}} \Rightarrow \lambda e. \text{burn}'(e) )</td>
</tr>
<tr>
<td>c. ( \text{v}^0 \Rightarrow \lambda x. \lambda e. [\text{event}(e) \land \text{argument}(e,x)] )</td>
</tr>
<tr>
<td>d. ( \text{v}^1 = \text{v}^0 \land \sqrt{\text{burn}}' )</td>
</tr>
<tr>
<td>e. ( \text{vP}' = \text{v}^1(\text{DP}') )</td>
</tr>
<tr>
<td>f. ( \text{Cause}^0 \Rightarrow \lambda P_{(v,P)} . \lambda e . \exists e'. [P(e') \land \text{event}(e) \land \text{CAUSE}(e,e')] )</td>
</tr>
<tr>
<td>g. ( \text{CauseP}' = \text{Cause}^0_{(vP)} )</td>
</tr>
<tr>
<td>h. ( \text{Voice}^0 \Rightarrow \lambda x . \lambda e. [\text{event}(e) \land \text{argument}(e,x)] )</td>
</tr>
<tr>
<td>i. ( \text{Voice}^1 = \text{Voice}^0 \land \text{CauseP}' )</td>
</tr>
<tr>
<td>j. ( \text{Taro} \Rightarrow \text{taro}' )</td>
</tr>
<tr>
<td>k. ( \text{VoiceP} \Rightarrow \text{Voice}^1'(\text{taro}') )</td>
</tr>
</tbody>
</table>
The structure in (143) and the derivation in (144) are like the analysis of the standard English causative presented in Chapter 3, where a causative head intervenes between the \( vP \) and the VoiceP, and serves to link two subevents, \( e' \) introduced by \( vP \) and \( e \) introduced by Voice\( _0 \). I have omitted the resultative head in this discussion to focus on the relevant structures.

Next, I follow Harley (2008) and Pylkkänen (2008) by assuming that the distinction between lexical causatives and analytic causatives lies in the attachment site of the causative head; in the system presented here, I propose that lexical causatives take a \( vP \) complement like in (143) above, while analytic causatives take a VoiceP complement (where the VoiceP complement of Cause\( _0 \) is potentially a full causative construction itself, with its own CauseP and \( vP \)), as schematized in (145).
Harley (2008) predicts that we will never encounter a lexical causative embedding inchoative morphology because lexical causative morphology and inchoative morphology are in merged in the same syntactic position, namely in a $v^0$ that selects a $\sqrt{\text{root}}P$. Harley’s prediction is evidenced by the data in (146); in (146a), inchoative morphology appears with the analytic causative and the root *tao* ‘to fall’, but when lexical causative morphology appears in (146b), the inchoative morphology disappears.

(146) a. Sensei-ga Hanako-ni kodomo-o yukkan tao-re-sase-ta

  teacher-NOM Hanako-DAT child-ACC slowly fall.down-INCH-CAUSE-PAST

  ‘The teacher made Hanako make the child fall down slowly.’
The proposal presented here makes the same prediction, but for a different reason; a lexical causative takes a vP complement but Voice⁰ is the locus of inchoative morphology, and Voice⁰ is never generated inside the vP. In this way, we derive the complementary distribution of lexical causative and inchoative morphology without having to assume that they are generated in the same syntactic position.⁷²

Now I examine analytic causatives in greater detail. I proposed that analytic causatives involve a causative head that combines with a VoiceP. However, analytic causatives come in multiple variants. In (147b), we know that the lower causative is an analytic causative because the two analytic causative morphemes collapse into one due to morphological constraints, as discussed surrounding (133) above. In this case, the outer analytic causative embeds a transitive VoiceP, while the inner analytic causative embeds an inchoative VoiceP without an external argument, as illustrated in (148). The derivation for (148) is given in (149).

(147) a. *Sensei-ga Hanako-ni kodomo-o yukkuri tao-re-sase-sase-ta
    teacher-NOM Hanako-DAT child-ACC slowly fall.down-CAUSE-CAUSE-PAST
    ‘The teacher made Hanako make the child fall down slowly.’

b. Sensei-ga Hanako-ni kodomo-o yukkuri tao-re-sase-ta
    teacher-NOM Hanako-DAT child-ACC slowly fall.down-INCH-CAUSE-PAST
    ‘The teacher made Hanako make the child fall down slowly.’

⁷² Technically, this system would predict that inchoative Voice⁰ could embed a lexical causative. I could not find this type of data in the literature, so it appears that the framework developed here overgenerates. I leave this issue to future research.
Translations and Interpretations

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>$v^0 \Rightarrow \lambda x . \lambda e . [\text{event}(e) \land \text{argument}(e,x)]$</td>
</tr>
<tr>
<td>b.</td>
<td>$\sqrt{\text{TAO}} \Rightarrow \lambda e . \text{fall'}(e)$</td>
</tr>
<tr>
<td>c.</td>
<td>kodomo $\Rightarrow \lambda x . \exists e' . [(\text{state}(e') \land \text{child'}(e') \land e' \equiv x)]$</td>
</tr>
<tr>
<td>d.</td>
<td>$v^1 = v^0 \land \sqrt{\text{TAO}}$</td>
</tr>
<tr>
<td>e.</td>
<td>$vP^* = v^1'(\text{kodomo'})$</td>
</tr>
<tr>
<td>f.</td>
<td>$[[v^1']]^{\text{M,C,g}} = \lambda x . \lambda e . [\text{event}(e) \land \text{argument}(e,x) \land \text{fall'}(e)]$</td>
</tr>
<tr>
<td>g.</td>
<td>$[[v^1P^*]]^{\text{M,C,g}} = \lambda e . [\text{event}(e) \land \text{argument}(e,\lambda x . \exists e'. [(\text{state}(e') \land \text{child'}(e') \land e' \equiv x)] \land \text{fall'}(e)]$</td>
</tr>
<tr>
<td>h.</td>
<td>$\text{Voice}'^0 \Rightarrow \lambda e . \text{event}(e)$</td>
</tr>
<tr>
<td>i.</td>
<td>$\text{VoiceP'} = \text{Voice}'^0 \land vP'$</td>
</tr>
<tr>
<td>j.</td>
<td>$[[\text{VoiceP}']]^{\text{M,C,g}} = \lambda e . [\text{event}(e) \land \text{argument}(e,\lambda x . \exists e'. [(\text{state}(e') \land \text{child'}(e') \land e' \equiv x)] \land \text{fall'}(e)]$</td>
</tr>
</tbody>
</table>
The analytic causative can also embed a lexical causative like in (150). Here, the outer causative embeds a transitive VoiceP, while the inner lexical causative has a vP complement, as illustrated in (151). The translation of the causative head that embeds a vP is the same as the translation of the causative head that embeds a VoiceP because both vP and VoiceP are of type ⟨v,t⟩, and the function of both causative heads is the same, to link two phrases involving separate subevents.
(150) Sensei-ga Hanako-ni kodomo-o yukkuri tao-s-(s)ase-ta

teacher-NOM Hanako-DAT child-ACC slowly fall.down-CAUSE-CAUSE-PAST

‘The teacher made Hanako make the child fall down slowly.’

(151)

The analytic causative can also embed an inchoative, as in (152). Here, the causative head embeds an inchoative VoiceP, similar to the bottom part of the structure in (148), as shown in (153).

(152) Taroo-wa niku-o kog-e-sase-ta

Taro-TOP meat-ACC burn-INCH-CAUS-PAST
I omit the derivations for (150) and (152) because they would proceed in a similar manner to that given in (149) for the sentence in (149b), with minor differences based on the syntactic differences between the three structures. However, I’d like to point out a few notable characteristics of the structures presented here, focusing on the terminal nodes. Note that according to this analysis, $v^0$ never has morphological content in Japanese, and $\text{Voice}^0$ only has morphological content when it is inchoative. This contrasts with $\text{Cause}^0$, which always has morphological content. I propose that $v^0$ does not have overt morphological content because it instead provides lexical category information, which is itself morphological. And I propose that only inchoative $\text{Voice}^0$ contains morphological content due to markedness; $\text{Voice}^0$ typically involves an argument, but inchoative $\text{Voice}^0$ is ‘defective’ in some way (à la Chomsky 2001), and thus is the marked version of $\text{Voice}^0$, and so it must be morphologically marked. The prototypical version of $\text{Voice}^0$ lacks morphological marking, because it is morphologically signaled by the presence of the argument it introduces. Finally, both analytic and lexical $\text{Cause}^0$
involve morphological marking to distinguish between the two, with morphological marking being inserted based on the competition model for DM described above (see also Harley 2008; Embick 2000, 2007; Embick & Marantz 2008; Embick & Noyer 2007 for more information about competition and blocking in DM).

Finally, consider the case of causatives of unergative verbs. Unergatives are interesting because they vary as to what type of causative they take. For example √NAK ‘cry’ is unergative, but selects a lexical causative -asi-, while √IK ‘go’ patterns with analytic causatives, as in (154).

(154) a. Taro-o ga Hanako-o nak-asi-ta

Taro-NOM Hanako-ACC cry-CAUSE-PAST

‘Taro made Hanako cry.’

b. Taro-o ga Hanako-o nak-ase-ta

Taro-NOM Hanako-ACC ik-CAUSE-PAST

‘Taro made Hanako go.’

Following the discussion above, we would assume that different structures are present for the two sentences; in (154a), the causative head would select vP, as in (155), while in (154b), the causative head would select a VoiceP, as in (156).
The analysis of Japanese causatives presented here is consistent with the patterns regarding lexical causatives described in section 4.3.3.1. For example, the monoclausal behavior of lexical causatives is predicted from the structure in (143), where there is a single VoiceP, in contrast to the biclausal behavior of analytic causatives, which contain multiple VoicePs, as shown in (145),
This analysis is beneficial in that it provides an explicit look at how the syntax and semantics of Japanese causatives functions in a DM framework.

4.4 Summing up

In this chapter, I took some major steps toward establishing an explicit and transparent model for the syntax-semantics interface in DM. I began the chapter with a discussion of causation based on Pylkkänen’s (2008) influential study, and I proposed a modification of Pylkkänen’s system to bring it in line with the assumptions for DM I proposed in Chapter 3. After discussing the roles of Case checking and head movement in the framework presented here, I presented an analysis of a number of argument-structure phenomena related to causation. I showed how previous analyses of these phenomena were more or less accurate, but I showed how the analysis I developed was necessary in order to have a proper understanding of how the syntax-semantics interface functions in DM.
Chapter 5: Extensions and Conclusions

In this dissertation, I introduced the Strong DM Hypothesis, which is a natural interpretation of the nature of roots given the assumption in the DM literature that roots lack syntactico-semantic features. I then presented a model of the syntax-semantics interface that is compatible with the assumptions of the SDMH, and showed how this model applies to a number of verbal environments, especially those involving causation. I also provided an initial look into formalizing how the Encyclopedia works in DM, allowing us to utilize the Encyclopedia to account for the unavailability of some constructions without making the Encyclopedia too powerful. In this Chapter, I first look at nominalizations and gerunds and provide a sketch of how the concepts developed in this dissertation can be extended to contribute to the existing DM literature on the topic. Then, I briefly sum up what I accomplished in this dissertation, describe some limitations of the work, and suggest some directions for future research.

5.1 Extending the system: Nominalizations and gerunds

One of the primary benefits of the DM architecture is that all elements that share the same root are derived from that root syntactically. In Chapters 3 and 4, I described how verbal structures are derived from a root, and I briefly sketched how nominal and adjectival constructions are derived from a root as well. In this section, I briefly illustrate how a number of nominalization and gerunds can be derived in the system developed throughout this dissertation.

The main advantage of deriving nominals and gerunds through the system developed in this dissertation is that I make an explicit distinction between eventive and stative predicates. Therefore, the stative aspects of nominal and gerundive constructions are directly conveyed in the compositional semantics.
Again, I must stress that the analysis presented here relies crucially on previous analyses of nominalizations and gerunds (Marantz 1997, 2000; Alexiadou 2001, 2010b,c; Harley 2009; Harley & Noyer 1998, 2000), and the primary goal of this section is to re-frame the previous analyses in terms of the model of the syntax-semantics interface developed in this dissertation.

The common feature of many analyses of nominalizations and gerunds in the DM framework is that the interaction of verbal and nominal projections in the syntax determines the nature of the construction, in terms of argument structure and event structure. (Alexiadou 2001; Harley 2009) In this section, I show how the DM implementation of Baker’s theory of lexical categories, and the treatment of the nominalizing functional head \( n^0 \) as lacking a specifier and as a stative predicate, is especially suited to contribute to the discussion of nominalizations and gerunds in DM. First, consider a non-eventive nominal as in (1).

1. \( \text{The break} \) in the plastic is not too severe.

In DM, we assume that the DP \( \text{the break} \) is derived somehow from \( \sqrt{\text{BREAK}} \), especially since the meaning in (1) is compositional. The structure for \( \text{the break} \) is fairly simple, as in (2). Since the only functional heads present are \( n^0 \) and \( D^0 \), there is no room for an ‘internal’ argument of \( \sqrt{\text{BREAK}} \), and the stative meaning is clearly derived, as in (3).

(2) \[
\begin{array}{c}
\text{DP} \\
\text{D}^0 \\
\text{the} \\
\text{nP} \\
\text{n}^0 \\
\sqrt{\text{BREAK}}
\end{array}
\]
This analysis is generally in line with the analysis of ‘result nominals’, as discussed in Grimshaw (1990).

The nominal under discussion in (1) is different that an eventive nominalization like that in (4).

(4) the destruction of the barn

Here, the root has an internal argument, which signifies that a verbal projection is present (in the framework defined in this dissertation). Case is not licensed because $n^0$ requires a referential index supplied by $D^0$, and no Voice$^0$ is projected to license Case on the internal argument. Since Case is not licensed on the argument, we can assume that of is an element inserted for last-resort purposes in line with standard Minimalist reasoning. (Chomsky 1995; for more recent views on Last Resort, see Collins 2001 and Boščović 2011) The structure for (4) is given in (5).

Alternatively, if a genitive $D^0$ is selected, the internal argument may move to the specifier of $D^0$ for Case purposes, as in (5’).
In both cases, the root moves through $\nu^0$ to $n^0$. Since we have the eventive phrase inside of the stative nominal projection, the semantics yield the proper interpretation, namely a state that is an instance of a destroying event, where the city is the argument of the event, as derived in (6). This analysis aligns the syntax to the morphology as well, as in Harley (2009). This analysis is
compatible with the analysis of ‘event’ nominals (also called ‘process’ nominals) in Grimshaw (1990) and Harley (2009).

(6) 

<table>
<thead>
<tr>
<th>Translations</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. √BREAK ⇒ λE. break’(E)</td>
</tr>
<tr>
<td>b. n^0 ⇒ λs. state(s)</td>
</tr>
<tr>
<td>c. nP’ = a^0Σ √RED’</td>
</tr>
<tr>
<td>d. D_{the.sg}^0 ⇒ λP ∈D_{(s,s)}. θx. ∃s. [P(s) ∧ s ≅ x]</td>
</tr>
<tr>
<td>e. DP’ = D_{the.sg}^0(nP’)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interpretations</th>
</tr>
</thead>
<tbody>
<tr>
<td>f. [[[nP’]]]_{M,C,g} = λs. state(s) ∧ break’(s)</td>
</tr>
<tr>
<td>g. [[[DP’]]]_{M,C,g} = θx. ∃s. [state(s) ∧ break’(s) ∧ s ≅ x]</td>
</tr>
</tbody>
</table>

Crucially, in nominalizations like (4), an additional argument can be merged, but it is merged directly in the specifier of D^0, as in (7). In these constructions, no Voice^0 is present, since of must be inserted to check Case on the internal argument.

(7) 

\[
\begin{array}{c}
\text{DP} \\
\text{DP} \\
\text{John} \\
\text{D'} \\
\text{D}^0 \\
\text{nP} \\
\text{n^0} \\
\text{-ion} \\
\text{DP} \text{ the barn} \\
\text{of} \\
\text{v^0} \\
\text{vDESTR /destr-/} \\
\end{array}
\]
Now, let’s consider the structure for some gerunds. The $of_{ing}$ gerund is equivalent to a nominalization in (7). In fact, when a non-gerund nominalization is available for a given root, the $of_{ing}$ gerund is generally not available, as illustrated in (8).

(8) a. John’s destruction of the barn
b. *John’s destroying of the barn
c. John’s building of the barn

This can be interpreted as an instance where nominal morphology (a marked form) competes with the gerundive morphology (the unmarked, productive form) and the marked form blocks the unmarked for, as per the competition/blocking model familiar in the DM literature (Halle & Marantz 1993; Embick 2000; Embick & Marantz 2008). However, two other primary versions of gerunds are available in English, the poss$ing$ and acc$ing$ versions in (9).

(9) a. We remember John’s destroying the barn.
b. We remember John destroying the barn.

In both sentences in (9), the gerundive portion of the structure contains Voice$^0$ to check Case on the barn. In (9a), the DP John moves from the specifier of Voice$^0$ to the specifier of D$^0$ for case purposes, as in (10), while in (9b), and we must assume some type of left-adjunction of the DP John to the nominal head is necessary like in (11), perhaps as an edge effect and for Case purposes.  

\[73\]

\[73\] See Chomsky (1995) for the initial proposal that the Extended Projection Principle is an instantiation of an edge feature, forcing subjects to move to the specifier of T$^0$. See Boeckx (2010) for a current overview of the role of edges in Minimalism.
(10)

\[
\begin{align*}
\text{DP} &\quad \text{DP}_1 \quad \text{D'} \\
\text{nP} &\quad \text{D}^0 \quad \text{\textit{\text{'s}}} \\
\text{VoiceP} &\quad \text{n}^0 \\
\text{Voice'} &\quad \text{-ing} \\
\text{Voice}^0 &\quad \text{t}_1 \\
\text{vP} &\quad \text{Voice'} \\
\text{DP} &\quad \text{v'} \\
\text{vP} &\quad \text{v'} \\
\text{\textbf{REM}} &\quad \text{\textbf{RE}} \text{MEM} \\
\end{align*}
\]

\[
\begin{align*}
\text{DP} &\quad \text{DP}_1 \quad \text{D'} \\
\text{nP} &\quad \text{D}^0 \quad \text{\textit{\text{'s}}} \\
\text{VoiceP} &\quad \text{n}^0 \\
\text{Voice'} &\quad \text{-ing} \\
\text{Voice}^0 &\quad \text{t}_1 \\
\text{vP} &\quad \text{Voice'} \\
\text{DP} &\quad \text{v'} \\
\text{vP} &\quad \text{v'} \\
\text{\textbf{DESTROY}} &\quad \text{\textbf{destr}} \quad \text{-oy-} \\
\end{align*}
\]
I cannot pursue a full analysis of nominalizations and gerunds here, but I have indicated how the work presented in this dissertation can easily be expanded in order to account for the syntactico-semantic system of nominal structures, complementing other literature on the topic.

5.2 Conclusion

In this dissertation, my goal was to examine issues of the syntax-semantics interface within the framework of Distributed Morphology. First, I was interested in clarifying some issues that remain with the interpretation of the fundamental premises of DM. Namely, it has been assumed
that roots lack syntactico-semantic features, so we need to determine the precise syntax and semantics of roots and the surrounding category-determining functional heads. In this effort, I proposed the Strong DM Hypothesis (SDMH), which proposed that, since roots have no syntactico-semantic features, they cannot select arguments, and all argument projection is mediated through the lexical-category determining functional heads. I developed a system for lexical-category determining heads in DM that complies with the SDMH based on similar systems such as Baker (2003) and Hale & Keyser (2002). An understanding of this foundational structure was necessary before we could develop the corresponding interpretive semantic model.

In developing a semantic model for DM, I had to take a number of factors into considerations. I chose to use an event-based semantics, and I make an explicit distinction between events and states as semantic types. I also defined roots as of type \( \langle E, t \rangle \), where \( E \) is the logical type of eventualities, which is vague as to whether they are predicates of events or states. Events (and states) are tied to functional heads in the syntax, and how a root combines with the different functional heads gives us information about event structure and argument structure. The category-determining functional heads serve to define the syntactic structure surrounding the root (including the ability to project arguments), and the eventive/stative nature of the construction. And argument structure and event structure are thereby conveyed in the semantic representation.

In applying the syntactic framework and semantic model developed in Chapter 3 to additional data in Chapter 4, I focused on causative constructions, and more specifically, argument-structure alternations involving causation. In previous analyses of causatives (Krater 2004; Pylkkänen 2008; Folli & Harley 2005, 2006, 2007), the difference between stative and eventive complements of the causative head is implicitly assumed. I built on these analyses by
providing an explicit characterization of the syntax and semantics of the causative head, proposing that it can select either an eventive or a stative complement, and explaining exactly what happens in either case. This analysis of causative constructions leads us to straightforward accounts of a number of different phenomena involving causation, including resultatives, subject-consumption alternations in English and Italian, causatives of directed motion in English, and Japanese lexical and analytic causatives.

There are a number of areas where the formal systems developed in this dissertation could be applied to analyze important data. For example, the systems presented here would lend themselves well to the analysis of passives and participles, and the issue of Control in nominalizations, which has never been sufficiently addressed, may find a solution in the DM framework developed here.

In this dissertation, I focused on an explicit implementation of DM taking the SDMH into account. However, we could ask whether fundamental assumptions of DM like the SDMH are warranted. For example, we could ask whether the Root Hypothesis actually holds; given the fact that for a given language, some roots only surface as a specific lexical category (e.g., in English, many roots like big and tall are only realized as adjectives, and other roots like poodle and sausage only surface as nouns), we might propose that some roots have an underlying lexical category specification, while others are predisposed to a certain lexical category although they can be realized in a number of ways. We could also ask whether the SDMH is correct; alternatively, since roots are syntactic objects, we could investigate whether syntactic features like the subcategorization of arguments are needed for roots. We must ask these types of fundamental questions about the nature of DM if we are to seriously consider DM as a model of the architecture of the grammar.
References


http://semanticsarchive.net/Archive/GI5MmI0M/kratzer.building.statives.pdf

http://semanticsarchive.net/Archive/GY4ZThjZ/Building%20Resultatives.pdf


