

**ADVERB TYPOLOGY:
A COMPUTATIONAL CHARACTERIZATION**

by
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This dissertation has been a long time coming, but I know there's so much more I could (and perhaps even someday will!) say about adverbs. I want to acknowledge the smallness of my drop in the adverb pond, but I do hope it's a drop.

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ABSTRACT

This thesis identifies the possible grammatical positions for adverbs in multiple-adverb constructions. [Cinque \(1999\)](#) gives a cross-linguistic analysis involving numerous rigidly ordered adverb specifiers. It is shown that while many of the acceptable adverb orders in English are predicted by [Cinque \(1999\)](#), not all of them are. Some alternative orders, based on corpus data and large-scale acceptability judgments, are also grammatical. A new adverbial hierarchy with five distinct classes – a smaller number of classes than in [Cinque \(1999\)](#) – is introduced which allows for these constructions. Adverbs and adjectives are also shown to obey a cross-linguistic relativized minimality constraint on movement, originally proposed to apply to adverbs by [Li and Lin \(2012\)](#). Both the ordering restrictions explained by the reduced hierarchy and the movement restrictions explained by the minimality constraint can be implemented using Minimalist Grammars, an unambiguous formalism that is also compatible with semantic computations. Unlike adjective ordering ([Scontras et al., 2017](#)), adverb ordering is also shown not to be predictable based on a single factor like subjectivity. All together, the facts presented here indicate that while semantic factors impose additional constraints on adverb ordering, base-generated adverb placement in English can be explained by a five-level syntactic adverb hierarchy, based on five general semantic classes. The reduced adverb hierarchy is predicted to apply cross-linguistically as well.

Chapter 1

INTRODUCTION

1.1 Overview

The goal for this thesis is to precisely formalize all positions and operations available to multiple adverb combinations, as well as to draw parallels to the adjectival domain. In the past, much work has been done in attempts to formalize adverb hierarchies and syntactic positions (see [Cinque \(1999\)](#), [Alexiadou \(1997\)](#), and [Ernst \(2002\)](#)), as well as work to account for the availability of adverbs to undergo movement ([Li and Lin, 2012](#)) and gapping constructions ([Engels, 2012](#)). Comparisons to adjectives and PP adjuncts are frequent, as they share the common quirk of having a restricted ordering with respect to other elements of the same category, yet a relatively free and optional distribution in a sentence. Though the nature of the adverb itself is debated, it is generally believed to follow a systematic pattern that is parameterized cross-linguistically. For linguists to use adverbs as syntactic diagnostics, it is essential to be clear about exactly where adverbs may appear, and why. In computational terms, it is crucial to formalize the operations which adverbs may undergo, and in which environments. Despite the significant and influential body of work on adverbs (perhaps most notably that of [Cinque \(1999\)](#)), there is not yet a consensus in the field about the structure and distribution of adverbs cross-linguistically.

Perhaps because of a strong Indo-European focus, many self-contained analyses of adverbs in a language become untenable in the face of additional language data. As we synthesize analyses from [Cinque \(1999\)](#), [Ernst \(2002\)](#), and others, it becomes clear that none of these accounts for everything correctly. To do so requires a clear and precise account of the syntax, as well as an exact definition of the semantic properties

of each adverb class (as the category of ‘adverb’ itself is quite expansive). I adopt here the formalism of minimalist grammars (MGs) (in the vein of [Stabler and Keenan \(2003\)](#)) to be as clear as possible about the consistent syntactic properties of adverbs as a class. In addition to forcing clarity, MGs have the benefit of being a provably mildly context-sensitive grammar (MSCG) formalism, which is the appropriate level of complexity for syntax ([Joshi, 1985](#)). MGs also can be easily modified to include relevant semantic information in a single model ([Kobebe, 2006](#)).

One key point is that the ordering of adverbs does not fall out from either the syntax or semantics alone. A semantic argument may be appropriate to explain why sentences like “John quickly luckily ate the sandwich” are strange, since *luckily* is a speaker-oriented adverb, so it should have higher scope than an event-related adverb like *quickly*; but similarly it must be a feature of the syntax that something like “How skillfully did John occasionally cut the lawn?” (but not “How skillfully did John cut the lawn?”) is ungrammatical in one language (Spanish) and grammatical in another (English). Some ordering of adverb classes is necessary, since adverbs are cross-linguistically ordered with respect to each other. However, it makes sense for adverbs to be adjuncts, since even though they have internal ordering restrictions, they are very free within a sentence and allow for recursion, which are both properties of adjuncts. I propose that a combination of sorts involving elements of the analyses from both Cinque (the ordering) and Ernst (the adjunction) is possible to formalize using MGs, and is ultimately beneficial in its clarity.

The remainder of this chapter gives an introduction to prominent theories of adverbs, and will provide evidence that neither the Cinque-style functional hierarchy nor the Ernst-style sentence-final adjunction allows for a complete and accurate description of adverb facts. Instead, this thesis will present and argue for a reduced syntactic adverb hierarchy, with five ordered classes, which can explain the ordering facts for multiple-adverb constructions in English. Though this dissertation focuses on adverbs in the preverbal position, as this is most common, the hierarchy should apply to

adverbs anywhere in a sentence. The reduced syntactic hierarchy is encoded in a minimalist grammar formalism, which allows for a forced ordering in adjunction. Each class in this reduced hierarchy has consistent semantic properties, and although adjective classes are not isomorphic to adverb classes, this thesis will also show that adjectives and adverbs both obey the same constraint on movement (the Potential Moveability Condition (Li and Lin, 2012)), which indicates that adjectives and adverbs have more in common than previously known, despite their many differences.

1.2 Background

1.2.1 Cinque 1999

Perhaps the most well-known study of adverb position comes from Cinque (1999), a view of adverbs as an expansive detailed nesting of over 30 semantically-based and strictly ordered functional projections above vP, with adverbs located as specifiers of each projection, as shown in Figure 1.1 (split into two parts for readability). These projections are said to be always present, even when they are unfilled. Note that some adverbs, like *completely*, appear at two different levels in the hierarchy.

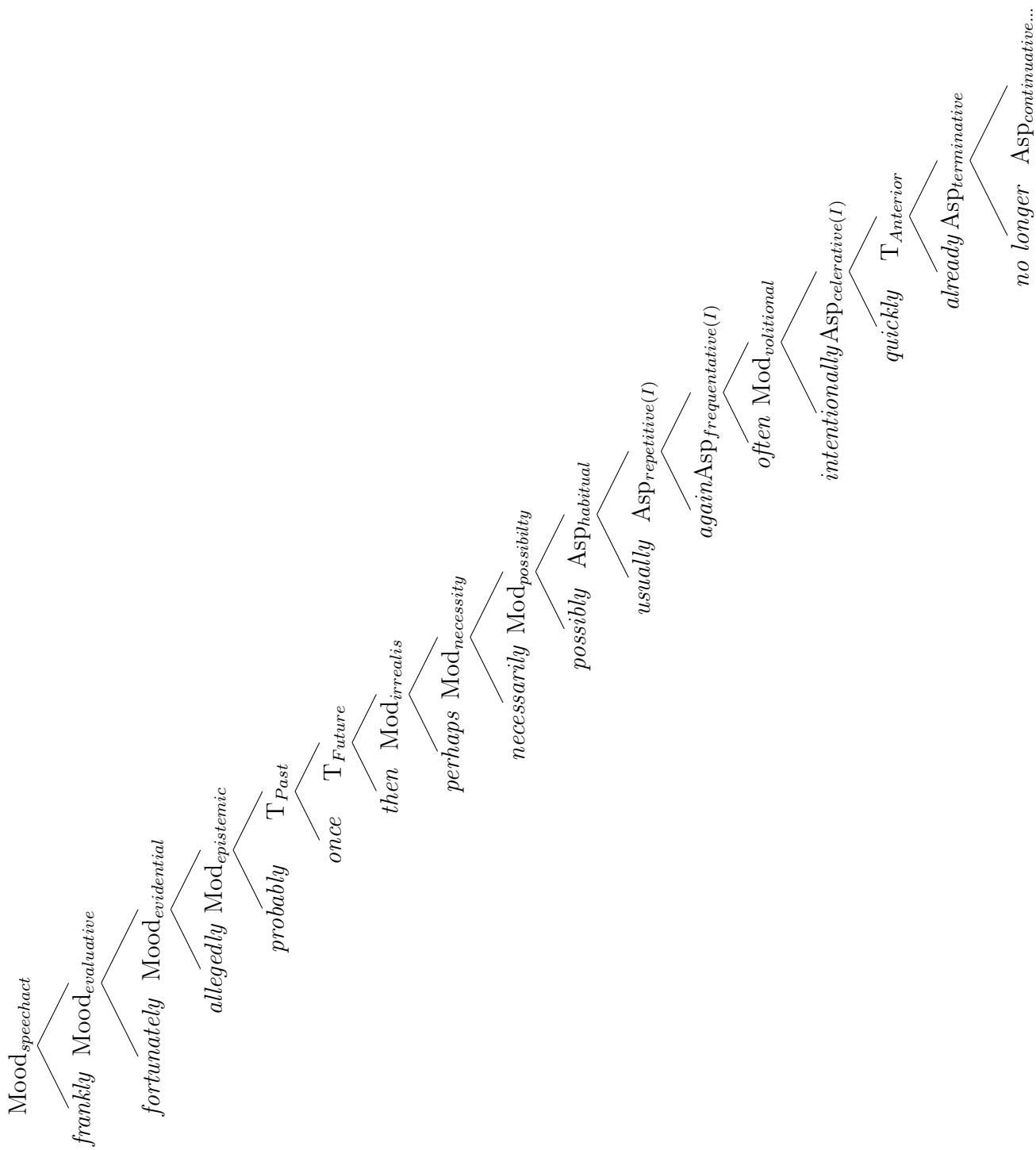


Figure 1.1: Adverb Specifier Hierarchy, pt1 (Cinque 1999:106, (92))



Figure 1.2: Adverb Specifier Hierarchy, pt2 (Cinque 1999:106, (92))

This ordering of projections is also stated by Cinque to be isomorphic to the ordering of verbal affixes in languages with extensive verbal morphology. Cinque’s analysis is useful in explaining the basic word order of multiple-adverb constructions allowed in many languages. However, it has been criticized for the uneconomical way in which it encodes an ordering which might instead be enforced by semantic constraints (Ernst, 2002). It has also been claimed (Ernst, 2002; Bobaljik, 1999) that several attested adverb orders seem to be possibilities not predicted by Cinque’s ordered system, as examples like (1) show.

- (1) George will have probably read the book.

In Cinque’s hierarchy, *probably* is an epistemic modal, and has only one base-generated position, which is higher than the auxiliaries and sentence subject. This means that both auxiliaries must raise over *probably* to generate the surface order in (1). Cinque states that (1) should be ungrammatical, since the movement of *have* crossing the trace of *will* or moving into its former position is a violation of the Head Movement Constraint. Cinque notes that if (1) is grammatical for some speakers (and, indeed, it is grammatical for most) then perhaps this is due to *probably* being a focusing adverb, thus directly attached to *read* (Cinque, 1999, p109), but he does not elaborate on this explanation or give a metric for when focusing adverbs might apply.

The analysis in Cinque (1999) is primarily focused on adverbs in the preverbal position (as is this dissertation), but he does discuss the three canonical positions for adverbs in English, which are the sentence initial position (2), the preverbal position (3), and the final position (4).

- (2) **Apparently** John wrote a letter.
 (3) John **apparently** wrote a letter.
 (4) John wrote a letter **quickly**.

Note that although single adverbs are relatively free, there are some positional restrictions. Adverbs like *apparently* which are ‘high’ in Cinque’s hierarchy, sometimes also called evaluative or sentence-level adverbs, cannot appear in sentence final position without comma intonation, as in (5).

- (5) *John wrote a letter **apparently**.

Comma intonation makes almost any adverb position acceptable, as seen in (6). I will assume that such adverbs introduced by comma intonation are parentheticals and are therefore outside the constituent structure of the sentence (as in McCawley (1982)).

- (6) John wrote a letter, **apparently**.

Positional restrictions can be used to disambiguate between two possible interpretations of an adverb. For instance, the adverb *cleverly* in (7) is ambiguous between a manner interpretation (meaning that the questions were answered in a clever way), or a subject-oriented interpretation (meaning that it was clever of John to answer their questions). However, (8) is restricted to the lower, manner interpretation, and (9) is restricted to the higher, subject-oriented interpretation.

- (7) John has **cleverly** answered their questions.
(8) John has answered their questions **cleverly**.
(9) **Cleverly** John has answered their questions. / John **cleverly** has answered their questions.

Cinque also notes that it is possible to force a manner reading¹ by adding another auxiliary, as in (10), though he claims that the manner reading is categorically different from the manner reading in (8).

¹ Judgments on whether this actually forces a manner reading vary.

(10) John has been **cleverly** answering their questions.

Cinque's evidence for distinct manner readings is twofold: first, he notes that there must be two distinct manner readings because both manner positions can be filled simultaneously, as in (11). The first instance is subject-oriented, and the second is a 'pure manner' reading.

(11) John has **cleverly** answered the questions **cleverly/stupidly**.

Secondly, he notes that the preverbal position can't satisfy verbal subcategorization requirements, as in (13).

(12) John has worded the letter **carefully**.

(13) *John has **carefully** worded the letter.

However, the meaning difference between the two proposed manner readings is not clear. Is it necessarily the case that there are two distinct classes of manner adverbs? (Ernst, 2002) provides another explanation for the two positions, noting that from a discourse perspective, preverbal position requires backgrounding, but when the verb makes no useful contribution without the adverb, the adverb must be foregrounded (and thus appear postverbally). For instance, in (13), *worded* is providing no real new information without *carefully*, and therefore *carefully* needs to appear in the prominent foregrounded position of (12).

Whether or not there is a meaning difference, it is true that most manner adverbs (*slowly*, *carefully*, etc) can appear preverbally or postverbally. However, this is not the case for manner adverbs which do not end in *-ly*.

(14) John played the piano (**hard/well/fast**).

(15) John (***hard**/***well**/***fast**) played the piano.

A similar morphological contrast exists also in other languages (for instance, Spanish non *-mente* adverbs like *rápido*, *bien*, *solo*). This might be derivable from the fact that many such non-*ly* adverbs are isomorphic to the adjectival form (*slow*, *fast*, *hard*), with the most common exception being ‘well’, as will be discussed further in §5.1.1. In the terms of [Cardinaletti and Starke \(1996\)](#), these adverbs are ‘morphologically deficient’, and [Ernst \(2003\)](#) states that such non-*ly* adverbs can be lexically marked as Lite adverbs, which forces them to the right of the verb. In this case, Lite adverbs are shorter than others, but this distinction refers not only to the length of the word, but correlates with other factors as well, like the degree of prosodic stress placed on the word (which is stronger for Lite adverbs). Note that this is a lexical contrast and not a syntactic one. Thus an adverb like *hard* has some lexically marked feature which forces it to appear sentence-finally, ruling out (15). Since only ‘low’ adverbs like some manner and frequency adverbs can appear post-verbally, the sentence-final position is roughly isomorphic to the lowest preverbal positions.

1.2.2 Semantic approaches

If we wish to eliminate the restrictive, predetermined syntactic adverb positions of Cinque, the most common alternative is something which treats adverbs as adjuncts, essentially unrestricted by syntax but with certain semantic constraints (and thus an ordering) which must be satisfied.

Some of the most influential work on adverb semantics comes from [Jackendoff \(1972\)](#) and [Ernst \(2003\)](#). Though the distributional analyses they espouse are partially syntactic, many of the core arguments given in their line of work are semantic.

Jackendoff notes that early generative grammar treated adverbs as a collection of unrelated elements, with no common underlying syntactic or semantic property. Contrary to this, he assumes that all adverbs have (roughly) the same syntax, and previous syntactic classes like ‘MannerAdv’ can be restated as semantic properties.

As a possible metric for distinguishing the classes of adverbs, Jackendoff considers which combination of three basic adverb positions (initial, final, or preverbal)

an adverb can appear in. Some adverbs, like *quickly*, *slowly*, *sadly*, *frequently*, *often*, and *soon* can appear in all three positions. Although *soon* is a non-ly adverb, it is remarkably free in its base position.

Adverbs like *evidently*, *probably*, *certainly*, *unfortunately* and *apparently* can appear in initial and preverbal positions, but not sentence-finally. These adverbs seem to be speaker or subject-oriented.

Adverbs like *easily*, *completely*, *totally*, *handily*, *badly* and *purposefully* can appear in preverbal and final positions, but not sentence-initially. Jackendoff notes that these adverbs do not have consistent adjectival paraphrases (though some do), citing, for instance, the awkward paraphrase of *Stanley ate his Wheaties completely* as *?The degree to which Stanley ate his Wheaties was complete*.

Adverbs like *hard*, *fast*, *more*, *less*, *early*, *home*, *well*, *terribly*, *slow* and *indoors*, which are generally non -ly adverbs, can appear only sentence-finally.

Finally, adverbs like *truly*, *simply*, *hardly*, *scarcely* and *virtually* can appear only preverbally. These adverbs also do not typically have adjectival paraphrases.

Semantic classes, on the other hand, have some overlap with the syntactic groupings listed. The first semantic group of adverbs described by Jackendoff is the speaker-oriented adverb, which he denotes with the semantic structure $\text{ADJ}(\text{SPEAKER}, f(\text{NP}^1, \dots \text{NP}^n))$, where ADJ is the semantic content of the adjectival counterpart of the adverb, and $f(\text{NP}^1, \dots \text{NP}^n)$ represents the relation between the verb and its subcategorized NP arguments. This semantics is available to adverbs in initial and preverbal position. For example, the speaker-oriented adverb *unfortunately* would have the structure $\text{UNFORTUNATE}(\text{SPEAKER}, f(\text{NP}^1, \dots \text{NP}^n))$.

The second group is the subject-oriented adverb, denoted by $\text{ADJ}(\text{NP}^i, f(\text{NP}^1, \dots \text{NP}^n))$, where $(1 \leq i \leq n)$. This denotation also applies to adverbs in initial and preverbal position. For instance, the subject-oriented adverb *quickly* has the denotation $\text{QUICK}(\text{NP}^i, f(\text{NP}^1, \dots \text{NP}^n))$.

The third group consists of manner, degree, and time adverbs. These are denoted by

$\left[\begin{array}{c} f \\ \text{ADV} \end{array} \right] (\text{NP}^1, \dots \text{NP}^n)$, which is meant to indicate that the Adverb interpretation is attached as an additional specification on the function, without changing the method of incorporation of the arguments. It applies in preverbal and final position. For instance, when used as a pure manner adverb, *quickly* is denoted by $\left[\begin{array}{c} f \\ \text{QUICKLY} \end{array} \right] (\text{NP}^1, \dots \text{NP}^n)$, meaning that the event happened quickly, but not that any of the participants themselves were necessarily ‘quick’.

The fourth group is the preverbal-only group. Jackendoff has no suggestion for a semantic structure for this class, but it applies only in preverbal position.

Ernst (2003) builds on Jackendoff’s work by proposing a semantic split which divides adverbs into those which can right-adjoin at the clausal level (i.e. appear in sentence final position with high scope) and those which cannot. One possible split he proposes is between predicational adverbs (which cannot) and functional adverbs (which can).

Predicational adverbs are claimed to have the following properties in English:

1. come from open classes
2. end in *-ly*
3. take a proposition, fact, or event as an argument
4. typically show a clausal/manner pattern of homonymous readings

To elaborate on the last point, these adverbs can generally appear in the configuration below.

(16) Frankly, they won’t speak to her. (clausal reading)

(17) They won’t speak to her frankly. (only manner reading)

Ernst notes that not every predicational adverb has this pattern of homonymous readings, since modal adverbs (like *probably*) are not allowed to take a manner reading and

so can't appear sentence-finally, and pure manner adverbs (like *loudly*) cannot take a clausal reading and so can't appear sentence-initially.

Functional adverbs, on the other hand, can always appear on the right with a clausal reading, and focus on things like frequency (e.g. *occasionally*), duration (*briefly*), and aspect (*already*).

In attempting to determine the core semantic characterization that can distinguish adverbs which can adjoin high on the right from those that can't, Ernst considers and rejects the following divisions: open vs. closed class, quantitative vs. qualitative, and gradable vs. nongradable. Ultimately, he decides on a notion of 'subjectivity', stating that the adverbs that cannot right-adjoin to higher, functional projections are exactly those which are "gradable adverbs on whose scale the members of its comparison class may be reranked according to the speaker's judgment of the context" (p 12), which turn out to be speaker and agent oriented adverbs, and manner adverbs. For instance, the manner adverb *energetically* can provide a scale of *energetic*-ness where different members could be ranked. So in the sentence *Caitlin energetically danced*, you can imagine that dancing energy will be ranked differently depending on if you are talking about a human child or an adult turtle. Ernst states that this lexical semantic property of subjectivity is an accurate predictor for the right-adjunction of adverbs to functional projections, since non-subjective adverbs like frequency, duration, aspectual, and mental-attitude adverbs are exactly those which can right-adjoin to a clause. However, it is not clear that the level of subjectivity of various adverbs is easily defined, as discussed in §4.3.

Engels (2012) makes the claim that because adverbs' positions are restricted relative to each other (as in (20)-(21)), but not independently (they can appear pre- or post-auxiliary, for instance), there must be semantic factors that control adverb distribution, thus arguing against a purely syntactic Cinque-style account.

(18) She (probably/wisely) has returned the money.

(19) She has (probably/wisely) returned the money.

(20) She probably has wisely returned the money.

(21) *She wisely has probably returned the money.²

Bruening (2010), following Baker (1991), suggests that the adverb orderings of (18) and (19) are not necessarily due to adverb movement or multiple adverb positions, but rather from an optional raising of the auxiliary *has*. Looking at the position of adverbs and auxiliaries with respect to negation, as in (22), indicates that since negation is presumed to initially be located above auxiliaries, it must be that the auxiliary ‘has’ is raised. Therefore we needn’t necessarily assume different base positions for the adverbs in the preverbal zone, regardless of their distribution among auxiliaries.

(22) She has probably not returned the money.

While the data in (18)-(21) indicate that a Cinque-style syntactic model is not the best account, it might still be that the syntactic ranking of adverbs proposed by Cinque could be restated as some semantic adverb hierarchy which restricts adverbs’ positions.

Ernst presumes that different classes of adverbs (evaluative, epistemic, frequency, etc) select for different types of arguments (facts, propositions, events, etc). When an adverb modifies an argument that it does not select for, there is a scope mismatch, and therefore ungrammaticality. This accounts for the ungrammaticality of (21), for instance, since *wisely* is a subject-oriented adverb, selecting for an event, but *probably* is a speaker-oriented epistemic modal, selecting for a proposition, which takes scope over lower adverbs like *wisely*. *Probably* is already making use of the speaker’s opinion, which requires a high attachment to the entire proposition, but *wisely* is referring only to the subject’s behavior, and not the speaker. Having both adverbs in the wrong order interferes with this scope-taking.

² Judgments on these sentences’ acceptability, as well as adverb ordering judgments in general, are quite variable from speaker to speaker, an issue which is discussed in §2. However, the judgments in (18)-(21) are given multiple times in the literature, in Ernst (2002); Cinque (1999); Engels (2012) among others. Whether or not (21) is acceptable is less important than the fact that it is *less* acceptable than (20).

In addition to the purely semantic machinery of this approach, though, some syntactic machinery is needed, too. While adverbs do seem to have a universal relative ordering which could be explained via either syntax or semantics, there are additional syntactic constraints on adverbs which seem to require a syntactic encoding of adverb type (like *wh*-movement; see §3.2.1). So, while it may be accurate for explaining adverb order in declarative sentences, semantic classes can be only one piece of the puzzle.

Engels uses an optimality theoretic account of adverbs to explain their distribution cross-linguistically, relying primarily on syntactic constraints from Grimshaw (1997) such as *STAY* (“Trace is not allowed”) and *SUBJECT* (“The highest A-specifier is structurally realised”). While this account provides for an integrated approach to the grammar, the constraints themselves are rather stipulative, and within each language, multiple constraint orderings are required. Given concerns about the overgeneration of optimality theory in general (McCarthy, 2011; Gerdemann and Hulden, 2012), the MG approach proposed here will allow for an explanation of adverb distribution which is more restricted and still accurate.

1.2.3 Minimalist grammars

Graf (2013b) discusses adjuncts as being defined by their optionality and iterability, and although this description is not intended uniquely for adverbs, it works well for them.

It’s true that adverbs are categorically syntactically optional (with the few exceptions of those that are selected for), with no defined upper limit, as in (23):

- (23) She (honestly) (probably) (carefully) returned the money.

Graf (2014) models adjuncts using the formalism of minimalist grammars (MGs). An MG consists of a set of lexical items with ordered lists of features, as well as the minimalist operations *Merge* and *Move*, applied when matching features combine. This has the benefit of being maximally explicit about when and why derivations occur.

MGs were developed in part to provide a formalization of Chomsky’s Minimalist Program (Chomsky, 1995). A minimalist grammar can be defined in the following way, based on Stabler and Keenan (2003):

Definition: A minimalist grammar is a five-tuple $G = \langle \Sigma, sel, lic, lex, M \rangle$, such that Σ is some finite alphabet, sel is the set of selectional features, and lic is the set of licensing features. Together sel and lic determine Syn , the set of syntactic features, which is the union of the following, where ‘=’ means ‘selects for’:

selectors = $\{= f | f \in sel\}$

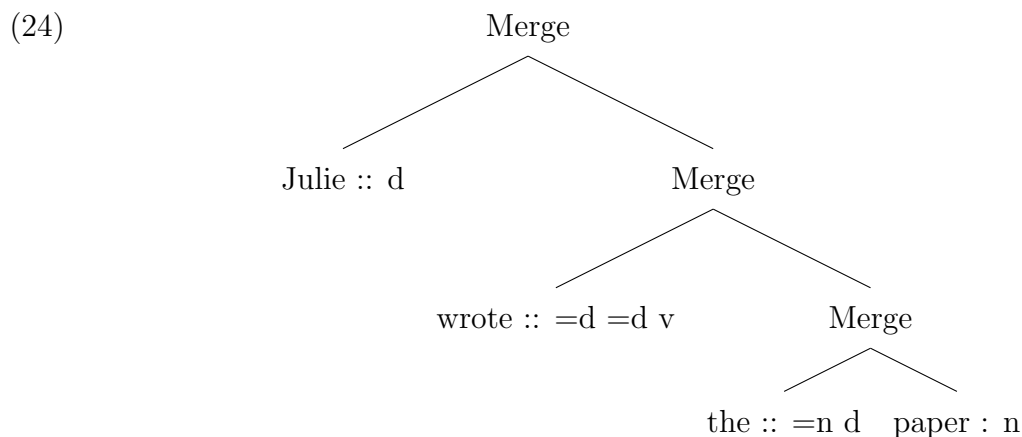
selectees = $\{f | f \in sel\}$

licensors = $\{+f | f \in lic\}$

licensees = $\{-f | f \in lic\}$

Lex , the lexicon, is a subset of $\Sigma \times Syn^*$ (where $*$ is the Kleene star, representing any possible concatenation of elements of, in this case, Syn), and M represents the operations Merge and Move.

See (24) for an example of Merging matched features in a simple sentence (where ‘d’ represents determiners, ‘n’ nouns, ‘v’ verbs).



If, in this system, adjuncts are treated as lexical items with identical features to whatever they are merging to, their optionality and iterability is captured. However, this also does not allow for any type of ordering, the likes of which we see within the adverb

class. Graf discusses some ways to accommodate this, the most restrictive of which is based on Fowlie (2014)’s strategy of inserting adjuncts freely into the derivation, and requiring some relation \mathcal{R} over category features which determines whether an adjunct may be inserted felicitously.

Under this approach, Fowlie describes a new method for Minimalist Grammars with Adjunction (MGA), wherein a new Adjoin operation is included in M . This operation allows for the tracking of where adjuncts are added in a derivation, and prevents illicit orderings via the required ordering relation \mathcal{R} .

Adjoin works with lexically defined triples; when an adjunct $[Y, n, m]$ adjoins to $[X, i, j]$, the resulting phrase is of category $[X, i, n]$, so long as $n > j$. For example, the phrase *big bad wolf* is allowed because *bad* $[\text{Adj}, 4, 0]$ adjoining to *wolf* $[\text{N}, 0, 0]$ yields $[\text{N}, 0, 4]$, since $4 > 0$, and *big* $[\text{Adj}, 6, 0]$ adjoining to *bad wolf* yields $[\text{N}, 0, 6]$, since $6 > 4$. *Bad big wolf*, on the other hand, fails because adjoining *bad* $[\text{Adj}, 4, 0]$ to *big wolf* $[\text{N}, 0, 6]$ is not allowed.

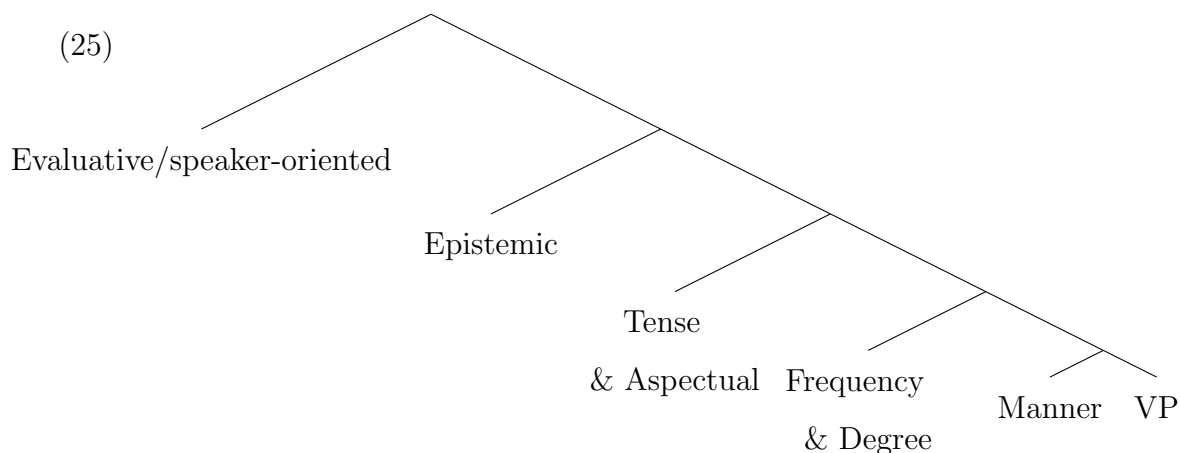
Adger (2010) presents a similar feature-based approach to the ordering of verbal projections like T and PerfP, but these projections are merged rather than adjoined. However, adverbs have a much freer distribution in the clause, so an operation that captures this seems necessary.

Though it does require the addition of a third Adjoin operation, the MG approach works very well in accounting for both the optionality of adverbs and the ordering requirement, though the ordering relation does need to be stipulated. It is somewhat mysterious why there are classes of adverbs that require an ordering relation at all, since adverbs aren’t especially ambiguous between classes. However, if we adapt the minimalist grammar formalism, partitioning adverbs into distinct classes might happen because of a pressure to keep grammars small. The same could also be said for adjectives (see §5). MGA is an appealing approach which allows for free adjunction, as long as the ordering relation is clearly defined (which is not trivial; see §2). It combines the intuitions of Cinque’s expanded hierarchy without explicitly encoding several levels of null structure, due to the lexicalized nature of MGs. It also allows for

non-adjunction operations to be encoded just as explicitly via Merge.

1.3 Adverb Classes that Count: Proposing a New Hierarchy

In addition to Cinque’s adverbial hierarchy, many other classes or groupings for adverbs have been posited, as detailed in this chapter. Although Cinque’s hierarchy at face-value is apparently too strict or too fine-grained for English adverbs, there are still some crucial orderings which need to be stated. To account for these orderings, I propose a reduced adverb hierarchy, consisting of only the classes of adverbs shown in (25). These classes are based on commonly cited semantic categories, which, it turns out, also pattern together syntactically.



Evaluative/speaker-oriented adverbs include words like *apparently* and *frankly*. Epistemic adverbs include *probably* and *perhaps*. Tense & Aspectual adverbs include *already*, *no longer*, *still*, *almost* and *once*. Frequency & Degree adverbs include *always*, *never*, *rarely*, *actually*, *really* and *very*. Manner adverbs include *neatly* and *quickly*.

Why these classifications, rather than all of the ones used by (Cinque, 1999)? Apart from the fact that they match speaker judgements more closely (as will be shown in §2), and that having fewer classes is preferable to having more classes, certain processes involving adverbs seem to be sensitive to partitions in the above hierarchy. These processes include wh-questions (§3.2.1), focus constructions (§3.2.3) and conjunction (§4.2.4).

1.4 Organization

This thesis is structured as follows. Chapter 2 justifies the necessary distinct **syntactic** adverb classes for English declaratives proposed in 1.3, based on evidence from corpus studies and native speaker judgments. This chapter also discusses other potential adverb hierarchies. Chapter 3 discusses how to encode the reduced hierarchy syntactically using minimalist grammars, as well as the restrictions for adverbs in movement constructions. Chapter 4 describes the semantic constraints on some adverb combinations, as well as semantic interpretations for each of the classes in the adverbial hierarchy proposed in §2. Chapter 5 compares adverbs to their adjectival counterparts, noting that the reasoning for a universal adjective hierarchy does not translate to an adverbial one, though manner adverbs and adjectives have similar semantic properties. The fact that adjectives, like adverbs, obey the same minimality constraint on movement is also discussed, which is a novel result. Chapter 6 concludes with some future directions.

Chapter 2

EVIDENCE FOR A REDUCED HIERARCHY

This chapter presents various evidence for the proposed reduced hierarchy of 1.3, restated below.

- (1) Evaluative/speaker-oriented (e.g. *apparently*) > Epistemic (e.g. *probably, perhaps*) > Tense (e.g. *once*) & Aspectual (e.g. *already, no longer, still, almost*) > Frequency (*always, never, rarely*) & Degree (e.g. *actually, really, very*) > Manner (*neatly, quickly*)

In 2.1, corpus examples of orders contra Cinque’s hierarchy are presented. In 2.2 the adverb order in 1.3 is tested using Amazon Mechanical Turk judgments. 2.3 presents some cross-linguistic evidence for adverb ordering restrictions. 2.4 compares the reduced hierarchy to Jackendoff-style semantic hierarchies, and considers some alternate formulations for adverb hierarchies.

2.1 Corpus Evidence

(Cinque, 1999) provides an excellent benchmark for the supposedly universal adverb ordering framework. However, given the basic schema he presents (shown in Figure 1.1), there are some ordering combinations which do not sound completely natural which are predicted to be allowed, and perhaps more difficult to explain, there are also combinations predicted to be unacceptable which seem to be allowed. For example, *Hannah briefly intentionally misled everyone* is generally accepted, even though *briefly* is lower in Cinque’s hierarchy than *intentionally*, and therefore should come after it in a sentence.

Note that while Cinque does not discuss manner adverbs in depth, he assumes that they are located in the specifier of VoiceP, as indicated by ‘well’ in 1.1.

2.1.1 Corpus data

One approach for gathering data on the usage of adverb combinations in English is to see which adverbs are actually produced together in a corpus. Unfortunately, combinations of multiple adverbs are relatively rare in natural speech, especially with more than two adverbs in a single sentence. Nevertheless, a look at the Corpus of Contemporary American English (COCA) reveals that the data are messier than a purely straightforward Cinque-style analysis would predict. Some expected orderings (like *frankly fortunately*) are never found, and some unexpected orderings are (see Table 2.1). Since the overall counts of multiple adverb sentences are relatively small, it is not surprising that some expected orders do not appear in the corpus (although it may also be that they are ruled out based on semantic factors; see §3 for more on this point). The appearance of unexpected orders is in need of some explanation, though, and although Cinque (1999) does provide several potential explanations for apparent counterexamples to the hierarchy, even taking these into account, some instances of unexpected orderings remain.

One common source for unexpected orderings comes in the form of ‘comma intonation’, also known as appositions or parentheticals. An example of this is found in (2), which if read without the comma intonation is indeed ungrammatical. In written text these sentences typically contain commas or parentheses.

- (2) Jerri always, frankly, overcooks the tortillas.

The counterexamples shown in Table 2.1, however, do not appear to be of this type. Another possible source for counterexamples is in the case of movement, as in focus constructions or in *wh*-questions. Movement seems to follow a different set of rules for adverb ordering, as discussed in §2.3. For instance, (3) is grammatical, though (4) is less so, suggesting that the movement of a lower adverb over a higher one can

result in an unexpected surface order. Again, the counterexamples from the corpus do not appear to be of this type. They are all declarative constructions, though it is possible there are cases of focus movement which were not indicated in the text by any particular emphasis, as in the modification cases discussed in the following paragraph.

- (3) How quickly does Nick usually build a new chair?
- (4) *Nick quickly usually builds a new chair.

Finally, and perhaps most difficult to diagnose, counterexamples can also come from cases of a lower adverb directly modifying a higher one. In such cases, no intervening material is allowed, and the semantic interpretation is different from a non-modification case. [Rooth \(1985\)](#) states that focus-sensitive adverbs (like *only*) can attach to their associated focused element, which is likely the reason for most adverbial modification. (5) is an example of such clustering. In this case, *only* could theoretically modify the whole sentence ('It was only smuggling food into the camp that Kel did, he didn't smuggle anything else in') or just the adverb *rarely* ('It was only on rare occasions that Kel smuggled food into the camp'). The former is semantically possible, but the latter reading is more salient.

- (5) Kel only rarely smuggled food into the camp.

Keeping these factors in mind, COCA contains the preverbal adverb sequences in Table 2.1 which are 'out-of-order' per Cinque's hierarchy. None of them look to be obvious examples of comma intonation, adverb movement, or adverb clustering, so their appearance is unexpected given [Cinque \(1999\)](#).

Ordered adverb pair	Example
probably allegedly	<i>But, I mean, 20-month-old children stick everything in their mouths as they go around the house. That's the phase and the stage that they're in. And this child probably allegedly saw some [meth] lying around and stuck it in his mouth.</i>
once allegedly	<i>WITHOUT FIRST CONSULTING ME, Deck sneaks his phone from the office and takes it to Butch, then together they take it to an acquaintance who once allegedly worked for some branch of the military.</i>
just allegedly	<i>I didn't understand why she was thinking like that when the-when our kids had just allegedly got carjacked.</i>
once probably	<i>The soffit had always been bricked in and had once probably been decorated with polychrome marble, long since disappeared.</i>
already probably	<i>You've already probably got the once-in-a-lifetime jitters every bride endures.</i>
no longer probably	<i>[They are] building up this crisis over an Agriculture Ministry building, where the documents no longer probably exist.</i>
still probably	<i>We still probably need that charismatic leader to come along.</i>
always probably	<i>I think he's always probably had a love of the outdoors.</i>
soon probably	<i>In fact, she really didn't know anything about it, which we will soon probably know more about.</i>
already once	<i>Roberts landed a spot at Calvert Hall College High School, a Baltimore boys' school that had already once refused him.</i>
always then	<i>I think the defense always wants to separate the two out because they can always then use the empty chair and say it was the other guy.</i>
already perhaps	<i>So if you think of the economy as already perhaps moving into a recession, then add to that the effect of these oil price increases, and the effect on consumer confidence, sure, it can well have the effect of giving us a mild recession.</i>
still perhaps	<i>Pascual opened his mouth to say he was sorry, to say it while Aranead could still perhaps hear.</i>
always perhaps	<i>Though, of course, we'll always perhaps try to send some embedded reporters, like we had during the war.</i>
always usually	<i>And we always usually watch the weather channel but today we didn't watch it.</i>
already quickly	<i>Senators had already quickly confirmed two other nominations.</i>
almost still	<i>In complex designs it almost still is impossible to predict all the possible interactions of even well-known physical laws.</i>
almost just	<i>This set had almost just killed you.</i>

Table 2.1: Unexpected orderings found in the Corpus of Colloquial American English (COCA)

2.2 Judgment Evidence

Although it has been shown that native speaker judgments are generally as reliable as experimental or larger-scale judgments (Sprouse and Almeida, 2012), sentences with multiple adverbs, especially consecutive adverbs, are often judged to be marginal. Comparing marginal sentences to other marginal sentences can still reveal useful information about the grammar, but the fact is that different theories of adverb ordering typically rely on different speaker judgments. Cinque’s work is criticized not for its theoretical basis (that is, his concept of comparing verbal morphology ordering to adverb ordering is rarely questioned), but for its failure to align with researchers’ own native speaker intuitions. For instance, the ordering between the two antonyms *no longer* > *still* is included in Cinque’s hierarchy because he finds the stated order to be more grammatical than the inverse. In a review of Cinque (1999), Manninen (2005) questions such a judgment, wondering why the two cannot be collapsed into a single category, since the two adverbs seem to have paralleling opposite semantics.

Since the analysis here also relies on disagreement with previously published judgments of others, and since there is not yet a clear universal consensus for which orderings are indeed grammatical (or even which orderings are better than others) in English, it seems prudent to corroborate my own judgments with additional data.

Using Amazon Mechanical Turk (AMT), it is possible to sample a number of native speakers to get their judgments about the acceptability of various adverb ordering combinations. Amazon Mechanical Turk is an automated way to collect survey data remotely, which has been shown to be equally rigorous as laboratory data (Sprouse, 2011; Gibson et al., 2011) and also allows for more diverse participants than testing local college students (Erlewine and Kotek, 2015). Using the unexpected pairs from COCA along with their counterparts in the expected order, we obtain the results shown in Table 2.2, where the unexpected orderings are listed above their Cinque-expected

counterparts. Subjects were restricted to those with IP addresses in the United States, and all reported English as their native language. A power analysis for desired $p=.05$ indicated that 40 subjects would be sufficient to show an effect, so 40 subjects were recruited and paid \$1.00 for participating. Two subjects were discarded for giving every sentence (including fillers) a rating of 1. Each rated basic S (ADV ADV) V O sentences (e.g. ‘John ADV ADV eats dinner’) on a 1-7 grammaticality scale. This is a common scale for linguistic judgments, and it has been shown to be equally as informative as magnitude estimation tasks ([Weskott and Fanselow, 2011](#)). Sentences were constructed so that the most obvious reading would be an [Adv[Adv V]] interpretation and not an [[Adv Adv]V] one, but it is possible that some subjects may have interpreted some adverbs as adverbial modifiers regardless. All test items were required, so each subject rated every sentence. The particular test items used are listed in [A.1](#).

Order	Score (1-7)	St. Dev.
probably allegedly	2.88	1.20
allegedly probably	3.19	1.36
once allegedly	4.14	1.62
allegedly once	4.81 (p=.005)	1.78
just allegedly	5.14	1.53
allegedly just	5.57	1.16
once probably	4.19	1.57
probably once	5.00 (p=.035)	1.58
already probably	3.71	1.59
probably already	5.29 (p=.001)	1.52
no longer probably	3.19	1.63
probably no longer	5.48 (p=.001)	1.50
still probably	5.00	1.61
probably still	5.81 (p=.05)	1.44
always probably	3.14	1.74
probably always	4.76 (p=.01)	1.70
soon probably	4.01	1.84
probably soon	4.67 (p=.05)	1.74
already once	4.04 (p=.01)	1.77
once already	3.02	1.48
always then	2.46	1.29
then always	3.35 (p=.01)	1.60
already perhaps	3.38	1.56
perhaps already	4.48 (p=.001)	1.50
still perhaps	3.67	1.80
perhaps still	5.19 (p=.001)	1.54
always perhaps	2.95	1.40
perhaps always	3.43 (p=.05)	1.75
always usually	2.67	1.53
usually always	4.33 (p=.001)	2.06
already quickly	3.77 (p=.01)	1.40
quickly already	2.95	1.28
almost still	3.38	1.66
still almost	3.67	1.62
almost just	4.38	1.69
just almost	4.00	1.84

Table 2.2: Acceptability scores for base adverb pairs

For reference, grammatical fillers (with just one adverb, e.g. ‘John carefully did his homework’) had an average rating of 6.66, and ungrammatical fillers (with tense

or agreement errors, e.g. ‘Max do his homework.’) had an average rating of 1.22. All of the adverb pairs tested fall between 2.46 and 5.81, indicating that no matter the order, two consecutive adverbs in this position are somewhat degraded. However, none of them were as ungrammatical as the clear ungrammatical items with elements like tense or number mismatches. This is not surprising, but it makes apparent the reason for the difficulty in obtaining definitive judgments on multiple adverbs in the literature – the judgments are generally unclear across the board.¹ Even in non-AMT settings, speakers generally prefer a sentence with fewer adverbs to a sentence with more adverbs. When I talk about grammaticality of adverb orderings, then, I do so in a strictly comparative sense: which orders are significantly *more* grammatical than others, on average? I do not intend to make any claim about the nature of grammaticality in general, or to propose an arbitrary grammaticality cutoff like 4/7, so all adverb grammaticality rankings should be considered only with respect to each other.

As for the predictions of Cinque’s hierarchy, on average the rating for all of his expected orderings was 4.39, and the rating for all unexpected orderings was 3.67. The average expected order ranking is significantly higher than the average unexpected order ranking ($p < .045$, per a one-tailed t-test on the averages). Overall this is a good result, ignoring the question of ‘are any of these items in the 3-5 range really fully grammatical?’, since it shows there is some baseline distinction between what Cinque’s universal hierarchy predicts and those orders which subvert the hierarchy. However, it is notable that the rating for a predicted grammatical ordering for each pair of orderings is **not** always significantly higher than the predicted ungrammatical counterpart. Six pairs in 2.2 do not attain significance for a preferred ordering, and two (*already once*, *already quickly*) are actually significantly less preferred than Cinque’s

¹ Readers of this thesis may also disagree with one or more of the judgments presented throughout, especially with different ameliorating contexts. All of the English language judgments I use, if not tested on AMT, have been checked with at least three other native speakers – but I know that in many cases, some readers will still disagree with some data. This speaks to the importance of checking judgments in corpuses or in a more methodical way.

expected orderings (*once already, quickly already*).

The reduced hierarchy, initially created by grouping broad pre-existing semantic classes, matches the AMT scores more closely than does the complete Cinque hierarchy, since all the orders predicted to be ungrammatical by the reduced hierarchy get lower scores than their reverse order counterparts, and it also corroborates the corpus data from §2.1.1 by collapsing many of Cinque’s functional heads into the same class which can be freely interleaved. If we take this simplified hierarchy as given, then it predicts the orderings in 2.3 to be grammatical or ungrammatical (note that most are in fact predicted to be grammatical). Stars next to the ungrammatical pairs indicate they were rated significantly lower than the grammatical pair.

Grammatical		Ungrammatical	
allegedly probably	3.19		
probably allegedly	2.88		
allegedly once	4.81	*once allegedly	4.14
allegedly just	5.57	just allegedly	5.14
probably once	5.00	*once probably	4.19
probably already	5.29	*already probably	3.71
probably no longer	5.48	*no longer probably	3.19
probably still	5.81	*still probably	5.00
probably always	4.76	*always probably	3.14
probably soon	4.67	*soon probably	4.01
already once	*4.04		
once already	3.02		
then always	3.35	*always then	2.46
perhaps already	4.48	*already perhaps	3.38
perhaps still	5.19	*still perhaps	3.67
perhaps always	3.43	*always perhaps	2.95
always usually	*2.67		
usually always	4.33		
already quickly	3.77	*quickly already	2.95
almost still	3.38		
still almost	3.67		
almost just	4.38		
just almost	4.00		
average score	4.20		3.75

Table 2.3: Simplified Hierarchy Predictions (with scores)

According to the predictions of this simplified hierarchy, grammatical orderings

get an average score of 4.20 and ungrammatical ones an average score of 3.75. Indeed, this is not strikingly different from the averages yielded by the predictions of the Cinque hierarchy, and in fact the difference between the two categories is slightly less. But if the two possible orderings in a pair of adverbs are compared, the simplified hierarchy ungrammatical orderings always have a lower score, which is not strictly true of the predictions in Table 2.2. Furthermore, there is only one predicted ungrammatical ordering in the simplified hierarchy which does not come out as significantly worse than the grammatical ordering, and there are likely additional considerations which can account for this anomalous result, as discussed in 2.2.1.3.

Why then are some of the predicted grammatical sentences scored so low? After all, it might be expected that grammatical orderings would score at least a 4 or 5, if not higher. It is hard to justify any sentence scoring between 2-3 out of 7 to be grammatical, though added context or intonation might help raise their score (since examples of each were found in an English corpus). Cases like these will be investigated more thoroughly in §2.1.4 below, but note that many of them are a semantic mismatch – *always usually* and *usually always* being a prime example. If *always* and *usually* are both frequency adverbs, it makes sense that their combination would be degraded, since multiple adverbs of the same type often are. Although *usually always* is scored significantly higher, it isn't especially high scoring, and the difference can be explained semantically – *usually* can modify *always*, giving the sense that USUALLY John always eats dinner, but in some cases he may not, whereas for *always* to modify *usually* would mean that John ALWAYS usually eats dinner, where the addition of *always* is semantically vacuous, since 'John usually eats dinner' would have the same meaning. This is similar to the semantic restriction on combining entailed modal adverbs, discussed in §4.2.3.

Similarly, a sentence that might seem contradictory, like 'John always never eats dinner', is interpreted as 'It is always the case that John never eats dinner', and NOT 'John always eats dinner and John never eats dinner'. This may account for its mild acceptability.

2.2.1 Adverb pair comparisons

This section investigates the rankings for each pairwise comparison of adverb orders individually, in more detail. In each case, an additional two-alternative forced-choice (2AFC) task was performed on AMT to determine if there is a strong preference for one ordering over another, using 40 subjects and the same experimental setup as before, with the two alternatives presented in a random order. The question order was also randomized. Subjects were asked to choose “Which sounds most natural?” between the two adverb orders.

2.2.1.1 Allegedly probably

Per [Cinque \(1999\)](#), *allegedly probably* should be the only grammatical order, and *probably allegedly* should be ungrammatical. Subjects rated *allegedly probably* a 3.19, and the opposite order a 2.88, which was not significantly different ($p > .05$). The simplified adverb hierarchy correctly predicts that both are epistemic adverbs and so both orders are equally grammatical. The forced-choice data also showed no significant preference in a one-tailed t-test, with 47.5 percent of participants choosing the *probably allegedly* order, and 52.5 percent choosing the *allegedly probably* order. This result is contra Cinque’s prediction and in favor of the simplified hierarchy.

2.2.1.2 Allegedly once

In this case, the simplified hierarchy and [Cinque \(1999\)](#) make the same prediction: *allegedly once* should be the only grammatical order, and *once allegedly* should be ungrammatical. Both are correct, as subjects rated *allegedly once* a 4.81, and the opposite order a 4.14, which was significantly different in the expected direction ($p < .05$). The forced-choice data also showed a significant preference, with 75 percent of participants choosing the *allegedly once* order. Although examples of the ‘once allegedly’ order are attested in COCA, the data here do indicate a preference for the opposite order, showing the need for relative grammaticality or acceptability when dealing with adverb hierarchies.

2.2.1.3 Allegedly just

Here too, the simplified hierarchy and Cinque (1999) make the same prediction: *allegedly just* should be the only grammatical order, and *just allegedly* should be ungrammatical. Subjects rated *allegedly just* a 5.57, and the opposite order a 5.14, which was not enough to achieve significance, though perhaps with a larger sample size it could be. However, the forced-choice data did show a significant preference, with 80 percent of participants choosing the *allegedly just* order. Worthy of note here is that although ‘just’ could also be interpreted as a manner adverb meaning something akin to ‘only’, both hierarchies place manner adverbs below the epistemic adverb ‘allegedly’, so this does not interfere with the predictions made.

2.2.1.4 Probably once

Again, the simplified hierarchy and Cinque (1999) make the same prediction: *probably once* should be the only grammatical order, and *once probably* should be ungrammatical. Both are correct, as subjects rated *probably once* a 5.00, and the opposite order a 4.19, which was significantly different in the expected direction. The forced-choice data also showed a significant preference, with 95 percent of participants choosing the *probably once* order.

2.2.1.5 Probably already

The simplified hierarchy and Cinque (1999) make the same prediction: *probably already* should be the only grammatical order, and *already probably* should be ungrammatical. Both are correct by a large margin, with subjects rating *probably already* a 5.29, and the opposite order a 3.71, which was significantly different in the expected direction. The forced-choice data also showed a significant preference, with 95 percent of participants choosing the *probably already* order.

2.2.1.6 Probably no longer

The simplified hierarchy and Cinque (1999) make the same prediction: *probably no longer* should be the only grammatical order, and *no longer probably* should be

ungrammatical. Both are correct again by a large margin, with subjects rating *probably already* a 5.48, and the opposite order a 3.19, which was significantly different in the expected direction. The forced-choice data also showed a significant preference, with 90 percent of participants choosing the *probably no longer* order.

2.2.1.7 Probably still

The simplified hierarchy and Cinque (1999) make the same prediction: *probably still* should be the only grammatical order, and *still probably* should be ungrammatical. Both are correct, with subjects rating *probably still* a 5.81, and the opposite order a 5, which was significantly different in the expected direction. The forced-choice data also showed a significant preference, with 95 percent of participants choosing the *probably still* order.

2.2.1.8 Probably always

The simplified hierarchy and Cinque (1999) make the same prediction: *probably always* should be the only grammatical order, and *always probably* should be ungrammatical. Both are correct, with subjects rating *probably always* a 4.67, and the opposite order a 4.01, which was significantly different in the expected direction. The forced-choice data also showed a significant preference, with 90 percent of participants choosing the *probably always* order.

2.2.1.9 Probably soon

The simplified hierarchy and Cinque (1999) make the same prediction: *probably soon* should be the only grammatical order, and *soon probably* should be ungrammatical. Both are correct, with subjects rating *probably soon* a 4.76, and the opposite order a 3.14, which was significantly different in the expected direction. The forced-choice data also showed a significant preference, with 65 percent of participants choosing the *probably soon* order.

2.2.1.10 Already once

The simplified hierarchy and Cinque (1999) make different predictions in this case: according to Cinque, *once already* should be the only grammatical order, and *already once* should be ungrammatical. The simplified hierarchy considers them both to be tense/aspectual adverbs and therefore the orders should be equally good. In this case, judgments go against Cinque's prediction, with subjects rating *already once* a 4.04, and the opposite order a 3.02, which was significantly lower. The forced-choice data also showed a significant preference, with 90 percent of participants choosing the *already once* order. Though the simplified hierarchy does not predict this result, at least it does not predict the opposite result, either. The preference for *already* > *once* may be due to subjects interpreting 'once' as a frequency adverb (*He did this once, not twice*) rather than a tense adverb (*Once, I was a young man*).

2.2.1.11 Then always

The simplified hierarchy and Cinque (1999) make identical predictions: *then always* should be the only grammatical order, and *always then* should be ungrammatical. Both are correct, with subjects rating *then always* a 3.35, and the opposite order a 2.46, which was significantly different in the expected direction. The forced-choice data also showed a significant preference, with 92.5 percent of participants choosing the *then always* order.

2.2.1.12 Perhaps already

The simplified hierarchy and Cinque (1999) make identical predictions: *perhaps already* should be the only grammatical order, and *already perhaps* should be ungrammatical. Both are correct, with subjects rating *perhaps already* a 4.48, and the opposite order a 3.38, which was significantly different in the expected direction. The forced-choice data also showed a significant preference, with 95 percent of participants choosing the *perhaps already* order.

2.2.1.13 Perhaps still

The simplified hierarchy and Cinque (1999) make the same prediction: *perhaps still* should be the only grammatical order, and *still perhaps* should be ungrammatical. Both are correct, with subjects rating *perhaps still* a 5.19, and the opposite order a 3.67, which was significantly different in the expected direction. The forced-choice data also showed a significant preference, with 90 percent of participants choosing the *perhaps still* order.

2.2.1.14 Perhaps always

The simplified hierarchy and Cinque (1999) make the same prediction: *perhaps always* should be the only grammatical order, and *always perhaps* should be ungrammatical. Both are correct, with subjects rating *perhaps always* a 3.43, and the opposite order a 2.95, which was significantly different in the expected direction. The forced-choice data also showed a significant preference, with 92.5 percent of participants choosing the *perhaps always* order.

2.2.1.15 Always usually

In this case, the simplified hierarchy and Cinque (1999) make differing predictions: Cinque's hierarchy correctly predicts that *usually always* should be the only grammatical order, and *always usually* should be ungrammatical. The simplified hierarchy predicts that both being frequency adverbs should allow for either order. Cinque's hierarchy is correct, with subjects rating *usually always* a 4.33, and the opposite order a 2.67, which was significantly lower. The forced-choice data also showed a significant preference, with 70 percent of participants choosing the *usually always* order. The reduced hierarchy is not necessarily incorrect, but rather, there are additional semantic constraints that rule out certain orders that are permitted by the hierarchy. In this case, a semantic constraint requires that the adverb with a more broad meaning (in this case *always*) needs to come second, otherwise the sentence is redundant and therefore degraded.

2.2.1.16 Already quickly

The simplified hierarchy and Cinque (1999) make the same prediction here: *already quickly* should be the only grammatical order, and *quickly already* should be ungrammatical. Both are correct, with subjects rating *already quickly* a 3.77, and the opposite order a 2.95, which was significantly lower. The forced-choice data also showed a significant preference, with 100 percent of participants choosing the *already quickly* order.

2.2.1.17 Almost still

The simplified hierarchy and Cinque (1999) make different predictions here: Cinque predicts that *still almost* should be the only grammatical order, and *almost still* should be ungrammatical. The simplified hierarchy considers both to be tense/aspectual adverbs, and therefore both should be equally good. Subjects rated *almost still* a 3.38, and the opposite order a 3.67, which was not significantly higher. This is expected by the simplified hierarchy and not Cinque's hierarchy. The forced-choice data also did not show a significant preference, with 55 percent of participants choosing the *still almost* order.

2.2.1.18 Almost just

The simplified hierarchy and Cinque (1999) again make different predictions: Cinque predicts that *just almost* should be the only grammatical order, and *almost just* should be ungrammatical. The simplified hierarchy considers both to be tense/aspectual adverbs, and therefore both should be equally good. Subjects rated *almost just* a 4.38, and the opposite order a 4.00, which was not significantly higher. This is expected by the simplified hierarchy and not Cinque's hierarchy. The forced-choice data also did not show a significant preference, with 52.5 percent of participants choosing the *almost just* order. However, it is worth pointing out that in the case, the ambiguity of 'just' as a manner adverb (as discussed in 2.2.1.3) could account for the unexpectedly high number of subjects preferring 'almost just'.

2.3 Cross-linguistic Evidence

Though Cinque’s adverb hierarchy has been tested and utilized in many languages other than English and Italian, the most striking grammaticality contrasts also fall along the lines of 1.3. That is, adverbs from different classes in the reduced hierarchy cannot switch places, whereas adverbs in the same class in the reduced hierarchy (but different classes in the Cinque hierarchy) can more easily do so. For instance, sharp grammaticality contrasts between evaluative and epistemic adverb orders are common, though it is hard to find examples of contrasts for adverbs within those classes. Data here comes from native speaker judgments.

- (6) a. John **fortunately** would *probably* send his children money.
b. *John *probably* would **fortunately** send his children money. [English (Li and Lin, 2012)]
- (7) a. John **xingyundi** jiang *keneng* jigei tade haizi qian.
b. *John *keneng* jiang **xingyundi** jigei tade haizi qian. [Chinese²]
- (8) a. Jonek **zorionez** *seguraski* bere seme-alabei dirua bidaliko die.
b. ??Jonek *seguraski* **zorionez** bere seme-alabei dirua bidaliko die. [Basque³]
- (9) a. Ahmad **lihusn alhath** rah *ihthimal* yib^ʕath lawladoh fluus.
b. *Ahmad *ihthimal* rah **lihusn alhath** yib^ʕath lawladoh floos. [Arabic⁴]
- (10) a. John **afortunadamente** mandarí *probablemente* dinero a sus hijos.
b. *John *probablemente* mandarí **afortunadamente** dinero a sus hijos. [Spanish⁵]

² Judgment from Huan Luo, p.c., as are all future uncited Mandarin Chinese examples

³ Judgment from David Rubio, p.c., as are all future Basque examples

⁴ Judgment from Eman Al Khalaf, p.c., as are all future uncited Arabic examples

⁵ Judgment from Angel Ramirez, p.c., as are all future uncited Spanish examples

- (11) a. John-un **tahaynghi** *ama* aitul-eykey ton-ul ponay-lkesi-ta.
b. ??John-un *ama* **tahaynghi** aitul-eykey ton-ul ponay-lkesi-ta. [Korean⁶]
- (12) a. John **may-măn** sê *có-thê* gui con anh tiễn.
b. *John *có-thê* sê **may-măn** gui con anh tiễn. [Vietnamese⁷]

Tescari Neto (2015) investigates the Cinque hierarchy for Portuguese, Bhatia (2006) for Hindi, and Wilson and Saygin (2001) for Turkish. Each of them find that in general, the ordering restrictions of Cinque are correct. However, Wilson and Saygin (2001) does find some counterexamples within one of the five classes in the simplified hierarchy, meaning that while they do not abide by Cinque’s hierarchy, they do abide by the simplified hierarchy. Specifically, they show that the adverbs for ‘usually’ and ‘always’ can appear in either order, unexpected by Cinque. They also find that some verbal morphemes, like future and completive, appear in orders contra Cinque’s expectations. The simplified adverb hierarchy makes no predictions as to the order of verbal morphemes, though, so this is irrelevant to the analysis presented here, which is that adverbs are adjuncts and not a sequence of functional projections. Indeed, it would be surprising if verbal morphemes corresponded exactly to the reduced adverb hierarchy given this account.

It is clear, then, that adverb ordering preferences are not English-specific.

2.4 The Reduced Hierarchy vs. Other Hierarchies

Although Cinque’s hierarchy as rigidly defined seems to make some adverb ordering predictions that are incorrect, a reduced hierarchy is not necessarily the only alternative formulation. This section compares the reduced adverb hierarchy to some other potential adverb hierarchies.

⁶ Judgment from JooYoung Kim, p.c., as are all future uncited Korean examples

⁷ Judgment from Xuyen Dinh, p.c., as are all future uncited Vietnamese examples

2.4.1 Jackendoff-style hierarchies

While Cinque’s adverb hierarchy makes numerous clear predictions about preverbal adverb ordering, the semantic accounts of [Jackendoff \(1972\)](#) and [Ernst \(2002\)](#) make fewer concrete predictions of this type, partially because they are more concerned with explaining the distribution of adverbs throughout the sentence (i.e. if they can appear sentence-initially, preverbally, or sentence-finally) than with explaining ordering restrictions between pairs of adverbs in the same ‘zone’. However, some ordering predictions from the four class adverb typology of [Jackendoff \(1972\)](#) can be extrapolated. Table 2.4 summarizes the main areas of overlap between the five classes in the reduced hierarchy presented in this dissertation and the four semantic classes of adverbs which [Jackendoff \(1972\)](#) distinguishes. Checkmarks mean that some adverbs from the reduced hierarchy class listed on the left are present in Jackendoff’s category, and Xs mean that the adverb class is not represented by Jackendoff’s category.

Jackendoff’s categories:	type 1 (speaker-oriented)	type 2 (subject-oriented)	type 3 (manner, degree, time)	type 4 (preverbal only)
evaluative	✓	✗	✗	✗
epistemic	✓	✗	✗	✗
temporal	✗	✗	✓	✓
frequency	✗	✗	✓	✗
manner	✗	✓	✓	✓

Table 2.4: [Jackendoff \(1972\)](#)’s adverb types by class in the reduced hierarchy

Notice that Jackendoff’s semantic groupings do not partition the classes of the reduced hierarchy (or vice versa). Therefore, if we assume that the only syntactic adverb classes are those typified by Jackendoff’s semantic categories (which, in fairness, he does not explicitly propose), there are some ordering restrictions which remain unexplained. To see this, let’s consider a few example orderings seen to have a significant preference in the AMT study in §2.2.

- (13) *allegedly once*, **once allegedly*
- (14) *probably always*, **always probably*
- (15) *already quickly*, **quickly already*

The adverbs in (13) are an epistemic adverb (‘allegedly’) and a temporal adverb (‘once’) in the reduced hierarchy, so their ordering is explained. For Jackendoff, they are a Type 1 adverb (‘allegedly’) and a Type 3 adverb (‘once’). If Type 1 is above Type 3, then the ordering can be explained by these classes, too. Likewise, in (14), ‘probably’ is a Type 1 adverb, and ‘always’ is a Type 3 adverb, so the ordering is explained. But notice that Type 3 adverbs contain all of manner, degree, time, and presumably frequency adverbs. Therefore, while the ordering in (15) is explained by the reduced hierarchy as a case of *temporal* > *manner*, per Jackendoff these are both Type 3 adverbs, and within themselves there is no ordering prediction. ‘Quickly’ is not a preverbal only adverb, so it is not in Type 4, and it is not necessarily subject-oriented, so it need not always be in Type 2. In order to explain ordering restrictions like (15), some additional requirement would be needed in addition to the basic four-way class distinction given in Ernst.

In general, these semantic hierarchies do not make *incorrect* predictions, but they fail to generate predictions between two adverbs of the same semantic type, like two speaker-oriented adverbs (*frankly probably*) or two manner/degree/time adverbs (*once quickly*). This is the opposite problem from the Cinque hierarchy, which makes predictions about almost every pair of adverbs, some of which turn out to be incorrect. The reduced hierarchy falls somewhere in the middle, though perhaps closer to the Jackendoff/Ernst side of the spectrum.

2.4.2 Variations on Cinque

Another possibility is that each class in Cinque’s hierarchy *is* correct, but that the ordering relation on those adverb classes is not a total order (where every class strictly must precede those below it), but instead a partial order. In this case Cinque’s

hierarchy could not be instantiated as functional projections, but the ordering Cinque proposes would stay the same. If the particular partial ordering is one where all the evaluative adverbs are ordered before all the epistemics, all the epistemics are before all the temporal adverbs, all the temporal adverbs are before all the frequency adverbs, and all the frequency adverbs are before all the manner adverbs, then this predicts the same ordering relations as the reduced hierarchy does. One possible benefit to considering a partial order on Cinque's extended list rather than just a reduced set of classes would be to preserve the relationships between the verbal affixes which encode similar semantic relationships as the adverbs in their specifiers. However, the morphological affixes do not seem to be as freely ordered as the corresponding adverbs, so the affixes would most likely be a total order even if the adverbs themselves are not.

Perhaps a more intuitive approach would be to consider a probabilistic hierarchy rather than a categorical one, where all the adverb classes Cinque proposes are valid, but the position of each adverb can change to another position within the hierarchy with a certain probability. Although such a stochastic approach is rarely used in generative syntax, the extreme variation in judgments people get for different adverb orderings might lend credence to such a formulation. The fact that most average ratings for two adverbs are generally somewhere between 3-4 out of 7 rather than a 1/7 or a 7/7 also appears to reflect a non-categorical judgment. As an example, the manner adverbs 'quickly' and 'easily' seem to be roughly interchangeable in order, so they could each have a probability of .5 of appearing higher than the other. On the other hand, a frequency adverb like 'always' may have a probability of .95 of appearing before the manner adverb 'quickly', but a .05 chance of appearing afterwards, since there are some people, though not the majority, who rate 'quickly always' as more acceptable than 'always quickly'. This type of probabilistic model is more opaque in terms of syntactic or semantic basis for ordering, but it could work well to incorporate multiple factors, if there are many factors at play which haven't been considered here (for instance phonological or morphological properties, or word frequency). In order to determine the exact weights for such a hierarchy we would need to collect many more

AMT judgments and run simulations, but this could be a promising area for future work.

2.5 Summary

This chapter has shown various evidence in favor of the reduced hierarchy and against the Cinque hierarchy. Corpus examples, judgment data, and forced choice data indicate more freedom in ordering than Cinque's hierarchy predicts. Other hierarchies are also possible, although none currently exists which can account for the full range of data. The next chapter will discuss how to instantiate the reduced hierarchy syntactically, using minimalist grammars.

Chapter 3

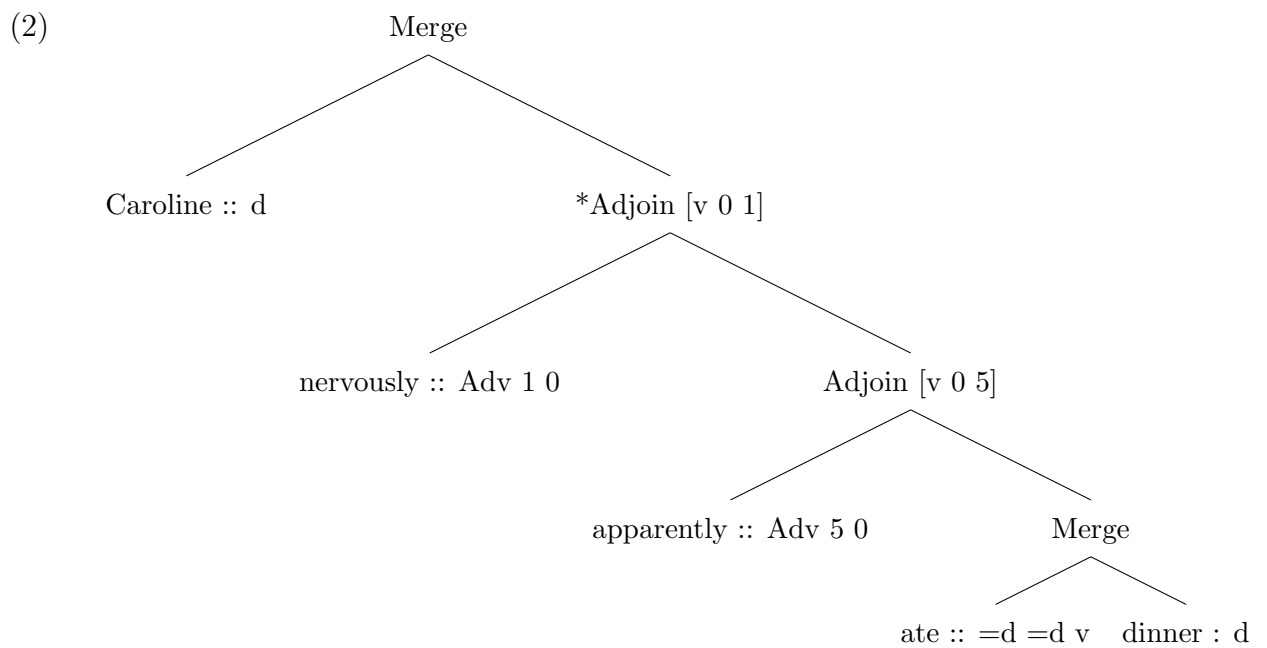
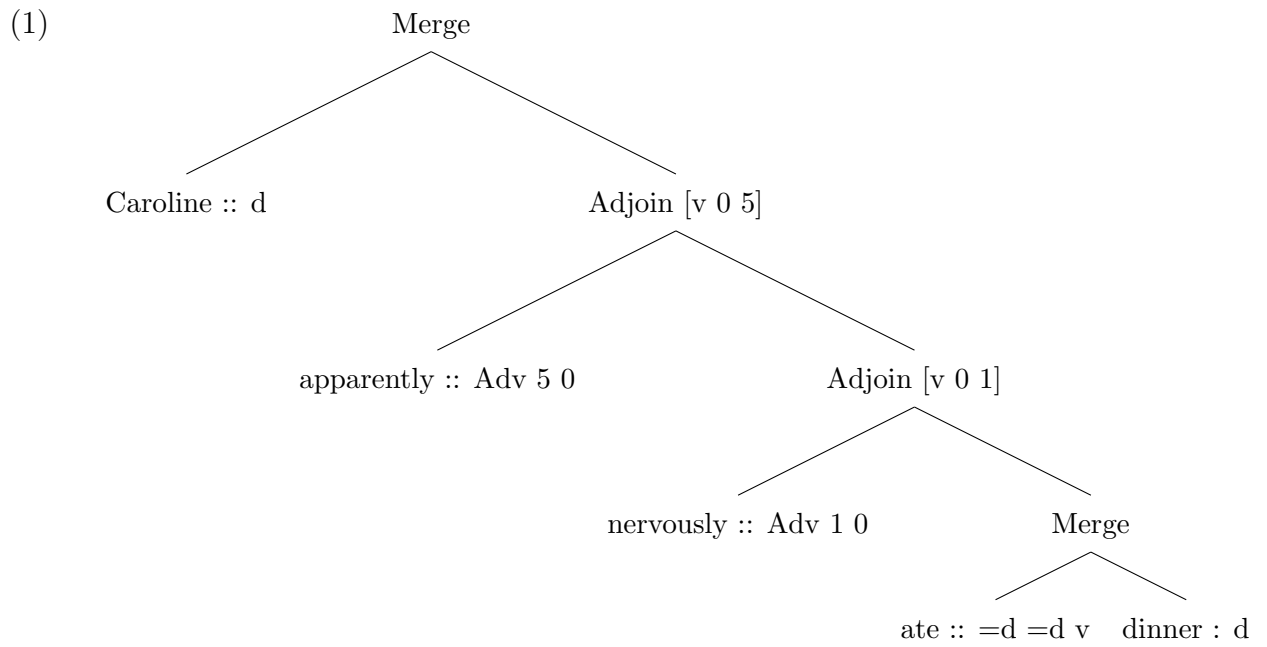
ADVERB SYNTAX

This chapter presents a MG formalism for encoding the reduced adverb hierarchy, as well as the restrictions on adverb movement. In 3.1 the formalism of minimalist grammars is used to describe the facts listed in 2.1. Section 3.2 looks at how to incorporate the different orderings found in wh-questions with adverbs.

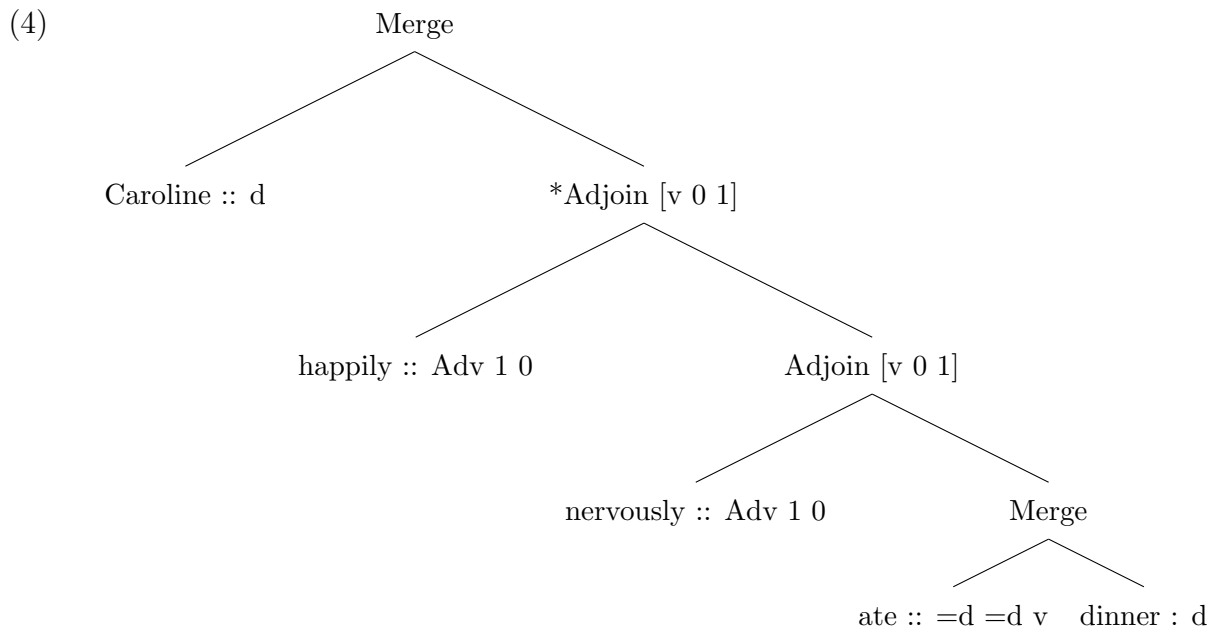
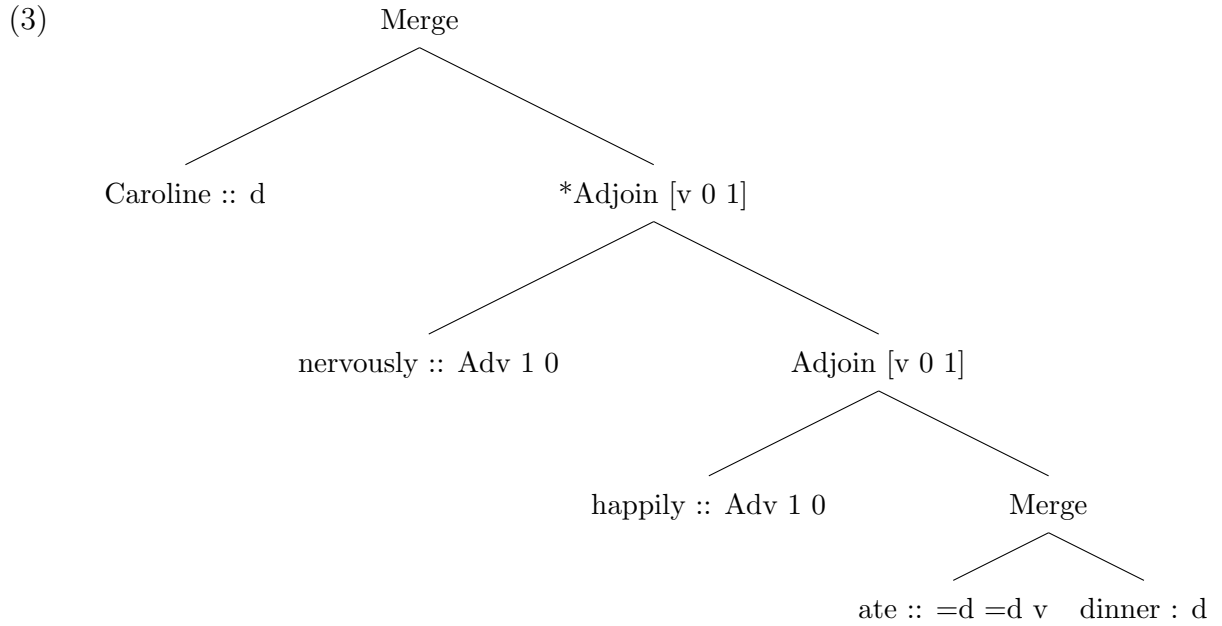
3.1 Encoding the Hierarchy

Recall the formalism of minimalist grammars with adjunction described in §1. While Fowlie (2014)’s description of the ordering relation for adverbs or other adjuncts is not fully spelled out (i.e. it is unclear which adjuncts get a value of 1, 2, 3 etc), we can straightforwardly map the levels of the simplified adverb hierarchy in 1.3 to the numerical values in the ordering relation. So, adverbs like *allegedly*, which are at the highest level of the hierarchy¹, can be mapped to a value of 5, epistemic adverbs receive a value of 4, tense and aspectual adverbs are 3s, frequency adverbs are 2s, and manner adverbs are 1s. Now we can treat adverbs as adjuncts, meaning they can be freely ordered and iterated, as long as they obey this five-degree ordering relation. For instance, the derivation in (1) is grammatical, but the one in (2) is not, since the rank of *apparently*, a speaker-oriented, evaluative adverb, is 5, which is strictly higher than the rank 1 of the manner adverb *nervously*.

¹ Some manner adverbs also have a ‘domain specification’ interpretation, like ‘mathematically’, which is interpreted at a higher level (which would be 6 in the reduced hierarchy).



Adverbs at the same level in the hierarchy can be freely ordered with respect to each other, as in (3) and (4).



The adjoin operation, like Merge and Move, can theoretically apply to constituents of any type, so long as the ordering relation is not violated. Unlike Merge, Adjoin is not attracted by a selectional feature. However, it is clear that adjunction of adverbs is not grammatical everywhere, for instance between a verb and its complement. [Fowlie \(2014\)](#) defines adjunct classes such that specific types of adjuncts are licit for different

categories. For instance, the adjuncts that can adjoin to adjectives, verbs, and adverbs (but not nouns) are adverbs. At spell-out, adverbs can be linearized to the left or right, except for evidential and epistemic adverbs, which must be marked as only being spelled out on the left.

3.1.1 Attachment sites

Although this dissertation, like Cinque (1999), is concerned mainly with adverbs in the preverbal position (as this is the most commonly available, and relatively unmarked, position), there are differences among the five adverb classes in the simplified hierarchy as to where in a sentence adverbs may appear.

Manner adverbs (*quickly*, *carefully*) can appear postverbally, preverbally, and sentence initially – with the exception of non-ly adverbs like *hard* and *fast*, which can only appear postverbally. When manner adverbs appear initially, they have a subject oriented interpretation, and when they appear postverbally, they have a ‘true manner’ interpretation. This means that the non-ly manner adverbs cannot receive the subject-oriented reading, because they cannot appear initially.

Frequency adverbs (*often*, *occasionally*) can appear postverbally, preverbally, and sentence initially – with the exception of the non-ly (and negative) adverb *never*, which can only appear preverbally. Note that some adverbs of quantification are also in this class of frequency adverbs, but can only get the quantificational reading preverbally and not postverbally. For example, *often* in (5) is quantifying over the eventuality of the if-clause, but this meaning is lost in (6).

(5) If a farmer owns a donkey, he often beats it.

(6) If a farmer owns a donkey, he beats it often.

Degree adverbs (*really*, *very*), which are in the same class, can appear preverbally and initially, but not postverbally. Some degree adverbs (like ‘only’) are focus associated adverbs, so they generally need focused material to associate with.

Tense and aspectual adverbs (*then, once*) can appear postverbally, preverbally, and sentence initially – with the exception of the non-ly adverb *just*, which can only appear preverbally.

Epistemic adverbs (*probably, possibly*) can appear preverbally and initially. The same is true for evaluative adverbs (*frankly, apparently*). This positional restriction can be explained by a semantic constraint requiring them to apply to a proposition, which could also be encoded in MGs if desired.

Table 3.1 gives a summary of the positions where each class can generally appear.

Grammatical in:	initial	preverbal	postverbal
evidential	✓	✓	✗
epistemic	✓	✓	✗
temporal	✓	✓	✓
frequency	✓	✓	✓
manner	✓	✓	✓

Table 3.1: Attachment sites by class

3.2 Adverb Movement Facts

3.2.1 Wh-questions

Although it may seem straightforward to encode adverb orders in MGs, the orders found in declarative sentences with multiple adverbs are often different than those found in adverbial wh-questions. For instance, (7) is perfectly acceptable in English, but (8) is marginal at best (and it is not due to some ban on moving *skillfully*).

(7) John frequently skillfully mows the lawn.

(8) ?How skillfully did John frequently mow the lawn?

A proposal by Li and Lin (2012) extends Rizzi (1990)’s theory of relativized minimality to adverbs as a ‘Potential Moveability Condition’ (PMC), stating that adverbs which

can undergo movement block other adverbs from the same type of movement over them. I will provide additional cross-linguistic evidence for a PMC analysis, with evidence from adverbs in movement and non-movement languages. Li. et al’s condition is stated below:

(9) **PMC: A Refined Relativized Minimality Condition:**

In a configuration $X \dots (Y) \dots Z$, where X c-commands Y and Y c-commands Z , Z can move to X only if there is no Y such that:

- (a) Z and Y are of the same structural type (A, A', head), and
- (b) If x ranges over types of *homogeneous* movement (*wh*, *focus*, ...) and $[X]$ over the features that signal a *constituent’s* ability to undergo x -movement, then x -movement of a constituent is blocked by a c-commanding $[+X]$ category, but not by a c-commanding $[-X]$ category.

Examples of the PMC for adverbs have been shown by Li et al to apply in English and Russian, but acquired evidence from Spanish, Arabic, French, Mandarin Chinese, Korean, Vietnamese, Hungarian, and Basque indicates that the PMC is indeed generalizable to other languages, though the specifics of which adverbs can be moved may vary.

Li and Lin (2012) characterize adverb movement in terms of features: if a feature is $[+F]$ for F movement, then it can undergo F movement, and it cannot be F moved if it is $[-F]$. The main result, that $[+F]$ adverbs block other $[+F]$ adverbs from moving, is shown in terms of *wh*-movement, *focus*, and *preposing*.

Specifically, Li and Lin (2012) consider *wh*-moveable adverbs to have a feature $[+W]$, indicating that they can head a *wh*-phrase and undergo *wh*-movement. (This is different from the $[+WH]$ feature, which is only positive for actual *wh*-words.) In English, evaluative, epistemic, and some frequency adverbs are $[-W]$, while manner adverbs and the remaining frequency adverbs are $[+W]$. Generally, this pattern holds

cross-linguistically, though some adverbs may translate into a different class.

For instance: in English, *skillfully* (MA) and *frequently* (FH) are [+W], while *luckily* (EV), *probably* (EP), and *occasionally* (FH) are [−W]. These particular adverbs’ values for [+W] in multiple languages are presented in Table 3.2. The sentences used to obtain the feature values in this table are presented in C.1. Since *frequently* and *skillfully* are both [+W] in English, and *frequently* is a higher adverb (level 2) than *skillfully* (level 1), the movement of [+W] *skillfully* over the [+W] *frequently* in (8) results in ungrammaticality.

	Chinese	Spanish	Basque	French	Korean	Arabic	English
<i>skillfully</i>	+	+	+	+	+	+	+
<i>luckily</i>	−	−	−	−	−	−	−
<i>probably</i>	−	−	−	−	−	−	−
<i>frequently</i>	+	+	+	+	+	+	+
<i>occasionally</i>	+	+	−	+	+	+	−

Table 3.2: [±W] feature values

Note that the only significant difference from English here is most languages’ [+W] *occasionally*.

Given this, it is expected that the same adverbs which block wh-movement in English do so in the languages presented above, and indeed, this is the case. For example, (10), where the [+W] adverb *skillfully* moves over the [+W] adverb *frequently*, is ungrammatical for all the languages above.

- (10) *John duoshuliandi jingchang chucuo?
 John howskillfully frequently mow his lawn
 *How skillfully did John frequently mow his lawn? [Chinese]

This is in contrast with a sentence like (11), where no blocking effect occurs, since *frequently*, being higher in the adverb hierarchy (according to the analyses of both Cinque and Ernst, as well as our simplified hierarchy in 1.3), does not ever cross the [+W] *skillfully*.

- (11) Elmana cacwu John-i nungswukhakey canti-lul kakk-ass-ni?
 how often John-Nom skillfully lawn-Acc cut-Past-Q
 How frequently did John skillfully mow his lawn? [Korean]

It is also expected that for those languages with a [+W] *occasionally*, *occasionally* should block wh-movement over it. This too turns out to be correct:

- (12) *Qué tan hábilmente cortó John ocasionalmente el césped?
 how skillfully cut John occasionally the lawn
 How skillfully did John occasionally cut the lawn? [Spanish]

Examples like the above provide strong evidence for the universality of the PMC. In other words, it seems like a legitimate syntactic constraint. Therefore, it should be included in any syntactic model of the grammar. To integrate the PMC as is into the formalism of MGs, though, requires a bit of a modification to the basic system. We want to restrict the movement of a +W adverb if there is any +W adverb in its path of movement.

We can begin with appealing to the Shortest Move Constraint (SMC). This constraint explains why sentences like **What_i did who eat t_i?* are ungrammatical, since the wh-word ‘who’ is closer to the wh-feature at the beginning of the sentence, and therefore it should be selected for movement before ‘what’. The SMC is generally encoded in MGs, as in Stabler 2011:

SMC: ‘Exactly one head in the tree has $-x$ as its first feature’ (where x is a variable ranging over all features).

Recall that $-f$ refers to licensee features, so, this version of the SMC prevents multiple heads in a tree from being eligible for the same type of movement at the same time. (Graf, 2013a, p. 26) points out that this is not a particularly intuitive formation for many syntacticians, but it does have the intended result of preventing the general issue of two matching licensee features both being active. For instance, in the case of **What did who eat?*, when a $[-wh]$ featured ‘who’ is merged into a derivation that already contains a $[-wh]$ featured ‘what’, the derivation crashes. However, in the case

of *Who ate what?*, the $[-wh]$ featured ‘who’ is eligible to move, since the lexical item ‘what’ is not involved in the subtree that is moving and doesn’t have an active $[-wh]$ feature as its first feature.

Though it seems at first glance that this formulation of the SMC is enough to solve our problem, since it forbids movement of a $+W$ lexical item when another $+W$ item is present, this is not exactly the constraint we want. Note that the $+W$ feature is meant in [Li and Lin \(2012\)](#) to indicate only that it can head a *wh*-phrase, but not that it is an actual *wh*-phrase. This indication is reserved for the *wh* feature, as is standard.

From here there are a few options. One option is briefly mentioned in [Li and Lin \(2012\)](#): combine the *wh* and W feature into a single tri-valued feature. In this situation, adverbs are classified as either $[+WH]$, $[-WH]$ or $[\]$, with \emptyset belonging to adverbs which cannot undergo *wh*-movement. Then the PMC is derived by modifying Move to be sensitive to $\pm wh$. Li et al reject this option because it goes against the traditional view of the WH feature, though it does seem feasible otherwise.

Another alternative is through implementing relativized minimality into MGs completely. [Stabler \(2011\)](#) outlines one possible way to do so, which consists of the following changes:

1. Some subset of selectors and categories are distinguished as persistent (and will not be deleted after being checked)
2. Merge is revised so that all features remain visible for intervention effects (though a distinction between persistent and non-persistent features is maintained for checking relations)
3. For any subtree t , *type* is defined as a function which maps each feature f to features that will block movement of $t[f]$, and *cover*(t_2) is defined as a function on any subtree t_2 of t_1 where *cover* is the set of features of heads t_3 such that any element of t_3 c-commands t_2 .
4. Given this, a revision to the SMC called the RMC is defined as follows: Merge applies to $t_1[=f]$ only if (i) $t_1[=f]$ has exactly one subtree $t_2[f]$, and (ii) $\text{cover}(t_2[f]) \cap \text{type}(f) = \emptyset$.

Stabler notes that MGs with the RMC included have the same expressive power as non-modified MGs. Given the RMC, we can easily define categories of adverbs which block movement of each other.

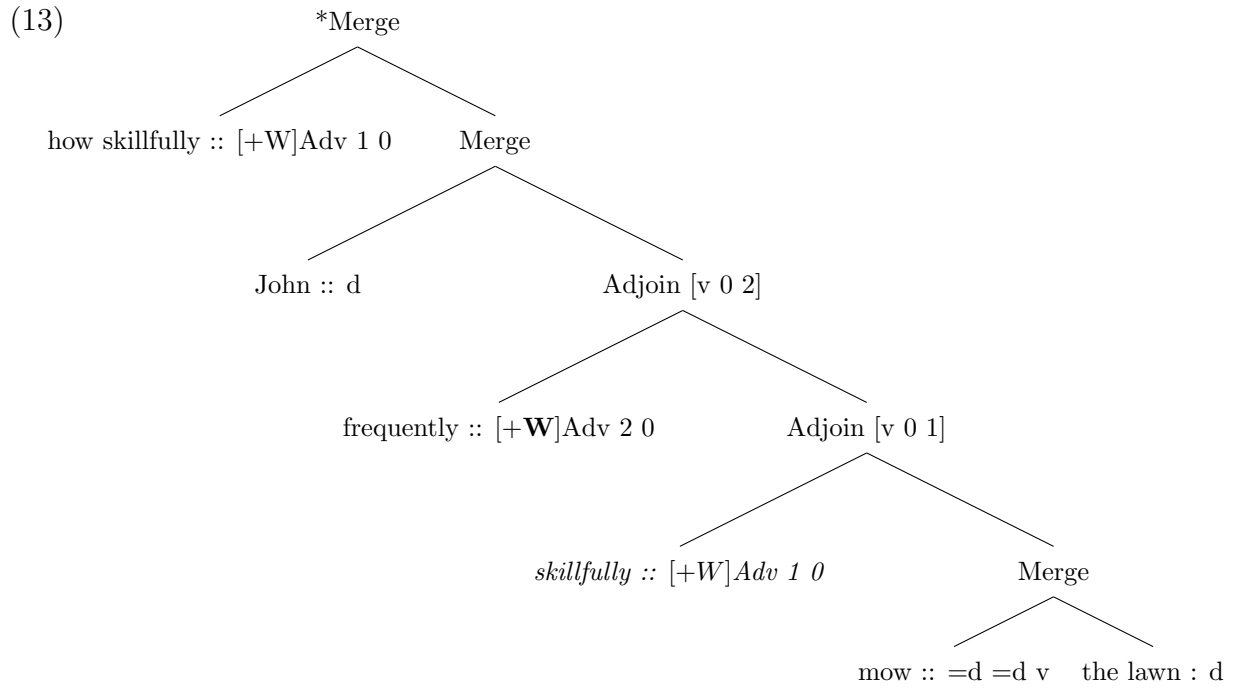
Though this approach seems more complicated, it is likely useful for other areas of the grammar which show Minimality effects, and therefore may be preferable.

Since this RMC restricted movement is not adjunction, it seems orthogonal to the rankings specified by the hierarchy in 1.3. However, note that the division of adverbs in a language into those which are [+W] or [-W] always partitions the adverb hierarchy in two contiguous groups, with the line between [+W] and [-W] adverbs in the hierarchy drawn either between temporal and frequency adverbs (as in Spanish, where temporal adverbs and above are [-W], and frequency adverbs and below are [+W]), or between different frequency adverbs (as in English, where temporal adverbs and above are [-W], but so is *occasionally*, and frequency adverbs and below are [+W], with the exception of *occasionally*). Whether the split is between temporal and frequency adverbs, or in the middle of the frequency adverbs, is a language-specific distinction. It makes sense for adverbs to partition between temporal and frequency adverbs, since these are two distinct classes in the adverb hierarchy, but it is a bit more mysterious why a partition should occur in the middle of a single class of adverbs, namely in the middle of the frequency adverbs. Why might a division occur in this place? None of the analyses of adverbs discussed in this dissertation have made any hierarchical distinction between *frequently* and *occasionally*, and indeed they seem to have similar semantic and syntactic properties.

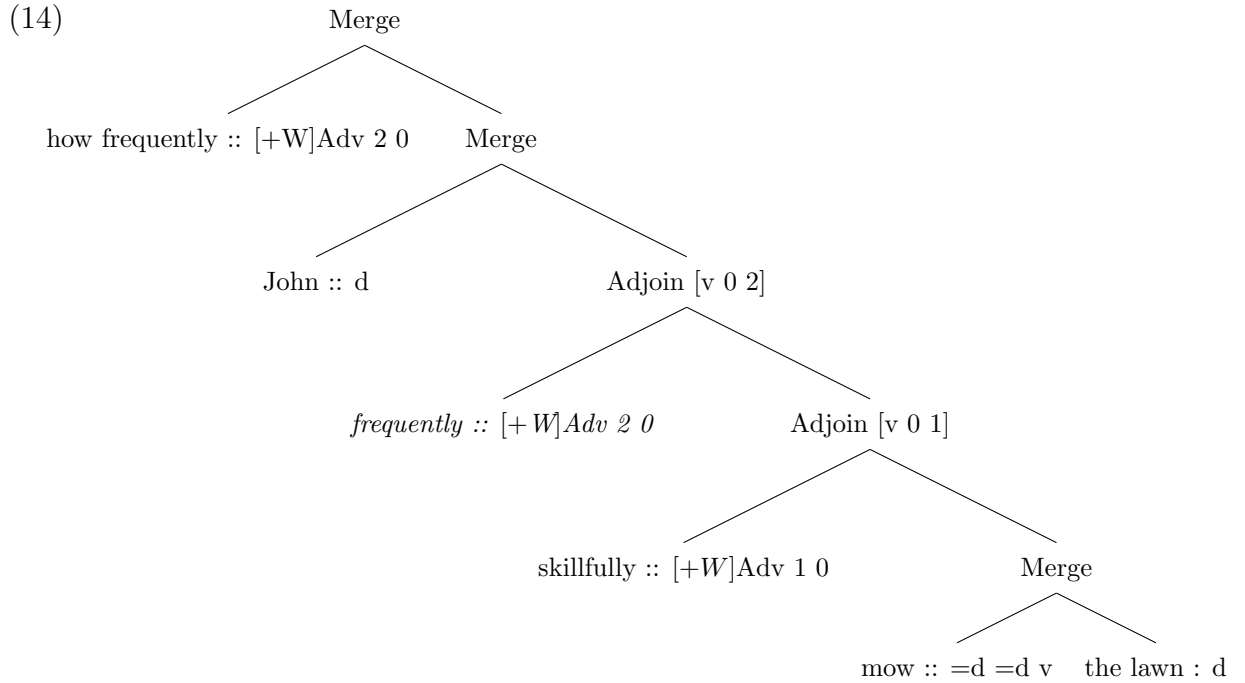
An additional mechanical turk judgement task (n=40) resulted in average ratings of 2.33 for *frequently occasionally*, and 3.67 for *occasionally frequently*, so by the standard hierarchical metric, it is possible that occasionally is higher than frequently. More likely, though, is the lexical property that occasionally is not gradable in English (*quite occasionally, *very occasionally), but frequently is (quite frequently, very frequently), and therefore it is semantically possible to wh-question the degree of frequency but not occasionalness. The same fact holds true in Basque, the other language

with the mid-frequency class split. Indeed, the adverbs which are wh-moveable are exactly those which are both at-issue (therefore the highest adverbs, like evidentials, are generally not wh-moveable) and gradable. Though the particular lexical items in each language which fulfill these criteria may not be identical, if an adverb can wh-move then it must be both at-issue and gradable in that language.

A sample MG derivation for the ungrammatical sentence ‘How skillfully did John frequently mow the lawn?’ is shown in (13). Because both adverbs are wh-moveable (indicated here by a +W feature), the movement of ‘skillfully’ is blocked by the higher adverb ‘frequently’.



The comparable grammatical sentence ‘How frequently did John skillfully mow the lawn?’ is shown in (14). Both adverbs are wh-moveable (indicated here by a +W feature), but since ‘frequently’ is hierarchically above ‘skillfully’, the wh-movement is not blocked by it.



3.2.1.1 An evidential exception

The PMC is a purely syntactic constraint on adverb positioning. Features vary from language to language, and their values cannot be universally predicted. However, the PMC does seem to have one consistent exception: sentences like “?How skillfully did John luckily mow the lawn?” are generally rated questionable at best. In languages like English and Korean, where luckily is [-W] and should not block the movement of ‘skillfully’ on syntactic grounds, the sentence still reads as ungrammatical. Although the movement of ‘skillfully’ should be syntactically licensed, it seems that evidential adverbs, like ‘luckily’, are generally not allowed in downward-entailing contexts, wh-questions included. Thus this issue is not to do with ‘skillfully’ (it can move over other adverbs, as in (15)), but instead with ‘luckily’, and other evidential adverbs, being disallowed in questions ((16), (17)). This restriction is discussed more generally in §3.2.1.

(15) How skillfully did John quickly mow the lawn?

(16) *Did John luckily mow the lawn?

- (17) *How many lawns did John fortunately mow?

3.2.2 Adverbs in non-movement languages

Li et al. illustrate the PMC for languages like English with frequent wh-movement. However, the PMC should also predict that in languages without wh-movement, nothing that looks like adverb movement should be blocked (since there are no [+W] adverbs to block it). And indeed, this appears to be the case. For Vietnamese, which follows the adverb hierarchy, wh-questions are realised in-situ, as seen below:

- (18) John da cat co vuon anh thuan-thuc the-nao?.
 John PST cut grass lawn he skillfully how
 How skillfully did John mow the lawn?

- (19) John da gui con anh tien may-man the-nao?.
 John PST send child he money lucky how
 How luckily did John send his children money?

Based on this, it follows that the adverb orders in wh-questions which are ungrammatical in English would be fine in Vietnamese, since there is no wh-movement:

- (20) John da may-man cat co vuon anh thuan-thuc the-nao?.
 John PST luckily cut grass lawn he skillfully how
 How skillfully did John luckily mow the lawn?

Perhaps a more interesting case is found in Korean, which also does not have obligatory wh-movement. However, it does allow some wh-scrambling.

- (21) Elmana nungswukhakey John-i canti-lul kakk-ass-ni?
 how skillfully John-Nom lawn-Acc cut-Past-Q
 How skillfully did John mow his lawn?
- (22) Elmana cacwu John-i aitul-eykey ton-ul ponay-ss-ni?
 how often John-Nom children-Dat money-Acc send-Past-Q
 How frequently did John send his children money?

When multiple adverbs are combined in a *wh*-question, those adverbs which can be scrambled frontward seem to block adverb movement, just as they do in the *wh*-movement languages:

- (23) ??Elmana nungswukhakey John-i cacwu canti-lul kakk-ass-ni?
how skillfully John-Nom often lawn-Acc cut-Past-Q
How skillfully did John frequently mow his lawn?

The inverse order is grammatical, as there is no movement of ‘frequently’ over the lower adverb ‘skillfully’:

- (24) Elmana cacwu John-i nungswukhakey canti-lul kakk-ass-ni?
how often John-Nom skillfully lawn-Acc cut-Past-Q
How frequently did John skillfully mow his lawn?

So it seems that even in a *wh*-in-situ language like Korean, the PMC still applies – though only for overt movement.

3.2.3 Contrastive focus

Similar minimality effects hold with adverbs in contrastive focus constructions. In English, evaluative, frequency, and manner adverbs can all be focalized - they can be said to have the feature $[+F]$. Epistemic and certain non *-ly* adverbs are $[-F]$, and so do not block focalization over them. The focalization considered is strictly contrastive:

- (25) A: He unfortunately mows the lawn every Saturday.
B: No, LUCKILY he mows the lawn every Saturday.

Other languages do not have exactly the same $[\pm F]$ specification for certain adverbs. A selection of the *F* values of adverbs in various languages is shown in 3.3. Note that with the exceptions of French and English², focalization for a single adverb seems

² English judgments vary on the feature value for *probably*, but the PMC applies for all these speakers no matter the value.

highly unrestricted.

	Chinese	Spanish	Basque	French	Korean	Arabic	Viet.	English
<i>luckily</i>	+	+	+	+	+	+	+	+
<i>frequently</i>	+	+	+	+	+	+	+	–
<i>noisily</i>	+	+	+	+	+	+	+	+
<i>probably</i>	+	+	+	–	+	+	+	+/–
<i>just</i>	+	+	+	+	+	+	+	–

Table 3.3: $[\pm F]$ feature values

Considering that most adverbs are $[+F]$, then it should be the case that these same adverbs block movement over them. In general, this is true: Arabic, Spanish and French again pattern well with the PMC; all their $[+F]$ adverbs indeed block focus over them:

- (26) *La, bsur^fah humma rah ihtimal y^feedo buna almadeenah.
 No, quickly they will probably rebuild the town
 No, quickly they will probably rebuild the town. [Arabic]
- (27) *No, ruidosamente, el frecuentemente corta el césped.
 No, noisily he frequently mows the lawn
 No, noisily he frequently mows the lawn. [Spanish]
- (28) *Non, bruyemment il tond frequemment son gazon.
 No, noisily he mows frequently the lawn
 No, noisily he frequently mows the lawn. [French³]

In the case of contrastive focus, it seems the split of $[+F]$ and $[-F]$ adverbs no longer cleanly divides any adverbial hierarchy, with evaluative adverbs being focusable in English and French (29), but not epistemic adverbs (30), and not temporal (31) or frequency (32) adverbs in English. However, the fact that each level in the simplified hierarchy either can be focused or not points to the syntactic cohesiveness of these classes. Again, note that the focusability of adverbs is crucial in determining whether

³ Judgment from Justin Rill, p.c., as are all future uncited French examples

another adverb can be focused above it, regardless of the class of adverb it is. So, in languages like English where *probably* is not focusable, it is grammatical to focus another adverb over it, but in languages like Spanish where *probably* is focusable, it is ungrammatical to focus another adverb over it. In this sense, the hierarchical ordering relation is needed to determine if a particular focus construction is available, since adverbs cannot be focused above other adverbs that are higher in the hierarchy.

(29) Non, heureusement il tond son gazon.
 No, luckily he mows the lawn
 No, luckily he mows the lawn.

(30) *Non, probablement il tond son gazon.
 No, probably he mows the lawn
 *No, probably he mows the lawn.

(31) *No, just he mowed the lawn.

(32) *No, frequently he mows the lawn.

3.3 Interim Conclusions

While the simplified adverb hierarchy in 1.3 can be easily mapped on to an ordering relation which successfully predicts grammaticality of adverb ordering pairs in non-movement constructions, this hierarchy cannot, on its own, predict the adverb orderings found in sentences with adverb movement, since cases where a low adverb moves over a higher adverb are only licit when the higher adverb is not moveable. However, a combination of the simplified adverb hierarchy plus the PMC can predict adverb orderings in all instances.

Although the adverb classes in the simplified hierarchy are semantic groupings as well as syntactic ones, it is also possible to divide the classes further along both semantic lines and syntactic ones (since they can be mapped to verbal morphology in some languages), as Cinque has done. However, none of those divisions are necessary to predict any type of adverb ordering – the simplified hierarchy is enough.

Chapter 4

ADVERB SEMANTICS

Many analyses of adverb ordering make reference to semantic factors, which help to explain why certain orders are forbidden cross-linguistically. Even given Cinque’s adverb hierarchy, or some other simplified hierarchy (like that in §1.3), there are orderings which seem to be unacceptable even though they are predicted to be grammatical based on a syntactic hierarchy alone. This chapter investigates a number of semantic reasons why some adverb combinations may not be compatible, as well as giving a semantic analysis for the adverb classes mentioned in the simplified hierarchy presented in §1.3.

Section 4.1 introduces several semantic distinctions used in theories of adverbs, none of which is sufficient on its own to describe the adverb ordering facts in Chapter 2. §4.2 details a variety of semantic constraints that affect licit adverb combinations. §4.3 provides an adverb semantics which can be integrated with the minimalist grammars of Chapter 3. §4.4 sums up the contribution of semantics to adverb ordering generalizations.

4.1 Semantic Properties of Adverbs

This section describes a variety of general semantic properties which effect different classes of adverbs, like ambiguity, opacity, and veridicality. These properties cut across the reduced adverb hierarchy in various ways, but none of these properties generate the five-class ordering relation we see among multiple adverb constructions.

4.1.1 Ambiguous adverbs

Event adverbs are those which are said to have scope over a semantic event, or generally a VP/vP, in contrast with a propositional adverb which relates to an entire proposition, generally an IP/CP. Some adverbs can be both an event and propositional adverb, depending on the interpretation. Other adverbs can be ambiguous with regards to what event they refer to. An oft-cited example is *again*, which is ambiguous in (1).

- (1) John opened the door again.

If *again* is interpreted at a restitutive level, it describes an action of opening that may not have been done before by the agent of the sentence, i.e. this may be John's first time opening the door today but he is returning the door to its original open state. Contrast this with the repetitive *again* interpretation, which is a reading requiring that John himself is repeating his action of opening the door. Evidence for this distinction comes from the fact that the verb *re-open* has the same semantics as *open again*, except that *re-* can only apply to the restitutive VP level, and cannot have a repetitive interpretation (Csirmaz and Slade, 2016).

Though (1) is ambiguous between a restitutive meaning and a repetitive one, this ambiguity disappears when *again* is in initial position, as in (2). Here only the repetitive reading, as in (3), is available.

- (2) John and Mary arrived at the restaurant. Mary opened the door, but it blew closed.

*Again John opened the door.¹

- (3) John opened the door, but it blew closed.
Again John opened the door.

So the adverb *again* must be ambiguous between two distinct interpretations in some

¹ Initial *again* is always grammatical on a speaker-oriented utterance reading, in the sense of '(I'm telling you) again, John opened the door'.

positions. Beck and Johnson (2004), following von Stechow (1995), suggest that the semantics of both restitutive and repetitive *again* are the same, but that the difference comes from where *again* adjoins in the sentence. So the restitutive reading has the structure in (4), where ‘again’ adjoins to a distinct clause that represents the result state of the door being open. The repetitive reading has the structure in (5), where ‘again’ adjoins to the whole event, thus representing a repetition of the event of John’s door opening.

(4) $[_{VP} \text{ John } [_{VP} \text{ BECOME } [_{AP} [_{AP} \text{ open the door}] \text{ again}]]]$

(5) $[_{VP} [_{VP} \text{ John } [_{VP} \text{ BECOME } [_{AP} [_{AP} \text{ open the door}]]]] \text{ again}]$

Beck and Johnson (2004) thus give the semantic derivations in (6)-(7) for (4) and (5) respectively.

(6) $\lambda e. \exists P[P_e(\text{John}) \wedge \exists e' \text{BECOME}_{e'}(\lambda e''. \text{again}_{e''}(\lambda e^*. \text{open}_{e^*}(\text{thedoor}))) \wedge \text{CAUSE}(e'), (e)]]]$

(7) $\lambda e''. \text{again}_{e''}(\lambda e. \exists P[P_e(\text{John}) \wedge \exists e' \text{BECOME}_{e'}(\lambda e^*. \text{open}_{e^*}(\text{thedoor}))) \wedge \text{CAUSE}(e'), (e)]]]$

However, just because an adverb has two possible interpretations does not necessarily mean that it is associated with both an repetitive reading and a restitutive reading. Recall the ambiguity of manner adverbs like *cleverly*, discussed in §1.2.1. Such adverbs seem to have two distinct semantic interpretations, but in this case both interpretations are still modifying an event or predicate. For example, the adverb *quickly* has at least two distinct interpretations, as noted in (8) and (9).

(8) John walked to the store quickly – his manner of walking was quick.

(9) John walked to the store quickly – the time of the walking event was short.

Though it is not an event/propositional divide, the dual interpretations of such manner adverbs are also generally taken to be the result of attachment to two different structural positions (Rawlins, 2013).

4.1.2 Veridicality

One property of some adverbs, but not all, is that of veridicality. Veridical adverbs (also called factive adverbs) are adverbs that entail the sentence which is formed after omitting the adverb. Many of these sentences appear to obviously assert the sentence without the adverb included, but since assertions entail themselves, these veridical adverbs still produce entailments. This veridical property can apply to both propositional (10) and event (11) adverbs.

(10) John fortunately finished his homework. \Rightarrow John finished his homework.

(11) John slowly finished his homework. \Rightarrow John finished his homework.

However some adverbs, specifically a majority of epistemic adverbs, are non-veridical:

(12) John probably finished his homework. \nRightarrow John finished his homework.

A few adverbs, like *never*, are antiveridical, meaning that they entail the negation of the sentence which is formed after omitting the adverb:

(13) John never finished his homework. \Rightarrow It is not the case that John finished his homework.

Veridicality does not correlate exactly with adverb class (the epistemic adverb ‘perhaps’ is non-veridical, while the epistemic adverb ‘certainly’ is veridical, for instance), but it also does not have any apparent effect on the syntactic behavior of adverbs, at least insofar as *wh*-movement, coordination, and focus are concerned. For instance, both (14) and (15) are ungrammatical, even though one adverb is veridical and one is not. Conjoining a veridical adverb with a non-veridical one (16) is no better or worse than conjoining two non-veridical adverbs (17), and likewise focusing both a veridical (18) and non-veridical (19) epistemic adverb is grammatical (capital letters represent contrastive focus).

- (14) *How perhaps did John finish his homework?
- (15) *How certainly did John finish his homework?
- (16) ??John certainly and perhaps finished his homework.
- (17) ??John probably and perhaps finished his homework.
- (18) CERTAINLY John finished his homework.
- (19) PERHAPS John finished his homework.

4.1.3 Opacity

Epistemic adverbs (*possibly, allegedly*) create opaque contexts for both the subject and the object, while some manner adverbs like *intentionally*, do only for the object, as shown in examples from [Thomason and Stalnaker \(1973\)](#) in (20)-(21):

- (20) Oedipus allegedly married Jocasta
 \nRightarrow the son of Laius allegedly married Jocasta
 \nRightarrow Oedipus allegedly married his mother
- (21) Oedipus intentionally married Jocasta
 \Rightarrow the son of Laius intentionally married Jocasta
 \Rightarrow Oedipus intentionally married his mother

The takeaway for [Thomason and Stalnaker \(1973\)](#) regarding opacity is that there are adverbs like *intentionally* which are not opaque for the entire proposition, only the object. Thus such adverbs cannot be treated the same as propositional adverbs, taking sentences and returning sentences. Instead they must modify an event without the agent specified.

4.1.4 Adverbs as arguments

[McConnell-Ginet \(1982\)](#) notes that subject-oriented manner readings (22) can be ambiguous in passives (either Sandra or Aubrey can be reluctant), while they are

actually disambiguated in non-passives (only Aubrey can be reluctant) (23).

(22) Sandra was reluctantly aided by Aubrey.

(23) Aubrey reluctantly aided Sandra.

McConnell-Ginet (1982) also notes that some adverbs are actually selected for in the case of certain verbs, like (24). Because of this, she analyzes adverbs not as adjuncts but as arguments. Under this analysis, all verbs have a potentially unsaturated additional adverb argument position (or more than one). This is compatible with a Davidsonian approach as well – events can just be described by further conjuncts, as in (25).

(24) JT worded his letter *(poorly).

(25) $\exists e : AIDING(e) \wedge AGENT(e, Aubrey) \wedge PATIENT(e, Sandra) \wedge MANNER(e, reluctant)$.

(25) allows for the ambiguity of reluctance in (22). The fact that Sandra can no longer be reluctant in the active (23) is explained by the fact that for McConnell-Ginet (1982), adverbs attach directly to the verb, and not to the entire event. So the additional verb ‘to be’ in the passive allows for an additional interpretation, whereas the active can only have the meaning in (26).

(26) $\exists e : AIDING(e) \wedge MANNER(AGENT, reluctant) \wedge AGENT(e, Aubrey) \wedge PATIENT(e, Sandra)$.

However, if adverbs are really arguments, the iterability and relatively free positioning within a sentence are harder to explain. Adverbs can also be sensitive to islands, even those rare adverbs which are selected for, as in the following French example from Rizzi (1990):

(27) a. ?Avec qui ne sais-tu pas [comment [PRO te comporter t t]]

With whom don’t you know how to behave?

b. *Comment ne sais-tu pas [avec qui [PRO te comporter t t]]

*How don't you know with whom to behave?

(See Graf (2013b) on why island-sensitivity would follow from iterability and free positioning.)² Rizzi (1990) also proposes that sensitivity to weak islands is not necessarily a property of either arguments or adjuncts, but rather follows from certain interpretive properties, like specificity, D-linking, and whether the extracted element is presupposed. Although island facts may then not necessarily be a good indicator of adjuncthood, iterability and free positioning still distinguish adverbs from other syntactic categories. Thus it seems adverbs, even in the rare cases when they are selected for, still behave differently from arguments. I therefore continue to consider them as adjuncts.

The takeaway of this section is that although adverbial properties like modifying events or propositions, opacity, and veridicality may explain some elements of adverbial distribution, none of them is enough to explain the ordering preferences seen among the five classes in the reduced adverb hierarchy.

4.2 Semantic Restrictions on Adverb Combinations

In addition to the ordering restrictions imposed by the adverbial hierarchy, there are some additional restrictions on adverb placement and ordering which are due to semantic factors, as detailed in the following section. Each of these restrictions are needed in conjunction with the syntactic adverb hierarchy.

4.2.1 Contraction to adverbs

Though it may seem phonological at first glance, the availability of contraction of finite auxiliaries to adverbs is based on semantic class. Only adverbs that are evidential or epistemic allow contraction, as seen in (28). Lower adverbs, including

² Graf, following Truswell (2007), also notes that syntactic adjuncts do not universally appear to be islands and suggests that adjuncts with theta roles may be semantic non-adjuncts, therefore not islands.

temporal, frequency, and manner adverbs, cannot host contractions (29). Presumably this is due to the differences in structural base position for the different adverb classes. Kaisse (1985) provides further discussion on auxiliary contraction possibilities.

- (28) a. Fabio apparently's going to summer school.
b. Katrina probably'd eat the entire cake if she had the chance.
- (29) a. *Cole then'd go to the party if he could.
b. *Jan often's eating rice in private.
c. *Ben quickly's making deals with everyone.

4.2.2 Downward entailing contexts

Bellert (1977) notes that certain (high) adverbs, like *fortunately*, *evidently*, *paradoxically*, *possibly*, *maybe*, *probably*, *allegedly* and *hardly* are degraded in questions, imperatives and antecedents of conditionals. Along similar lines, Nilsen (2003) notes a possible restriction on high adverbs in downward entailing contexts, like those in (30)-(35) below:

- (30) Did Stanley (*ADV) eat the wheaties?
- (31) If Stanley (*ADV) ate the wheaties...
- (32) (*ADV) eat (*ADV) the wheaties!
- (33) Stanley (ADV) didn't (*ADV) eat the wheaties.
- (34) I hope Stanley (*ADV) ate the wheaties.
- (35) No students (*ADV) ate the wheaties.

Nilsen (2003) calls such high adverbs 'positive polarity items' because of their sensitivity to such contexts. However, not all 'high' adverbs are banned in these contexts, at least not in English.

- (36) Did Stanley (*fortunately/*evidently/*paradoxically/possibly/maybe/probably/allyedly/hardly) eat the wheaties?
- (37) If Stanley (fortunately/evidently/paradoxically/possibly/maybe/probably/allyedly/hardly) ate the wheaties...
- (38) (*Fortunately/*Evidently/*Paradoxically/*Possibly/Maybe/*Probably/*Allegedly/*Hardly) eat the wheaties!
- (39) Stanley didn't (*fortunately/*evidently/*paradoxically/*possibly/*maybe/*probably/*allyedly/*hardly³ eat the wheaties.
- (40) I hope Stanley (*fortunately/*evidently/*paradoxically/?possibly/?maybe/?probably/?allyedly/hardly) ate the wheaties.
- (41) No students (?fortunately/?evidently/?paradoxically/?possibly/?maybe/?probably/allyedly/hardly) ate the wheaties.

It seems that evaluative adverbs are ungrammatical in questions (36), imperatives (38), and under the scope of negation (39). Epistemic adverbs are also ungrammatical in imperatives and under negation, but are grammatical in questions. In (38), *Maybe eat the wheaties!* is grammatical for most speakers, but it seems to have more of a suggestion interpretation (like *Maybe you could eat the wheaties!*), more than a strict imperative.

Although there are certainly restrictions on propositional adverbs which are not seen in event adverbs (manner adverbs are fine in each of these downward entailing contexts, for instance), epistemic and evaluative adverbs behave differently from each other yet cohesively as two individual groups, as shown in Table 4.1, providing further evidence that they are distinct syntactic classes.

³ *Hardly* is acceptable here in some dialects of American English as a double negative.

Grammatical in:	questions	imperatives	negation	contraction
evaluative	✗	✗	✗	✓
epistemic	✓	✗	✗	✓
temporal	✓	✓	✓	✗
frequency	✓	✓	✓	✗
manner	✓	✓	✓	✗

Table 4.1: Adverb properties by class

4.2.3 Redundant and entailed adverbs

Multiple adverbs of the same class should theoretically be able to combine in a single proposition, but much as repeating identical adverbs is strange and infelicitous, adverbs of the same class are often degraded. Either they are redundant, like (42), or there is an entailment relationship, like (43).

(42) ?John perhaps possibly walked away.

(43) ?John definitely maybe walked away.

These are not totally ungrammatical, however, since the interpretations still allow for a coherent semantics, albeit one where the speaker is emphasizing a degree of mid-utterance uncertainty.

(Cinque, 1999) mentions the ungrammaticality, along the lines of (42):

(44) ?Stanley surely probably ate his wheaties.

(45) ?Stanley probably surely ate his wheaties.

(46) Stanley probably happily ate his wheaties.

Cinque (1999) concludes that this degree of ungrammaticality is just a result of the general fact that the cooccurrence of two adverbs ending in -ly is quite regularly degraded, but this doesn't account for the preference most speakers have for (46) over

either (44) or (45). Nilsen (2003) states that in this case the strangeness may result from the speaker finding it probable that they are sure that Stanley ate his wheaties. In other words, it is a semantic clash regarding the speaker's epistemic state.

4.2.4 Coordination of adverbs

Coordination is generally restricted to elements of the same semantic type, so if the essential adverb classes are distinct, as claimed, then it should be the case that adverbs within those classes can be coordinated, but not adverbs from different classes (note that there are many examples of items from distinct *syntactic* classes conjoining, as seen in Sag et al. (1985)). Indeed, this is true for the most part, as shown in (47). Adverbs from the same class can generally be conjoined, and conjunctions of adverbs from different classes (48) are quite bad.

- (47) ?John frankly and fortunately did all of the work. [Evaluative]
 John allegedly and apparently took his time. [Epistemic]
 John now and then eats a ham sandwich. [Temporal]
 Mary always and often did the dishes. [Frequency]
 Kara carefully and quietly made a plan. [Manner]
- (48) *John frankly and allegedly did all of the work. [Evaluative and epistemic]
 *John allegedly and then took his time. [Epistemic and temporal]
 *John then and frequently eats a ham sandwich. [Temporal and frequency]
 *Mary always and carefully did the dishes. [Frequency and manner]

Note that it is the evaluative adverbs which are least acceptable under conjunction. However, this is not surprising, since having multiple evaluative adverbs in one sentence is generally ungrammatical (49) (there are no sentences in COCA with multiple evaluative adverbs in any order).

- (49) ??John frankly fortunately did all of the work.

(50) ??Frankly, John fortunately did all of the work.

This ungrammaticality cannot be purely due to semantic incompatibility, since (51) is more acceptable.

(51) Frankly, it was fortunate that John did all of the work.

This is due to the height of attachment and interpretation of the adverbs in (49), where both *frankly* and *fortunately* are speaker evaluations about the entire proposition (and there must be some restriction on the number of evaluations per proposition), whereas in (51), *frankly* scopes over the entire proposition *It was fortunate that John did all of work*, and in this case only *frankly* is the speaker's evaluation, while *fortunate(ly)* is simply asserted. (See 4.3 for a semantic account of evaluative adverbs.)

Some coordinations, like (52), are perhaps ungrammatical not because they are different categories, but because of the entailment relation of two modal adverbs, for instance (4.2.3).

(52) #John necessarily and possibly did all of the work.

Note that with an accommodating context, conjunctions with apparently entailed adverbs can be acceptable, as in (53) – but the order matters here, as (54) is less acceptable.

(53) John possibly and maybe even necessarily did all of the work.

(54) #John necessarily and maybe even possibly did all of the work.

Many combinations of temporal adverbs are also not fully grammatical, but this isn't because of a clash specific to conjunction either, rather that a tense mismatch within a sentence creates ungrammaticality, as in (55).

(55) *John tomorrow and yesterday did all of the work.

When temporal adverbs do not create a tense mismatch, then they can be combined, as in (56).

(56) John will do all of the work today and tomorrow.

4.3 An Integrated Adverb Semantics

The basics of adverb semantics can be formalized under a number of approaches. The operator approach (Kamp, 1975) within the Montagovian tradition states that adverbs are functors which return the same type as that of their argument. There is a split between adverbs that take a truth value (or a proposition) to return a truth value (or proposition), and adverbs that take a set (or concept) and return a set (or concept). This goes along the lines of the event/propositional divide described in §3.1, which I generally adopt here.

However, there are some additional considerations to be made for the semantics of different classes of adverbs.

4.3.1 Semantics of evaluative adverbs

Recall that in the simplified adverb hierarchy in §1.3, evaluative (or speaker-oriented) adverbs are in the highest position. This is also true for Cinque’s hierarchy. Evaluative adverbs are always propositional adverbs (not event adverbs) because they require the speaker’s evaluation of the entire proposition. For instance, *fortunately* in (57) refers to the speaker’s evaluation that the fact that Ceres finished her homework is fortunate.

(57) Ceres fortunately finished her homework.

Potts (2005) treats evaluative adverbs as triggers for conventional implicatures. Under this view, (57) entails the following two things: (1) the at-issue content: Ceres finished her homework and (2) the conventional implicature: It is fortunate that Ceres finished her homework. The CI in (2) must be an implicature and not at-issue because it cannot

be denied, questioned, or negated; i.e. (58) is not felicitous, and nor is the negation in (59).

- (58) A: Ceres fortunately finished her homework.
 B: #No she didn't. The professor assigned the wrong questions, so it was unfortunate that she finished it.
- (59) Ceres fortunately didn't finish her homework. \neq It wasn't fortunate that Ceres finished her homework.

Another property of evaluative adverbs is that they appear to take wide scope. Scheffler (2013) presents the example in (60), noting that (a) can mean that John is putting on an act where he pretends not to love Mary, but he actually does love her, but (b) cannot have this meaning.

- (60) (a) Mary is upset because it is obvious that John doesn't love her.
 (b) Mary is upset because John obviously doesn't love her.

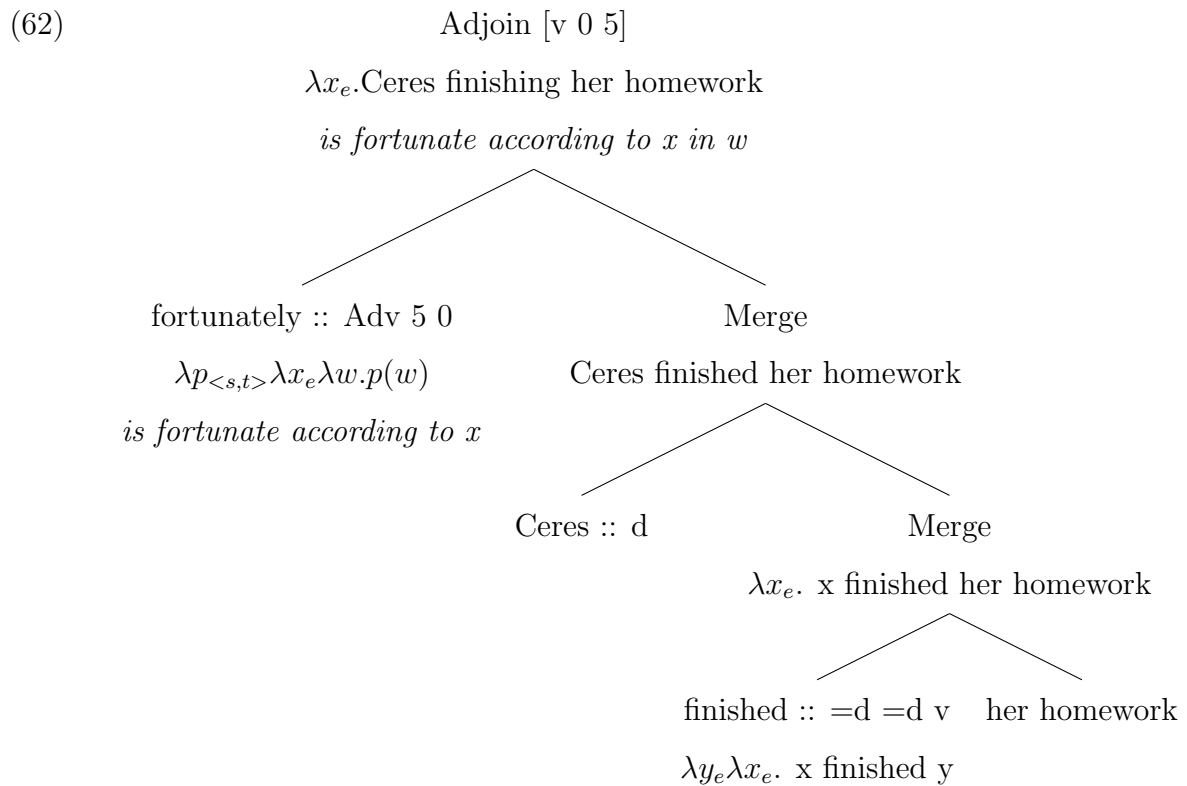
Liu (2012) similarly notes that evaluative adverbs must take widest scope, and cannot be within the scope of negation or quantification. This explains the ban on wh-movement of evaluative adverbs, since if evaluative adverbs were wh-questioned, they would necessarily be under the scope of the wh-question operator. Similarly Bellert (1977) explains this ban by a restriction on simultaneously asking a question and asserting a proposition. This is one area where adverbs and adjectives' behavior differs (see Chapter 4 for others), as a sentence like 'How fortunate was it that John got the job?' is grammatical. This ban for evaluative adverbs therefore must just be stipulated – the adverb form is not at-issue, but the adjective form is.

Thus evaluative adverbs are sentence level adverbs of type $\langle\langle s, t \rangle, \langle s, t \rangle\rangle$, and they can be thought of as introducing the additional evaluation in (61).

- (61) $\llbracket \textit{fortunately} \rrbracket = \lambda p_{\langle s, t \rangle} \lambda x_e \lambda w. p(w)$ is fortunate according to x

Though this evaluation is not at-issue, per [Potts \(2005\)](#), *fortunately* just introduces the speakers' evaluation on a separate CI tier.

The semantic computation can be applied in the minimalist grammar framework along with the syntactic composition, as shown in (62), where the CI tier information is in italics.



4.3.2 Semantics of epistemic adverbs

Like evaluative adverbs, epistemic adverbs (*probably*, *perhaps*) are propositional. Because their meaning overlaps with possibility and necessity modals, it is straightforward to use possible world semantics to evaluate the meaning of such adverbs, as in (63) and (64) below ([Cresswell, 2012](#)).

$$(63) \quad \llbracket necessarily_R \rrbracket = \lambda p_{<s,t>}\lambda w.\forall w' \in R(w)[p(w')]$$

$$(64) \quad \llbracket possibly_R \rrbracket = \lambda p_{<s,t>}\lambda w.\exists w' \in R(w)[p(w')]$$

The meaning of *John necessarily ate a sandwich*, then, is that for all worlds accessible by some accessibility relation R , the proposition that *John ate a sandwich* is true.

4.3.3 Semantics of tense and aspectual adverbs

The class of tense and aspectual adverbs includes adverbs like *just* and *then* which are more anomalous than the adverbs of any other class, as they tend to be more restricted and have lower grammaticality scores overall (see §2.1.2) when combined with other adverbs. One reason for this may be that most of these adverbs are not derived from adjectives using the *-ly* suffix, and are rather what is referred to as lexical adverbs. They also require (or instantiate) specific tenses or aspectual information, making them potentially incompatible with other adverbs that require a different tense or aspect. These adverbs (and those below it in the hierarchy) take events rather than propositions.

[Altshuler \(2010\)](#) provides an analysis for various temporal adverbs, like *then* and *now*. He proposes that they combine with a tense operator in T , tense operators being relations between some time t and the speech event of the utterance e_0 . For instance, the past tense operator is given in (65), stating that some event happened at a time t previous to the run-time of the speech event.

$$(65) \quad \llbracket T_{PST} \rrbracket = \lambda Q \lambda s \lambda t [t < \tau(e_0) \wedge Q(s, t)]$$

The denotation of *then* is shown in (66); *then* provides a ‘state input’ (s_n) which requires a topic state as an antecedent, and it supplies an unspecified time input.

$$(66) \quad \llbracket then \rrbracket = \lambda Q \exists t [Q(s_n, t)]$$

It is possible that the topic state can be an overt antecedent, as in (67), though it need not be.

$$(67) \quad \text{Mary ran into the room, then she ran back out.}$$

Now is acceptable only in stative verb phrases (see (68)-(69)), and Altshuler (2010) gives it the denotation in (70), where *CONS* is a relation requiring the speech event to be a ‘consequent state of the perspectival event’.

(68) John now accepts his children.

(69) *John now ran five miles.

(70) $\llbracket now \rrbracket = \lambda Q \exists t \exists s [t = \tau(e_n) \wedge \text{CONS}(e_n) = Q(s, t)]$

Altshuler (2010) does not provide a denotation for the aspectual *just*⁴, but I would extend his analysis to give it the denotation in (71), which requires the event to occur recently before the utterance time.

(71) $\llbracket just \rrbracket = \lambda Q \lambda s \lambda t [t < \tau(e_0) \wedge Q(s, t) \wedge \text{RECENT}(t)]$

4.3.4 Semantics of frequency adverbs

Frequency adverbs, like *always*, *never*, and *often*, are often treated as quantificational, since they tend to quantify over the frequency or time of events in a world. Some, but not all, of these adverbs are gradable, so they may involve a degree modifier as well (Heim, 1982).

To interpret frequency adverbs like *often* or *rarely*, Doetjes (2007) argues that a standard of comparison (*n*) is needed, which may be contextually determined. For instance, *rarely* refers to an event which occurs ‘less than *n* times, where *n* is contextually determined by a norm/what we expect’ (Doetjes, 2007).

⁴ Aspectual ‘just’ is distinct from the degree adverb ‘just’, which has similar semantics to ‘only’, or the manner adverb ‘just’, which has similar semantics to ‘barely’:

(i) I just/only wanted for them to like me.

(ii) I just/barely finished in time.

4.3.5 Semantics of manner adverbs

Cresswell (2012) and Parsons (1990) extend the scope of the Davidsonian approach to manner adverbials like *slowly*, noting that manner adverbs can modify events through simple conjunction. For instance, *John walked quickly* can have the denotation in (72).

$$(72) \quad \exists e : WALKING(e) \wedge AGENT(e, John) \wedge \mathbf{QUICK}(e).$$

Such an analysis maintains the veridicality of manner adverbs, since it is clear from (72) that *John walked quickly* entails *John walked*. For consistency we can write the denotation of *quickly* as in (73).

$$(73) \quad \llbracket quickly \rrbracket = \lambda e. quick(e)$$

This denotation in (73) is ambiguous between a quick event time and John walking in a quick manner - the two readings are not distinguished here. A combination of multiple manner adverbs ('John quickly walked excitedly') works in the same way, as in (74). The sentence also entails *John walked*, *John walked quickly*, and *John walked excitedly*.

$$(74) \quad \exists e : WALKING(e) \wedge AGENT(e, John) \wedge \mathbf{QUICK}(e) \wedge \mathbf{EXCITED}(e).$$

That entailment falls out in this way seems generally desirable, although note that there are occasionally questionable consequences of treating all manner adverbs this way, as in (75) below.

$$(75) \quad \text{James partially ate the apple.} \Rightarrow \text{James ate the apple.}$$

Although adverbs like 'partially' are certainly manner adverbs in terms of their distribution with regard to other adverbs, it is possible that they belong to a semantically distinct subclass of manner adverbs. Schäfer (2008) notes that true manner adverbials

should be paraphrasable as either ‘in an Adj manner’ or ‘How X, that is Adj’ (based on the test from Bartsch (1976)). Indeed, such tests work for an unproblematic manner adverb like *quickly* (76), but they fail for *partially* (77) (and its opposite, *completely*).

(76) John walked in a quick manner. How John walked was quick.

(77) *John ate the apple in a partial manner. *How John ate the apple was partial.

However, the contribution of ‘partially’ to the sentence is such that it describes a property of the eating event, and not of John or of the speaker. It also is degraded in wh-questions, which is unexpected for a manner adverb (78).

(78) ?How partially did John mow the lawn?

Intuitively, much like ‘occasionally’ in 3.2.1, (78) sounds worse than other wh-questions with manner adverbs because ‘partially’ is not gradable - something is either partial, or not. Thus even while ‘partially’ appears to occasionally behave differently from other manner adverbs, this is due to being part of a subclass of non-gradable adverbs, and *not* due to being part of a syntactically distinct non-manner class. Likewise, although the entailment in (75) is questionable (since ‘to eat’ a definite NP implies completion), this does not mean that the semantic characterization in (72) is incorrect. Indeed, the entailment given by (79) seems perfectly reasonable.

(79) $\exists \text{eating}(e) \wedge \text{AGENT}(e, \text{James}) \wedge \text{THEME}(e, \text{the.apple}) \wedge \mathbf{PARTIAL}(e). \Rightarrow$
 $\exists \text{eating}(e) \wedge \text{AGENT}(e, \text{James}) \wedge \text{THEME}(e, \text{the.apple})$

Furthermore, although adverbs like *quickly* and *cleverly* are known to have two possible readings, the strict manner reading and what is often called the subject-oriented reading (indicated by a paraphrase of the kind ‘it was quick/clever of Subject to do X’), both readings are describable by the same semantic denotation here. It is a matter of lexical ambiguity what it means for a walking event to be quick – is the duration of the entire

event quick, or is the manner of moving the limbs performed quickly? For our purposes, this is really a case of vagueness resulting from the ambiguity of the adjective ‘quick’ itself: ‘That was some quick walking by John’ can again have either a subject oriented or manner reading (so too with *beautifully* and *beautiful dancer*). [Cresswell \(2012\)](#) and [Rawlins \(2013\)](#) address such issues of gradability in more detail, and [Tenny \(2000\)](#) breaks down event structure into subparts to account for the ambiguity.

It is true that some manner adverbs, like *reluctantly* and *willingly* require an individual argument, whereas some manner adverbs like *quickly* do not necessarily require one. Though it may seem strange to include both traditionally subject-oriented and non-subject oriented manner adverbs in the same category, with regard to ordering they do pattern together, as seen in [\(80\)](#).

- (80) a. John always reluctantly does the dishes.
 b. The party always quickly ends.
 c. I quickly reluctantly returned home. / I reluctantly quickly returned home.

4.3.5.1 A note on ambiguous scope

Occasionally, two adverbs can cooccur and result in two different possible meanings due to a scope ambiguity. Such ambiguities were noted by [Avery Andrews \(1983\)](#) and later analysed by [Pesetsky \(1989\)](#) and others, including [Cinque \(1999\)](#). These are sentences of the type in [\(81\)](#).

- (81) John intentionally twice knocked on the door.

[\(81\)](#) can mean either (a) John knocked twice, and it was intentionally twice instead of some other number, or (b) John knocked twice, and both times were with intention. Though the adverb order in [\(81\)](#) is not predicted by the simplified hierarchy, this is likely a case of *intentionally* directly modifying *twice*. As shown in [Neeleman and Payne \(2017\)](#), in an unambiguous sentence, when *twice* is replaced with a synonymous

phrase that cannot directly modify adverbs, like *a second time*, the order becomes ungrammatical (82). Likewise, when *twice* is replaced with *a second time*, the ambiguous (81) is disambiguated (83), and can only have the meaning where John knocked twice, and it was intentionally twice instead of some other number. So, sentences of this type rely on adverbial modification to generate the unexpected order.

(82) *John a second time continuously knocked on the door.

(83) John intentionally a second time knocked on the door.

4.4 Where Semantics Matters

Though the above sections provide semantic analyses proposed by different authors for each adverb class, each of these semantic derivations can also be encoded with MGs, as in (62). One important, yet unanswered question is whether the five classes in the reduced hierarchy can themselves ‘fall out’ from semantic analyses. I do not think the semantics necessitates such a partition, since although semantic reasons can account for why sentence-level adverbs must appear higher than event-level adverbs, this is not enough to derive the rest of the classes in the adverb hierarchy. For instance, frequency and manner adverbs are both event-level adverbs, but frequency adverbs always appear higher than manner adverbs syntactically.

While it is of course important to have a coherent semantics of adverbials for its own sake, there are also several key distributional gaps in adverb ordering which can be explained by appealing to their semantics rather than the notion that they belong to distinct syntactic classes. The most notable of these gaps are as follows: some epistemic and evidential adverbs are ungrammatical under negation, due to their being positive polarity items (§3.2.1); multiple evidential adverbs are ungrammatical in a single proposition, due to a restriction on multiple speaker evaluations from a single sentence (§3.2.2), and non-gradable adverbs are ungrammatical in *wh*-questions, which is a phenomenon that occurs across adverb classes (§3.3.5). Though these semantic

restrictions have an effect on adverbs' syntactic distribution, in each case the restriction is based on something distinct from their syntactic adverb class.

Chapter 5

ADJECTIVES AND ADVERBS

The categories of adjectives and adverbs have a great deal in common, enough so that they have occasionally been considered part of the same category both grammatically and conceptually ([Baker, 2003](#); [Bybee, 1985](#)). Both are modifiers which can be iterated yet have some sort of ordering restriction. Both also are subject to the PMC. §5.1 introduces these similarities. However, there are some crucial differences between related adverbs and adjectives, as §5.2 shows. The issue of adjectival ordering is discussed in §5.3, which argues that although adjective ordering may be straightforwardly predicted by subjectivity (as shown by [Scontras et al. \(2017\)](#)), the same cannot be said for adverbs. Universality is also argued to not predict adverb order, though it has been claimed to work for adjectives ([Danks and Glucksberg, 1971](#)). Though adverbs do not share the same conceptual basis for ordering as adjectives do, adjectives can also be modeled using MGs with adjunction, as shown in this section. §5.4 briefly discusses the possibilities for the structure of adverbs with regard to adjectives. Ultimately, I conclude that while understanding the precise nature of the relationship between adverbs and adjectives is still a challenge, the fact that both categories obey the PMC indicates that they do have more in common syntactically than what was previously known, though they still have many differences.

5.1 Adjective and Adverb Similarities

Like nouns and verbs, adjectives and adverbs (and prepositions) are commonly stated to be distinct basic lexical categories ([Radford, 1997](#); [Haegeman and Guéron,](#)

1999) (though there are possible exceptions for each category; see Baker (2003)). However, adjectives and adverbs share a relationship which is nonexistent between the other presumed categories.

As adverbs have a hierarchy of possible word orders, so do adjectives. It is well-known to learners of a second language that certain adjectives have a fixed order where they must appear with respect to each other. For instance, in English, it must be that, in the absence of focus, size descriptors and color descriptors precede other adjectives, in that order: *small red happy dogs* but not **red happy small dogs*. Though the specific classes in the adverb and adjective hierarchies may be different ones, both grammatical categories have some sort of internal hierarchical structure which affects their distribution.

Furthermore, just as some adverbs describe properties of events, so do some adjectives. In fact, it has been argued (Emonds, 1976) that adjectives and adverbs are members of the same category, as they are in complementary distribution, with the only variation being syntactic. Consider the pair in (1)-(2).

- (1) Tim was working noisily.
- (2) Tim was working and it was noisy.

These sentences are identical in meaning, but they are syntactic variants of one another. The Single Category Claim (SCC), endorsed by Emonds (1976); Radford (1988); Baker (2003), and others, states that adverbs and adjectives are indeed members of a single category, and their evidence is all based in claims of syntactic complementarity.

Payne and Pullum (2010) also discuss the issue of whether or not adverbs and adjectives are distinct categories; they conclude that the categories are in fact separate. Again, their evidence against the SCC is primarily syntactic; they show that whether you get an adverb or adjective cannot be reliably predicted by its distribution. For instance, there are both adjectives (3) and adverbs (4) which appear as external modifiers of NPs.

- (3) She was [such a baby].
- (4) She had endured it with [barely a complaint].

The data in [Payne and Pullum \(2010\)](#) comes from languages like English and Italian, which have unique adjectival and adverbial forms, typically with a direct visible relationship between adverb and adjective pairs. This is common, but it is not the only pattern seen in the world's languages. Consider the following adverb-adjective pairs in Indonesian:

- (5) *cepat* 'quick' - *cepat* 'quickly'
- (6) *bising* 'noisy' - *bising* 'noisily'
- (7) *benar* 'correct' - *benar* 'correctly'

Notice that the adjectival and adverbial forms are the same. This is not true for every pair in Indonesian (because there are some adverbs of time, for instance, that have no 'corresponding' adjectival version, like 'here' or 'tomorrow') but it is the case for the majority of adverbs. There is no productive ADJ + Suffix = ADV rule like that which is found in English and most Romance languages. This means that given a word like *cepat* with no context, we do not know if it is an adjective or if it is an adverb. Similar correspondences are seen in languages like Dutch and Turkish. Though this may seem strange, there are actually a few English pairs with this property, too. Consider the sentence in [\(8\)](#).

- (8) Heidi takes her *daily* pill *daily*.

This sentence shows 'daily' being used as both an adverb and an adjective. The distinction is made clear only from syntactic position. Pairs like this are relatively infrequent in English, though in colloquial English they are becoming more common. It is not unusual to hear speakers remark something like [\(9\)](#), where *quick*, though

typically an adjective, is being used as an adverb:

- (9) Could you hand me that toothbrush really quick?

Sentences like (9) are still considered ‘degraded’ in Standard English, but they are used frequently in less formal settings. One could even view this usage as minor evidence for the Single Category Claim – clearly there is not a huge conceptual difference between adjective and adverb if they are so easily collapsed. However, the pattern is not fully generalizable, even in informal registers, as seen in (10), which is universally not accepted. Interestingly, when modified by adverbs, even examples like (10) generally improve, as seen in (11).

- (10) *Could you hand me that glass careful?

- (11) ?Could you hand me that glass real careful?

There are many languages which behave similarly to Indonesian with regard to adjective/adverb morphology (e.g. Dutch or Turkish). From a universalist viewpoint, we assume that languages like Indonesian are underlyingly no different from languages like English, and that the lack of overt distinction between adjective and adverb means nothing about the psychological categories of the speaker. However, it remains a possibility that speakers of languages like Dutch or Indonesian actually do not make a distinction between adjective and adverb, since the categories are not obviously distinct in their language.

5.1.1 Non-derived adverbs

While most adverbs in English have a corresponding adjectival form (*frankly/frank*, *possibly/possible*, *frequently/frequent*, *cleverly/clever*), there are some non-derived, or lexical adverbs, which have no corresponding adjectival form. Most tense and aspectual adverbs are of this type (*once*, *then*, *just*, *soon*), but *well* is a manner adverb of this type as well. In addition, there are other lexical adverbs which take an identical

form to an adjective, like *fast*, *early*, *slow*, *less*, *hard*, *close*, and *more*. Such adjectival forms are restricted to appearing postverbally, as [Jackendoff \(1972\)](#) noted.

However, this restriction does not apply to *well* (and possibly *fast*, depending on dialect), even though it is a lexical adverb. In passive constructions, it can appear either pre- or post-verbally, as shown in (12). (For more on modification of passive verbs, see [Kennedy and McNally \(1999\)](#)).

(12) The table had been (well) set (well).

(13) The beef had been (*slow) eaten (slow).

However, in actives, all non-ly manner adverbs are ungrammatical in preverbal position (including ‘well’) (14). This distinction in the case of ‘well’ could result from the movement of verbs in actives, but not passives, eliminating the option for the once postverbal position ([Caponigro and Schütze, 2003](#)).

(14) The boy (*well) runs (well).

5.1.2 The single category claim

Given these similarities, as well as the fact that the PMC applies to adjectives and adverbs equally (see §5.3), it seems reasonable to posit that underlyingly, adverbs and adjectives are members of a single lexical category, which will (sometimes) surface differently as a result of a morphological spell-out rule that attaches *-ly* (or the equivalent adverbial ending in each language) in the syntactic positions where adverbs appear. In cases where adverbs and adjectives are identical, the spell-out rule would be one of zero derivation. The following section introduces some environments where, in addition to differences in their syntactic position, adverbs and adjectives also appear to have differing underlying semantic properties, indicating that though they may be a single conceptual category, their contrasting distribution syntactically must result in semantic ramifications.

5.2 Adjective and Adverb Differences

Even in cases where an adverb seems straightforwardly derived from an adjective and *-ly* suffix, the adverb cannot always be replaced by an adjectival paraphrase, as shown in (15)-(16), even if a corresponding adjective exists (17). It is a lexical property of these adjectives that they can only be used attributively and not predicatively, which is a distinction that is not reflected by the corresponding adverbs.

(15) John merely/formerly ate a sandwich.

(16) *It was mere/former that John ate a sandwich.

(17) John ate a mere/former sandwich.

There also exist some seemingly derived adverbs which have a difference in meaning from their adjectival counterpart, like *square* and *squarely*.

Additionally, while evaluative and epistemic adverbs seem to be ruled out in downward entailing contexts (§3.2.1), the same is not true for the corresponding adjectival paraphrase:

- (18) a. * Yul didn't possibly win.
b. It is not possible that Yul won.

Based on this fact, Nilsen (2003) (and others) state that there must be a truth-conditional difference between Subject-Oriented adverbs and adjectives. The difference can be seen in some epistemic adverb/adjective pairs, where the adjectival form creates a cancellable proposition, but the adverbial form does not.

- (19) a. It's possible that Becky will win. . .
b. # Becky will possibly win. . .

. . . even though she certainly won't.

Nilsen (2003) proposes that the adverb version is not compatible with the continuation because adverbs are inherently stronger statements than the adjective equivalent.

Payne and Pullum (2010) note also that where adjectives can take complements, as in (20), most adverbs cannot (21).

(20) Brad was proud [of his wife].

(21) Brad smiled proudly *[of his wife].

However, some adverbs can take a PP, as in (22)- (24).

(22) Fortunately [for us], Brad smiled independently [of any reason].

(23) Brad smiles similarly [to his wife].

(24) Brad smiled proudly [for his wife].

In some languages, like German, adverbs and adjectives inflect differently, with adjectives having a series of case declensions, even though apart from the inflection the adverb and adjectival form is identical (e.g. *ensetzlich*, ('awful, awfully') (Bartra and Suñer, 1997).

There are also many cases where the adjectival form of an adverb is gradable, but the adverb is not, as in (25). This is a challenge to explain if adjectives and adverbs are somehow the same.

(25) a. *How possibly/probably is it?

b. How possible/probable is it?

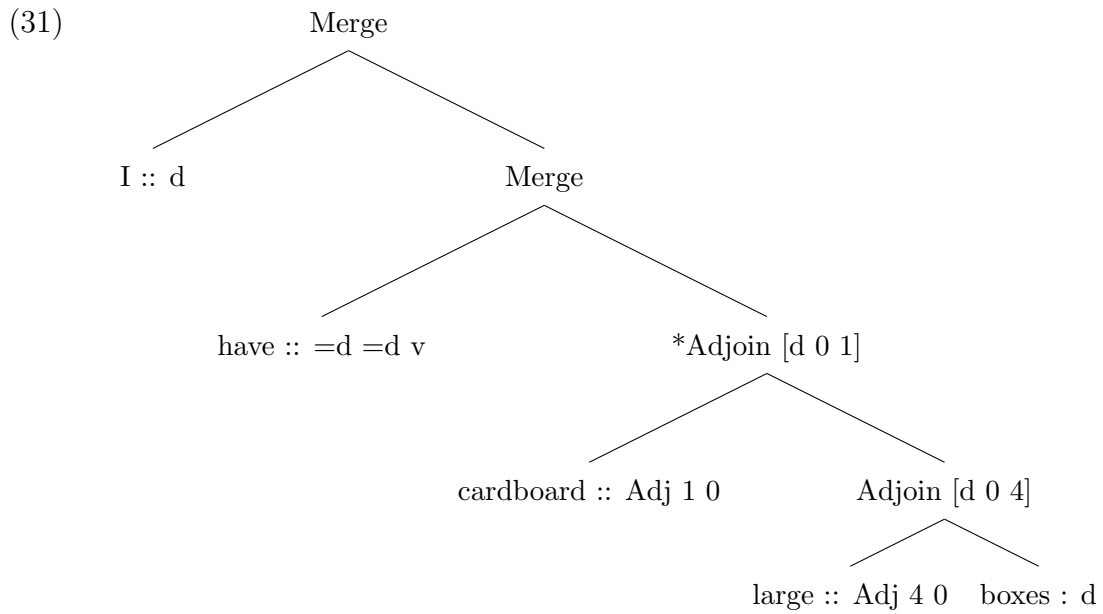
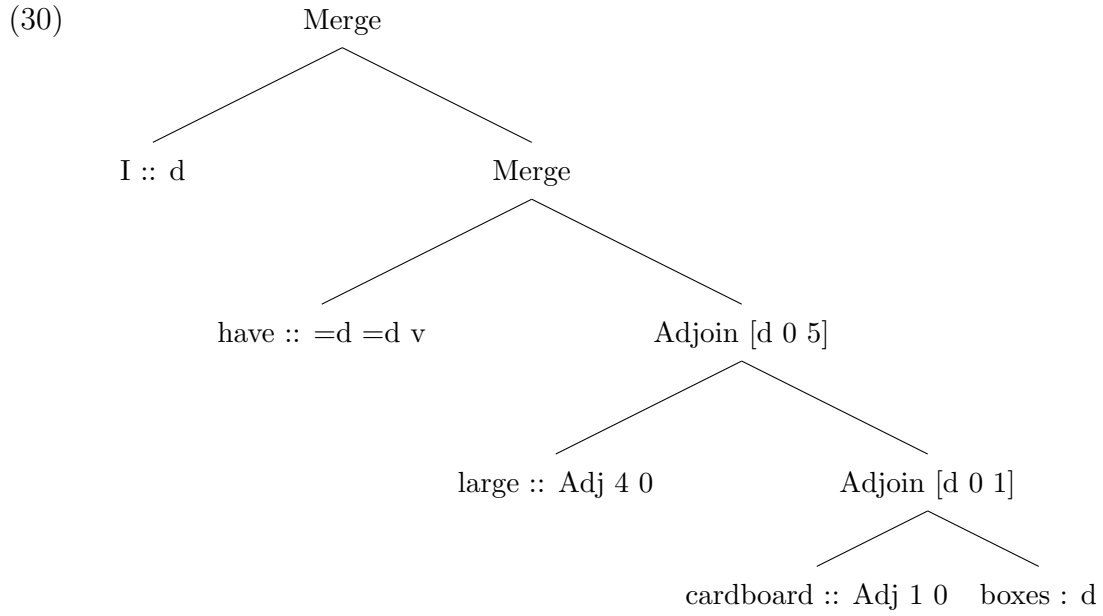
5.3 Adjective Ordering

Though adjectives do often behave differently than adverbs, it is clear that they have a great deal in common. Adjectives also have what can be considered a required ordering among adjectives cross-linguistically, though it is not straightforwardly isomorphic to the adverb ordering hierarchy, since not all adverbs have an adjectival

(29) ??I have several cardboard green large boxes.

Neurological studies have shown that speakers hearing an ungrammatical adjective order will generate a P600 and N400 ERP response, indicating both a syntactic and semantic violation (Kemmerer et al., 2007). Studies have also shown that speakers with language impairments due to brain damage can have difficulty identifying the ‘correct’ adjective order in a language, even when they know the general syntactic rule that adjectives modify nouns and other adjectives, and they are also able to identify which semantic property adjectives describe (i.e. size or color) (Kemmerer et al., 2009). So, adjective ordering is a grammaticalized feature, and not just a conceptual property (though it is also a conceptual property, since the adjective ordering relation is the same cross-linguistically).

Just as MGs with an ordering relation on adjunction were used to model adverb classes in §3, the same can be done with adjectives, which will have their own internal ordering relation – in this case a seven-level one, if we take the hierarchy in (26) as given. Here number adjectives would be given rank 7 and material adjectives rank 1 (the lowest adjective class). Unlike adverbs, adjectives cannot adjoin anywhere in a clause – they are adjuncts in the NP/DP domain only, and in English must be linearized to the left. An example MG derivation with adjectives is shown for the grammatical sentence in (30) and the ungrammatical sentence in (31).



5.3.1 Adverbs modifying adjectives

The adverb classes in the simplified hierarchy of Chapter 2 are established on the basis of their ordering as verbal (or sentential) modifiers. However, adverbs also have an ordering relation to obey when in a pre-adjectival position, though adverbs are subject to the additional semantic requirement of compatibility with the adjective.

Predicative adjectives can be modified by each adverb class in the hierarchy, in their expected orders, as seen in (32).

- (32) She is (frankly) (probably) (still) (frequently) (embarrassingly) cheerful.

Adjectives in attributive position seem to accept adverbs in each class as well, although some specific adverb/adjective combinations are more marginal.

- (33) The ?frankly cheerful dog jumped around the yard.

- (34) The probably elderly dog hobbled around the yard.

- (35) The still cheerful dog hobbled around the yard.

- (36) The always cheerful dog hobbled around the yard.

- (37) The quickly frozen dog hobbled around the snow-covered yard.

There are some adverbs which are simply not compatible with certain attributive adjectives, regardless of order, because of semantic reasons. These adverbs are event-oriented manner adverbs, in cases where the adjective cannot be construed as the result of an event. For instance, a phrase like *?the slowly green N*, if accepted, must be interpreted as there having been some type of ‘becoming green’ event (which was slow). If such a construal is difficult, then the manner adverb will be judged as more marginal.

5.3.2 The PMC for adjectives

Like adverbs, there are some adjectives which can undergo wh-movement, and yet there is no PMC interaction when a ‘lower’ adjective moves over a higher one in a single clause (38) (though the extracted adjective must become predicative to do so, which may be a confounding factor). Adjectives describing material are the only adjectives that cannot be freely extracted (39), possibly because they are relatively

ungradable¹.

(38) How tiny is the interesting square table?

(39) *How cotton is the nice blanket?

In attributive position, extraction over a higher adjective *does* seem to be less grammatical than extraction of the higher adjective, for adjectives of size (40), age (41), color (42), and shape (43). Judgments from 40 native English speaking subjects recruited on AMT yield the following average grammaticality scores on a 1-7 scale, where extracting over a higher adjective always leads to a significant decrease in grammaticality compared to the extraction over a lower adjective. For instance, according to the well-established adjective hierarchy (Cinque et al., 1994), the order *interesting tiny table* is grammatical, and **tiny interesting table* is not. Then, extracting ‘tiny’ over the higher adjective ‘interesting’ was significantly worse than the opposite (40).

(40) a. ??How tiny of an interesting table did we buy? (avg = 2.71)

b. How interesting of a tiny table did we buy? (avg = 3.62)

(41) a. ??How old of a fun table did we buy? (avg = 2.14)

b. How fun of a old table did we buy? (avg = 4.52)

(42) a. ??How red of an interesting table did we buy? (avg = 2.03)

b. How interesting of a red table did we buy? (avg = 4.33)

(43) a. ??How square of an interesting table did we buy? (avg = 2.81)

b. How interesting of a square table did we buy? (avg = 3.42)

From a pragmatic perspective, it might seem that this discrepancy is due to the fact that questioning a broader quality would be more felicitous than a more specific quality, but this doesn’t explain why *How round is the table?* and *How interesting is the table?*

¹ Although *how ADJ* questions are ungrammatical, questions like ‘What percent ADJ is the nice blanket’ are fine.

are both grammatical. So, it seems the PMC is applicable to adjectives as well as adverbs.

5.3.2.1 The PMC for adjectives and adverbs together

Given that the PMC seems to apply in similar ways to adverbs and adjectives, is it possible that adverbs can be blockers for adjective movement, or that adjectives can intervene in adverb movement? In fact, it seems that such intervention is possible, at least in biclausals, as shown in the examples below. (44) is grammatical; the movement of *slowly* is grammatical (45); but (46) is ungrammatical. The same is true for movement of *slow* over *frequently*.

- (44) It is frequent that he slowly eats dinner.
- (45) How slowly is it claimed that he eats dinner?
- (46) *How slowly is it frequent that he eats dinner?
- (47) It is frequently that he is slow to eat dinner.
- (48) How slow is it that he is to eat dinner?
- (49) *How slow is it frequently that he is to eat dinner?

The fact that the PMC applies to combinations of adverbs and adjectives could count as evidence that on some level, they are part of the same broader category. Since the PMC is syntactic, it might be that they are members of a larger syntactic category combining adverbs and adjectives.

5.3.3 Does subjectivity predict adverb order preferences?

Much like in the adverbial domain, there is some debate as to whether the adjective hierarchy is something encoded in the syntax (again the Cinque et al. (1994) approach), or whether it results from some semantic or psychological factor instead. Scontras et al. (2017) propose that the ordering of adjectives can be predicted by the

level of subjectivity required to evaluate them. For instance, they state that in the phrase ‘the big blue box’, people have stronger inherent intuitions about what items are blue than they do about which items are big. In order to test whether subjectivity is a full predictor of adjective ordering, they used AMT to recruit participants who rated subjectivity and participants who rated adjective ordering grammaticality, and compared the two, finding a strong correlation across the board. Adjectives with lower degrees of subjectivity were more grammatical when closer to the noun they described. Since most analyses of the adjective hierarchy are based on something more than just subjectivity, this is surprising. [Scontras et al. \(2017\)](#) mention that a similar effect might be found with adverbs, though they do not test this. I attempt to replicate their experiment for adverbs below.

[Scontras et al. \(2017\)](#) rated subjectivity of adjectives by explicitly asking subjects ‘how subjective is the adjective X’ on a scale from ‘completely objective’ to ‘completely subjective’. They also tested these subjectivity ratings against a second measure of ‘faultless disagreement’, asking subjects if, in a scenario where speaker A asserts that an apple is old and speaker B asserts that an apple is not old, both speakers can be correct. [Scontras et al. \(2017\)](#) found that the measure of faultless disagreement correlated strongly with the measure of subjectivity, such that if two disagreeing speakers were judged to both be potentially correct, then the adjective is more subjective. This indicates that the straightforward subjectivity rating is accurate. So, I employ the same methodology to determine the subjectivity of adverbs, where subjectivity refers to the amount of variability there could be in assessing whether or not something is the case.

Subjects (n=40) were recruited on Amazon Mechanical Turk and again limited to those with IP addresses in the United States; all subjects reported English as a native language. The adverbs tested are those specifically mentioned in Cinque’s hierarchy, and the average subjectivity score (where 0 is fully objective and 1 is fully subjective, converted from a 0-10 rating by subjects) is reported for each adverb in Table 5.1 below, with the adverbs from Cinque’s hierarchy listed in descending order from highest to

lowest. Below the double line are 4 additional adverbs tested which were not explicitly mentioned in Cinque’s hierarchy. Subjects were also given attention check questions (e.g. ‘How subjective is the color red?’ (avg = .04), ‘How subjective is beauty?’ (avg = .88)).

Adverb	Score	St.Dev
frankly	.49	.12
fortunately	.66	.14
allegedly	.63	.19
probably	.70	.19
once	.23	.07
then	.41	.18
perhaps	.67	.19
necessarily	.59	.11
possibly	.71	.17
usually	.65	.20
again	.34	.13
often	.64	.17
intentionally	.45	.11
quickly	.73	.09
already	.50	.11
no longer	.26	.07
still	.38	.09
always	.37	.05
just	.58	.21
soon	.81	.11
briefly	.71	.16
characteristically	.62	.21
almost	.63	.13
completely	.33	.08
well	.65	.14
fast	.70	.08
never	.25	.09
slowly	.69	.13
cleverly	.73	.17
carefully	.63	.15

Table 5.1: Subjectivity score of adverbs (0 = fully objective)

At first glance, it seems that there is little correlation between position in Cinque’s hierarchy and average subjectivity. Figure 5.1 shows the values in a line

graph, with the highest adverb in Cinque’s hierarchy on the left. We would expect to see a monotonically descending line if subjectivity were the sole predictor of adverb ordering. Instead, the R^2 value is .007, indicating that subjectivity has almost no effect on the adverb order predicted by Cinque. Additionally, a linear mixed effects model using the package `lme4` in R (Winter, 2013), with adverb height as the fixed effect and subjects as a random effect, found the correlation to be far from significant ($p=.63$).

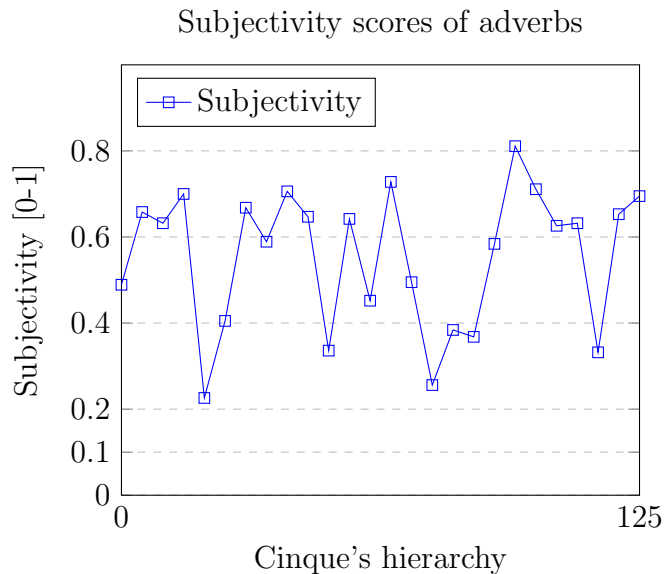


Figure 5.1: Cinque’s Hierarchy (0=frankly, 125 = fast) x Adverb Subjectivity (0-1)

Table 5.2 and Figure 5.2 show the average subjectivity value for adverbs in the five classes of the simplified hierarchy of §2.1.3. Even in this new schema, subjectivity does not appear to predict adverb ordering, with a very slight correlation ($R^2=0.048$, $p=.72$).

Adverb	Average Score
evaluatives	.57
epistemic	.66
tense/aspect	.45
frequency	.48
manner	.60

Table 5.2: Subjectivity score of adverbs (0 = fully objective)

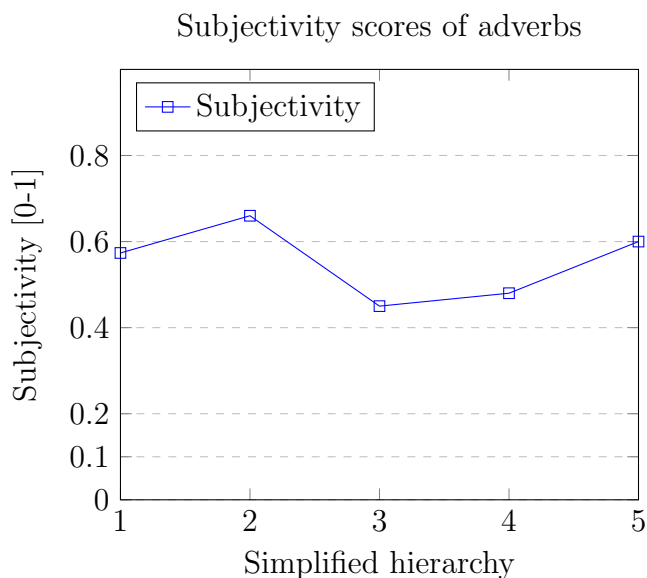


Figure 5.2: Simplified Hierarchy (1=evaluative, 5=manner) x Adverb Subjectivity (0-1)

One factor which likely contributes to this result is that for many adverbs, especially propositional adverbs, the notion of subjectivity is far from clear. What does it mean for ‘frankly’ to be subjective? The amount of frankness felt by the speaker of a sentence is highly context dependent, so some speakers may be more objective than others. Another factor is that manner adverbs refer to a very heterogenous group of concepts, subsuming almost the entire field of adjectival concepts tested by [Scontras et al. \(2017\)](#) – quality (*interestingly*), age (*newly*), size (*hugely*), shape (*squarely*), as well as other things. To collapse each of these concepts into a single class works syntactically, but for notions like subjectivity, since these adverbs have nothing in common conceptually (except that they describe events), there is a great deal of variation. Even among the 12 manner adverbs here (Table 5.1), the standard deviation was .145.

5.3.4 Does universality predict adverb order preferences?

Although it seems very similar to the notion of subjectivity, another claim made about adjective ordering is that it is a natural result of the degree of universality shared by a concept, with more ‘universal’ concepts appearing closer to the noun ([Danks and Glucksberg, 1971](#)). For instance, there is less variability among all *cotton* objects than

among all *good* objects. To ensure that this is not a predictor of adverb order, a similar study to the subjectivity experiment was performed for universality.

Subjects (n=40) were recruited on Amazon Mechanical Turk and again limited to those with IP addresses in the United States; all subjects reported English as a native language. The adverbs tested are the same: those specifically mentioned in Cinque’s hierarchy, and the average universality score (where 1 is fully universal and 0 is not at all universal) is reported for each adverb in Table 5.3 below. Subjects were asked the question ‘How similar are all things that ADV happen?’ to determine universality. Subjects were also given attention check questions (e.g. ‘How similar are all dollar bills?’ (avg = .89), ‘How similar are all living things?’ (avg = .11)).

Adverb	Score	St.Dev
frankly	.13	.11
fortunately	.20	.17
allegedly	.44	.13
probably	.11	.14
once	.50	.09
then	.40	.16
perhaps	.42	.17
necessarily	.70	.16
possibly	.42	.16
usually	.46	.13
again	.34	.09
often	.32	.08
intentionally	.60	.09
quickly	.50	.09
already	.42	.13
no longer	.80	.11
still	.77	.14
always	.84	.09
just	.78	.11
soon	.45	.14
briefly	.65	.11
characteristically	.54	.13
almost	.70	.11
completely	.34	.11
well	.60	.13
fast	.53	.11
never	.75	.08
slowly	.42	.08
cleverly	.58	.11
carefully	.72	.14

Table 5.3: Universality score of adverbs (1 = fully universal)

As might be expected, there is little correlation between position in Cinque’s hierarchy and average ‘universality’. Here the R^2 value is .31, indicating that universality has a very small effect on the adverb order predicted by Cinque. Here too a linear mixed effects model with adverb height as the fixed effect and subjects as a random effect found the correlation to be insignificant ($p=.43$).

The same is true for the simplified hierarchy, as shown in Table 5.4, where

universality gives a slight upward correlation ($R^2=0.64$).

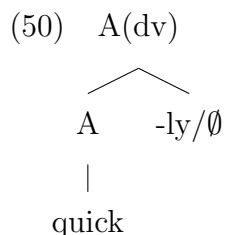
Adverb	Average Score
evaluatives	.17
epistemic	.42
tense/aspect	.62
frequency	.59
manner	.55

Table 5.4: Universality score of adverbs (1 = fully universal)

Even though universality was slightly more successful than subjectivity, it does not have significant predictive power for adverbs. Ultimately, it seems that no single conceptual property can fully determine the order of adverbs in English, even if those properties are claimed to do so for adjectives.

5.4 Adjective Structure

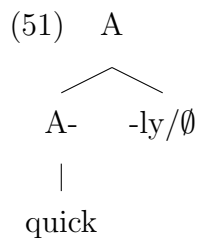
In sum, then, this chapter has shown that while adverbs and adjectives do not both obey an ordering based on the same conceptual feature of either subjectivity or universality, they both do obey an ordering. The simplified adverb hierarchy plus PMC also predicts the movement restrictions of adverbs over adjectives (and vice versa), and the fact that adjectives obey the PMC in a similar fashion to adverbs indicates that they are members of a single category at some level syntactically. However, it is not clear what that would mean. One option is that adverbs include embedded adjectives, as in (50).



Adverbs in many ways do have a wider distribution than adjectives, so their being a

superclass might make intuitive sense. Because both adverbs and adjectives obey the PMC, whatever PMC feature is on the adjective should be shared by the corresponding adverb, which this structure would predict. However, adverbs do not modify nouns, and cannot appear in downward entailing contexts. These features would then need to be restrictions imposed by the adverbial morphology.

It is also possible that the single adjective/adverb class has a structure more like that of (51), where adjectives are somehow deficient forms of the category and are therefore unable to modify clauses, adverbs, and verb phrases.



Another possibility is that adjectives and adverbs are completely distinct categories syntactically, and their morphological similarities are irrelevant. The fact that adjective ordering seems to be based on subjectivity but adverb ordering is not is one piece of evidence for this approach. This would mean that whatever features adverb and adjectives share (ordering restrictions, PMC, semantic similarities) are coincidental or based on the fact that they are adjunct-like elements. However, PP adjuncts do not have a similar ordering relation, nor have they been shown to obey the PMC.

Whatever the structure, adjectives and adverbs clearly have many commonalities.

Chapter 6

CONCLUSIONS AND FUTURE DIRECTIONS

This dissertation has shown that adverb ordering is clearly influenced by many factors, but even so, the hierarchy of adverbial projections needn't be as complicated as a Cinque-style analysis requires. Instead, we can reduce the number of syntactic adverb classes to five and still account for the orderings found in English declaratives and other constructions, with the addition of semantic constraints. However, the case in other languages should be more thoroughly investigated, as discussed in §6.1. It is also possible that, because the experimental data in this thesis were obtained using written text, the effects of prosodic factors have been overlooked. This issue is discussed in §6.2. Finally, §6.3 concludes.

6.1 Non-English Adverb Ordering

Although I am confident that the reduced hierarchy proposed here will work for English, and I am not aware of any languages where it immediately fails, a broad sampling of languages ought to be investigated in order to understand how universal the claims made either here or in Cinque (1999) really are. For instance, some languages are claimed to not have adverbs at all grammatically, but their meaning is instead encoded in some verbal affix. While Cinque's approach makes predictions about the orders of such morphemes, a comprehensive study of morphological affixes with adverbial meanings has not yet been undertaken (to my knowledge) – other than the one done by Cinque. Likewise, for languages with different adverbial morphology, it is possible that distributions are more restricted.

Apart from English and Italian, few languages have been methodologically compared to the hierarchy in Cinque (1999) to see how well it holds up. Though some of

these have been partially investigated, like Turkish, by [Wilson and Saygin \(2001\)](#), an exhaustive study of adverb orderings in various constructions has (to my knowledge) not been performed. Therefore such a study would be an excellent test case for the restricted adverbial hierarchy.

6.2 Prosodic Effects

As noted in §2.1, the same linear string containing adverbials can be interpreted to have different structures depending on how it is pronounced. One such structure that has ramifications for the work here is the possibility of ‘comma intonation’, as in [\(1\)](#).

- (1) John quickly, frankly, failed.

This prosody can rescue an otherwise ungrammatical sentence, but it has a distinct structure from the non-comma version, which I assume to be syntactically outside the main clause ([Potts, 2002](#); [McCawley, 1982](#)). However, even while the corpus data and AMT data used in this thesis never contain overt written commas, it is possible that some speakers or subjects intended comma intonation regardless. This is difficult to prevent in written mediums, but perhaps alternative spoken data could be used in future testing to avoid this reading. Recent experimental work ([Stevens, de Marneffe, Speer, and Tonhauser, Stevens et al.](#)) indicates that AMT judgment tasks for spoken utterances can yield significant differences in subjects’ interpretation of focus alternatives for sentences containing manner adverbs, so such experimental distinctions are certainly possible.

6.3 Summing Up

Many analyses of adverb ordering make reference to semantic justifications to explain why certain orders are forbidden cross-linguistically ([Jackendoff, 1972](#); [Ernst, 2002](#)). Others employ an elaborate syntactic hierarchy of functional projections ([Cinque, 1999](#)). This dissertation argues for a formal ordering relation of only five essential

syntactic adverb classes (evaluative, epistemic, tense/aspect, frequency/degree, and manner), which allows for adverbs to be treated as adjuncts, so long as they do not contradict the five level ordering relation. Unlike [Cinque \(1999\)](#), I propose that the adverb classes do not have a single base-generated position, but rather that adverbs have a fairly free distribution, and this distribution cannot be distilled to a single factor like subjectivity or universality as it can for adjectives. Such a situation can be modeled by MGs with Adjunction, which is an unambiguous, rigidly-defined formalism. Additional distributional restrictions on adverbs are explained using additional movement constraints (the PMC) or semantic constraints (ungrammaticality under negation for PPIs, a restriction on multiple evidentials in a proposition, and a restriction on *wh*-questions with non-gradable adverbs), but these constraints are in addition to the five-class ordering relation, not in place of it. Adjectives are shown to have many differences from adjectives; however, the fact that adjectives and adverbs are subject to the same movement constraint in the PMC, modeled using MGs, is contributing evidence that adjectives and adverbs share a close syntactic relationship, to the exclusion of other lexical categories.

The implications of this analysis are, as one might have expected, that neither a purely structural account nor a semantic account can singlehandedly account for adverbial ordering phenomena. The extensive functional architecture of [Cinque \(1999\)](#) is unnecessarily detailed, as shown by extensive naturally occurring counterexamples. On its own, though, any syntactic ordering restriction is not detailed enough to account for all adverbial behavior, as shown by additional constraints required for the movement of adverbs cross-linguistically.

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Appendix A

MECHANICAL TURK TEST ITEMS

A.1 Adverb Order Ratings

Below are the test items used to obtain the AMT data in Chapter 2.

- (1) John probably allegedly ate dinner.
- (2) John allegedly probably ate dinner.
- (3) Jackie allegedly probably finished her homework.
- (4) Jackie probably allegedly finished her homework.
- (5) Marc allegedly once was a firefighter.
- (6) Marc once allegedly was a firefighter.
- (7) Charlotte once allegedly was an acrobat.
- (8) Charlotte allegedly once was an acrobat.
- (9) Colby just allegedly won a million dollars.
- (10) Colby allegedly just won a million dollars.
- (11) Tina allegedly just made a new friend.
- (12) Tina just allegedly made a new friend.
- (13) Richard once probably owned a mansion.
- (14) Richard probably once owned a mansion.
- (15) Kelly probably once owned a motorcycle.

- (16) Kelly once probably owned a motorcycle.
- (17) Sonja probably already set the table.
- (18) Sonja already probably set the table.
- (19) Sean probably already did his homework.
- (20) Sean already probably did his homework.
- (21) Emily no longer probably drinks beer.
- (22) Emily probably no longer drinks beer.
- (23) Jeff probably no longer eats sushi.
- (24) Jeff no longer probably eats sushi.
- (25) Jackson probably still dyes his hair.
- (26) Jackson still probably dyes his hair.
- (27) Rachel probably still goes rock climbing.
- (28) Rachel still probably goes rock climbing.
- (29) Tony always probably liked bagel sandwiches.
- (30) Tony probably always liked bagel sandwiches.
- (31) Mary always probably kicked with her right foot.
- (32) Mary probably always kicked with her right foot.
- (33) Janet will probably soon get a new job.
- (34) Janet will soon probably get a new job.
- (35) Brian will probably soon meet his daughter.
- (36) Brian will probably soon meet his daughter.
- (37) Quinn once already lived in a car.

- (38) Quinn already once lived in a car.
- (39) Riley once already took dance lessons.
- (40) Riley already once took dance lessons.
- (41) Jacob always then did his homework.
- (42) Jacob then always did his homework.
- (43) Melissa always then cleaned the dishes.
- (44) Melissa then always cleaned the dishes.
- (45) Caroline perhaps already decided on a dress.
- (46) Caroline already perhaps decided on a dress.
- (47) William perhaps already baked cupcakes.
- (48) William already perhaps baked cupcakes.
- (49) Dre perhaps still takes dance lessons.
- (50) Dre still perhaps takes dance lessons.
- (51) Gary perhaps still drives to work.
- (52) Gary still perhaps drives to work.
- (53) Neda perhaps always lies to her friends.
- (54) Neda always perhaps lies to her friends.
- (55) Dillon always perhaps cooks with olive oil.
- (56) Dillon perhaps always cooks with olive oil.
- (57) Rob usually always interviews funny guests.
- (58) Rob always usually interviews funny guests.
- (59) Cass usually always tells the truth.

- (60) Cass always usually tells the truth.
- (61) Jonas quickly already sold his car.
- (62) Jonas already quickly sold his car.
- (63) Aubrey quickly already packed her bags.
- (64) Aubrey already quickly packed her bags.
- (65) Riley still almost likes his boss.
- (66) Riley almost still likes his boss.
- (67) Ciera still almost hates her mother.
- (68) Ciera almost still hates her mother.
- (69) Kevin just almost won the lottery.
- (70) Kevin almost just won the lottery.
- (71) Rita just almost messaged her ex.
- (72) Rita almost just messaged her ex.

A.2 Adjective Subjectivity and Universality Ratings

Below are some sample test items used to obtain the AMT data in Chapter 4.

A.2.1 Subjectivity

- (73) How subjective is the adjective *quickly*?
- (74) How subjective is the adjective *just*?
- (75) How subjective is the adjective *rarely*?
- (76) How subjective is the adjective *probably*?

A.2.2 Universality

- (77) How similar are all things that always happen?

- (78) How similar are all things that just happen?
- (79) How similar are all things that never happen?
- (80) How similar are all things that fortunately happen?
- (81) How similar are all things that rarely happen?
- (82) How similar are all things that quickly happen?
- (83) How similar are all things that probably happen?

Appendix B

CROSS-LINGUISTIC JUDGMENTS

B.1 Cross-linguistic [\pm wh] Data

Below are the additional data used to fill out the table for [\pm wh] values in Table [3.2](#).

B.1.1 Chinese

- (1) John duoshuliandi chucáo?
John how skillfully mow his lawn
How skillfully did John mow his lawn?

- (2) *John duoxingyun chucáo?
John how luckily mow his lawn
*How luckily did John mow his lawn?

- (3) *John duodagai chucáo?
John how probably mow his lawn
*How probably did John mow his lawn?

- (4) John duojingchang chucáo?
John how frequently mow his lawn
How frequently did John mow his lawn?

- (5) John duoouer chucáo?
John how occasionally mow his lawn
*How occasionally did John mow his lawn?

B.1.2 Spanish

- (6) Qué tan hábilmente cortó John el césped?
What degree skillfully cut John the lawn?
How skillfully did John mow his lawn?

- (7) *Qué tan afortunadamente mandó John dinero a sus hijos?
 What degree luckily sent John money to his children?
 *How luckily did John send his children money?
- (8) *Qué tan hábilmente cortó John el césped?
 What degree probably cut John the lawn?
 *How probably did John mow his lawn?
- (9) Qué tan frecuentemente mandó John dinero a sus hijos?
 What degree frequently sent John money to his children?
 How frequently did John send his children money?
- (10) Qué tan ocasionalmente mandó John dinero a sus hijos?
 What degree occasionally sent John money to his children?
 *How occasionally did John send his children money?

B.1.3 Basque

- (11) Zein trebeki moztu zuen Jonek belarra?
 how skillfully cut John grass?
 How skillfully did John mow his lawn?
- (12) *Zein zorionez bidali zien Jonek dirua bere seme-alabei
 how luckily sent John money his to children?
 *How luckily did John send his children money?
- (13) *Zein seguraski moztu zuen Jonek belarra?
 how probably cut John grass?
 *How probably did John mow his lawn?
- (14) Zein maiz bidali zien Jonek dirua bere seme-alabei
 how frequently sent John money his to children?
 How frequently did John send his children money?
- (15) *Zein noizbehinka bidali zien Jonek dirua bere seme-alabei?
 how occasionally sent John money his to children?
 *How occasionally did John send his children money?

B.1.4 French

- (16) Avec combien d'habileté Jean a-t'il tondu son gazon?
 With how-much of-skill John has mowed his lawn?
 How skillfully did John mow his lawn?

- (17) *Avec combien de chance Jean a-t'il envoyé de l'argent à ses enfants?
 What degree of luck John has sent of money to his children?
 *How luckily did John send his children money?
- (18) *A quel degré de probabilité Jean a-t'il tondu son gazon?
 To what degree of probability John has mowed his lawn?
 *How probably did John mow his lawn?
- (19) A quelle fréquence Jean envoyait-il de l'argent à ses enfants
 To what frequency John sent of money to his children?
 How frequently did John send his children money?
- (20) A quelle fréquence Jean envoyait-il de l'argent à ses enfants
 To what frequency John sent of money to his children?
 *How occasionally did John send his children money?

B.1.5 Korean

- (21) Elmana nungswukhakey John-i canti-lul kakk-ass-ni?
 how skillfully John-Nom lawn-Acc cut-Past-Q
 How skillfully did John mow his lawn?
- (22) *Elmana tanhayngghi John-i aitul-eykey ton-ul ponay-ss-ni?
 how fortunately John-Nom children-Dat money-Acc send-Past-Q
 *How luckily did John send his children money?
- (23) *Elmana ama John-i canti-lul kakk-ass-ni?
 how probably John-Nom lawn-Acc cut-Past-Q
 *How probably did John mow his lawn?
- (24) Elmana cacwu John-i aitul-eykey ton-ul ponay-ss-ni?
 how often John-Nom children-Dat money-Acc send-Past-Q
 How frequently did John send his children money?
- (25) Elmana kakkum John-i aitul-eykey ton-ul ponay-ss-ni?
 how occasionally John-Nom children-Dat money-Acc send-Past-Q
 *How occasionally did John send his children money?

B.1.6 Arabic

- (26) Kayf bimaharah Ahmad gaSS ʔoshob almarj?
 How skillfully Ahmad cut.3MS grass the.lawn
 How skillfully did Ahmad mow his lawn?

- (27) *Kayf lihusn alhath ba^ʕath Ahamd la awladoh fluus?
 How to.goodness the.luck send.3MS Ahmad to children.3MS.POSS money
 *How luckily did Ahmad send his children money?
- (28) *Kayf ihtimal gaSS Ahamd al^ʕoshob?
 How probably cut.3MS Ahmad the.grass
 *How probably did Ahmad mow his lawn?
- (29) Kayf bitakrar Ahmad ba^ʕath la awladoh fluus?
 How frequently Ahmad send.3MS to children.3MS.POSS money
 How frequently did Ahmad send his children money?
- (30) Kayf bilmunasabat Ahmad ba^ʕath la awladoh fluus?
 How occasionally Ahmad send.3MS to children.3MS.POSS money
 *How occasionally did Ahmad send his children money?

Appendix C

IRB STATUS

C.1 IRB Status

The IRB at the University of Delaware has determined the Mechanical Turk surveys used in the dissertation to have Exempt status. The project submission number and title are [960725-1] *Studies of English syntax using Amazon Mechanical Turk*. All surveys began with a standard disclaimer and all information was optionally given and kept anonymous.