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Information Structure, Grammar and Strategy in Discourse

Abstract

This dissertation examines two information-structural phenomena, Givenness and Focus, from the perspective of both syntax and pragmatics. Evidence from English, German and other languages suggests a "split" analysis of information structure--the notions of Focus and Givenness, often thought to be closely related, exist independently at two different levels of linguistic representation. Givenness is encoded as a syntactic feature which presupposes salience in prior discourse and either (1) prevents prosodic prominence (in languages like English and German), or (2) drives syntactic movement (in languages like Italian). On the other hand, Focus, which introduces strong prosodic prominence and a contrastive interpretation, exhibits none of the expected properties of a syntactic feature, and is therefore analyzed quite differently. I argue that Focus is the result of purely pragmatic principles which determine utterance choice in the face of grammatical optionality. The syntactic and phonological systems often generate multiple possible formulations of an utterance, and communicative principles can be invoked to explain the correspondences between certain kinds of discourse contexts and certain patterns of linguistic form. The application of communicative principles to problems of utterance choice is modeled mathematically using the tools of game-theoretic pragmatics. From this perspective, utterances are taken to be strategically chosen in order to maximize communicative effectiveness. Ultimately, the strong differences between Focus and Givenness emphasize a methodological point: both syntactic and pragmatic perspectives are necessary to fully determine the space of possibilities in natural language. Neither perspective should be ignored.

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Jon Scott Stevens

The truth of the thoughts here communicated seems to me unassailable and definitive.
—Wittgenstein, 1918

I have been forced to recognize grave mistakes in what I wrote in that first book.
—Wittgenstein, 1945

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ABSTRACT

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Jon Stevens

Robin Clark

This dissertation examines two information-structural phenomena, Givenness and Focus, from the perspective of both syntax and pragmatics. Evidence from English, German and other languages suggests a “split” analysis of information structure—the notions of Focus and Givenness, often thought to be closely related, exist independently at two different levels of linguistic representation. Givenness is encoded as a syntactic feature which presupposes salience in prior discourse and either (1) prevents prosodic prominence (in languages like English and German), or (2) drives syntactic movement (in languages like Italian). On the other hand, Focus, which introduces strong prosodic prominence and a contrastive interpretation, exhibits none of the expected properties of a syntactic feature, and is therefore analyzed quite differently. I argue that Focus is the result of purely pragmatic principles which determine utterance choice in the face of grammatical optionality. The syntactic and phonological systems often generate multiple possible formulations of an utterance, and communicative principles can be invoked to explain the correspondences between certain kinds of discourse contexts and certain patterns of linguistic form. The application of communicative principles to problems of utterance choice is modeled mathematically using the tools of game-theoretic pragmatics. From this perspective, utterances are taken to be strategically chosen in order to maximize communicative effectiveness. Ultimately, the strong differences between Focus and Givenness emphasize a methodological point: both syntactic and pragmatic perspectives are necessary to fully determine the space of possibilities in natural language. Neither perspective should be ignored.

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Chapter 1

Introduction

1.1 Prior Questions

Chomsky (2011), challenging Enfield (2010), asks if language is like “today’s weather”, an accidental collection of distinct phenomena which conspire toward a single effect, or if there is indeed a singular mechanism, unique to the human species, that is specialized for language. The Minimalist conception of language (Chomsky, 1995, 2005) leans strongly toward the latter: there is posited to be a faculty of language (FL) which is a specialized cognitive computational system responsible for the fact that humans—and no other animals—acquire an unconscious rule-based system of grammatical competence. That this grammatical competence is used for communication is seen as secondary from this perspective. But even taking it to be true that the core abstract system underlying the use of grammar was not selected or “designed” by evolution for any particular communicative purpose, this does not rule out a strong role for communicative principles in a complete theory of language.

At first glance this may seem to be either a contradiction or else a conflation of two distinct senses of the word “language”. The word is ambiguous between: (1) the computational combinatoric system FL as it is narrowly defined within mainstream Minimalist linguistic theory, and (2) the more colloquial sense of the word, which encompasses the externalization and communicative/social uses of FL. Under definition (1), assuming Chomsky’s thesis to be correct, it would be a contradiction in terms to claim that communicative principles play any role in determining natural language possibilities. However, under definition (2) it is a perfectly reasonable, even obvious, thesis—the space of possible utterances is determined by both grammar and pragmatics. But is the broader second def-

inition of “language” useful for studying FL? The reflex of many theoreticians may be to answer in the negative, adopting the following view from Chomsky (2011, p.275):

Sometimes externalization is employed for communication—by no means always, at least if we invest the term “communication” with some significance. Hence, communication, *a fortiori*, is a still more ancillary property of language, contrary to much conventional doctrine—and of course language use is only one of many forms of communication.

In general this seems to be true—nothing about communication can explain why “colorless green ideas sleep furiously” is a sentence of English but “sleep ideas green colorless furiously” is not. But there is one area of linguistic research where principles of pragmatics and communication collide with principles of FL: the study of information structure. By definition, information structure consists in those areas where discourse context partially determines linguistic form. In this dissertation, I analyze the information-structural phenomena of Givenness and Focus which leads to a particular view on the relationship between syntax and pragmatics. Namely, we must allow a role for discourse context and communicative efficacy in determining judgments about what is acceptable or possible in a language.

This view is arrived at by first showing that one aspect of information structure—the marking of Givenness—respects rules of syntactic structure formation. These rules are well-established in syntactic theory and are, as Chomsky predicts they would be, semantically and pragmatically arbitrary. That is to say, there is no obvious communicative reason why the following contrast should exist—the explanation is purely structural.

- (1) a. Which professor did you have for biology?
- b. *Which did you have professor for biology?

The generalization here is that the entire *wh*-phrase *which professor* must move to the front of the sentence to form a question—partial movement is not allowed. Chapters 3 and 4 are dedicated to showing that there is evidence for similar structural constraints on the marking of Givenness (i.e. salience in prior discourse). This gives us a template for what a syntactically encoded information-structural feature should look like. Crucially, when we examine the distribution of Focus (i.e. prominence due to contrast, in a particular sense), the template is violated. This suggests a different view of Focus: there is no feature in the syntactic derivation of a sentence, as is often assumed, which is responsible for Focus.

Rather, the phenomenon arises from communicative principles which regulate how utterances are chosen when multiple grammatical alternatives exist. FL generates all possible Focus structures, independent of context, and pragmatics filters them.

This is a somewhat different conception of linguistic judgments than what is sometimes assumed by syntacticians in that strong negative intuitions about sentences are not necessarily due to ungrammaticality. Rather, a strong negative intuition about a sentence can arise either due to failure of FL and/or the parameters of the language in question to generate that sentence, or else due to a pragmatic mismatch between the sentence and the context in which it is situated. Nonsensical sentences like “colorless green ideas sleep furiously” can exist in a contextual vacuum, yielding the intuition that this is an acceptable sentence of English. But other sentences, e.g. “JOHN kissed Mary” (with strong prosodic prominence on the subject) become *contextualized*—one cannot help but evaluate them with respect to a discourse context—and the sentence is only acceptable if the context that is given (either explicitly or perhaps implicitly) is appropriate. This does not mean that the sentence is *ungrammatical* when the context does not allow it; it is merely infelicitous.

This is not a new idea; it is exactly the hypothesis utilized by followers of the approach of Vallduví (1990), who posits an autonomous “module” of grammar, i.e. of FL, called Information Structure which imposes correspondences between syntax and “information packaging”, i.e. instructions on how to functionally interpret an utterance. Eilam (2011, p.6), following this approach, nicely distills the proposed difference between grammaticality and felicity in context.

(T)he lack of attention to context and Information Structure leads to the misinterpretation and misanalysis of data; in particular, the unacceptability associated with phenomena which are driven by Information Structure considerations is mistaken for ungrammaticality, and these phenomena are erroneously analyzed as syntactic and/or semantic in nature.

I take this to be correct in spirit. However, I provide an analysis which does not require any modification of the accepted architecture of FL, an architecture which typically does not include an Information Structure module. I hold that there is no autonomous domain-specific mechanism responsible for phenomena such as Focus. Rather, I aim to provide a more parsimonious account whereby Focus is epiphenomenal, resulting from the interaction between general communicative principles and optionality in grammar.

This account has two advantages. First, it is more in line with Minimalist principles, in that FL is strictly limited to the set of computational operations required to mediate sound

(or sign) and semantics, with no additional constraints introduced by information structure. Second, it offers a deeper explanation of why Focus exists (to facilitate communication). Finally, the current work illustrates that in fact, some of what is called information-structure, i.e. phenomena related to the notion of Givenness, really *are* due to principles of FL. Therefore, what is called “information structure” is indeed like “today’s weather”—it is an accidental combination of a syntactic feature whose interpretation yields particular discourse effects, and the (likely unconscious) application of general principles of communicative optimality to the problem of optionality in grammar.

1.2 Roadmap

Chapter 2 begins with a survey of previous literature on information structure, providing a basic definition of the concept and analyzing some previous claims about the information-structural notions of Focus, Topichood, Contrast and Givenness. The terminology surrounding these ideas is muddy, confusing and often contradictory. I attempt to filter the useful from the superfluous, making some assumptions along the way, and ultimately arriving at a particular set of terminology to be used in the remainder of the volume. In this chapter I also outline some syntactic assumptions and introduce the style of notation to be used throughout. Finally, I give a brief primer on the field of game-theoretic pragmatics, the tool which I use to model the communicative theory of Focus which I eventually develop.

Chapters 3 and 4 are devoted to the phenomenon of Givenness. A recent previous analysis is considered and then refuted, which leads to a syntactic generalization regarding certain interesting data. These data are introduced in Chapter 3, where I use both intuitions and results from two audio-based judgment tasks to argue for a particular analysis of “de-accenting” in English. I show that de-accenting due to Givenness (i.e. salience in prior discourse) is in fact limited by syntactic principles. For example, a partial adjunction structure cannot be marked as Given (and subsequently de-accented) without marking the entire XP as Given. This is analyzed in terms of a syntactic feature. Chapter 4 applies this analysis to German, showing that the same principles hold, and also extending the analysis to scrambling constructions in German.

Chapters 5 and 6 deal primarily with Focus. I argue that, in light of the analysis of Givenness in the preceding chapters, Focus should not be analyzed as involving a syntactic feature as often assumed. Rather, Focus should be seen as the result of applying communicative principles to a language where multiple prosodic or syntactic options are available.

This is modeled within the framework of game-theoretic pragmatics. Game theory provides a simple mathematical toolkit for modeling decision-making by rational agents. This toolkit is used to create a model determining what kinds of prosodic/syntactic choices are most desirable given a few basic assumptions about communicative optimality. Chapter 6 applies this model very tentatively to problems of Focus and movement, suggesting that apparent correlations between Focus and word order do not in fact negate the claim that Focus is not directly encoded in syntactic competence. Chapter 7 is a brief conclusion.

Chapter 2

Background & Assumptions

2.1 Information Structural Notions

As a descriptive term, *information structure* (IS) refers to those aspects of an utterance which signal the speaker's assumptions about the hearer's knowledge state. In a variety of languages, different formulations of an utterance correlate with non-truth-conditional meanings which suggest that, as Chafe (1974, p.112) puts it, "the speaker cannot be ignorant of the fact that the addressee already has certain other things in his consciousness." IS has been partitioned in a number of ways (see Vallduví and Engdahl, 1996, p.510 for a list of formulations), the most popular of which involve some combination of *Focus* (Chomsky, 1971; Vallduví, 1990; Rooth, 1992; Roberts, 1996), *Topichood* (Reinhart, 1981; Vallduví, 1990; Büring, 2003), *Contrast* (Vallduví and Vilkuna, 1998; Kratzer, 2004; Selkirk, 2007; Wagner, 2012) and *Givenness* (Chafe, 1974; Schwarzschild, 1999; Féry and Samek-Lodovici, 2006; Selkirk, 2007; Wagner, 2012). Different theories assign different ontological status to these supposed primitives. IS has been conceived of as a structure on discourse itself (Prince, 1981b; Roberts, 1996, 2011a), an information-organizing component of grammar (Vallduví, 1990; Vallduví and Engdahl, 1996; Eilam, 2011) and a set of features in narrow syntax (Rooth, 1992; Selkirk, 2007, and many others). I address the concepts of Focus, Topichood, Contrast and Givenness from these perspectives, providing brief synopses of how the concepts have been applied in past literature and how they contribute to the current picture.

2.1.1 Focus

I begin with a note on terminology. It has long been noted that the right-edge prosodic prominence pattern of English is systematically restricted by context. In a default, out-of-the-blue pragmatic context, prosodic prominence is assigned such that a strong pitch accent falls on the rightmost constituent in an utterance, with smaller peaks in prominence falling on other lexical words to the left of that strong, “nuclear” accent. In certain other contexts, however, an element can become exempt from sentential stress assignment, causing the pitch accent that would otherwise fall on that element to shift leftward. After Ladd (1996) I call this apparent shift in prominence *de-accenting*. Importantly, in using this term I do not wish to imply the existence of some intermediate representation where de-accented elements were once accented. I’m simply using the term to refer pre-theoretically to cases where context disprefers or prohibits accent on something that, as Swerts et al. (2002) puts it, “might otherwise be expected to be accented.”

One salient case of de-accenting is so-called question-answer congruence, illustrated below (primary sentential stress in small caps, de-accented constituent underlined, pitch track taken from a PRAAT recording in blue).

- (1) Q: Did anything interesting happen at the party?
A: Yes. Mary DANCED.



M a r y D A N C E D

- (2) Q: Who danced at the party?
A: MARY danced. / #Mary DANCED.



M A R Y d a n c e d

The context in (2) (the question about dancing) forces the verb *danced* to be de-accented, whereas in (1) we see what is taken to be the default pattern. Much IS research aims to characterize these intonational variations in English and other languages, but this same pragmatic dimension can affect different aspects of grammatical realization. In Italian, which we will return to in Chapter 6, word order is affected.

(3) Q: ‘What happened to Gianni?’

A: Gianni è andato VIA.
Gianni is gone away
‘Gianni left.’

(4) Q: ‘Who just left?’

A: È andato via GIANNI.
is gone away Gianni
‘Gianni left’

De-accenting in English is often seen as a way of marking that a constituent is outside the Focus of a sentence, where the Focus is the linguistic material whose meaning fills in some salient open proposition (e.g. ‘somebody danced’ or more accurately ‘x danced’, as in (2), see Prince, 1986). Formally, this has been analyzed in a few different ways. Rooth (1992) posits that F-features are assigned within elements whose meanings are anaphoric to corresponding sets of alternatives called Focus Semantic Values (FSVs). An FSV for a constituent is obtained by substituting a variable in for the Focused element within that constituent, and then generating the set of all relevant meanings that conform to that schema. For (2) this means the set of all propositions of the form ‘x danced’, i.e. {‘Mary danced’, ‘John danced’, etc.} This FSV must be evoked by the prior discourse in order for Focus to fall only on *Mary*. This is indeed true for (2) because the Hamblin semantics¹ for the preceding question, ‘who danced?’, is identical to the FSV. The condition does not hold for (1), however, and thus narrow Focus on *Mary* is prohibited. In this case we find default stress assignment, because Focus must fall on the entire sentence, whose FSV is the set of relevant propositions evoked by the question, ‘did anything interesting happen at the party?’ This constraint on Focus placement combined with a constraint to minimize Focus domains wherever possible, derives the accent placements in (2) and many other types of examples. Under Rooth’s formal description, F-features are licensed by an operator \sim that scopes over the F-marked constituent. The accent shift from verb to subject in (2) is licensed by the structure below, where $\sim B_1$ adjoins to S and introduces the requirement that S have a discourse antecedent S’ such that S’ is a member of the FSV of S. This is illustrated in Fig.1 below.

¹Hamblin (1973) establishes the standard logical treatment of questions, where a question’s denotation is its set of possible answers—a wh-question’s denotation, then, is the set of all propositions obtained by substituting meaningful elements into the slot filled by the wh-word.

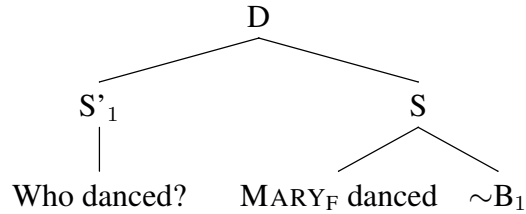


FIGURE 1: NARROW FOCUS ON THE SUBJECT

Alternatively, under the “information packaging” approach of Vallduví (1990), one may view Focus as a primitive object in a separate component of grammar, called Information Structure, which gives instructions on how to organize the storage of propositional content. This view combines the file card updating semantic framework of Heim (1988) with Prince’s (1986) notion of a salient open proposition. Each utterance has a Ground, the open proposition which is suggested by the preceding context, and a Focus which fills in the Ground to complete the meaning of the utterance. The Ground is further divided into a Link and a Tail, where the Link tells the hearer what or who the sentence is “about”, i.e. which file card to update with the new knowledge conveyed by the utterance. (This is equivalent to some definitions of Topic, discussed in 2.1.4 below.) Not all sentences must have a Link and a Tail. For example, the answer in (2) is not a fact about a particular entity in the discourse, but rather a general fact about the world. Thus, the sentence lacks a Link. Rather, there is some global file card which contains the knowledge ‘x danced at the party’ (the Tail), and the IS configuration of the answer instructs the hearer to locate this proposition and replace it with the saturated proposition ‘Mary danced’, which results from substituting ‘Mary’ (the Focus) in for the free variable. Vallduví’s conception of Focus is based on the idea that propositional content has a structure that is independent from the syntactic structure of the sentence that conveys it. While the approach has been criticized for its reliance on Heim’s file card metaphor (see Hendriks and Dekker, 1996; Hendriks, 2002), it has provided an intuitive and influential interpretation of Focus as a supplier of missing information in discourse.

A third view of Focus is oriented toward the communicative goals of interlocutors. Roberts (1996, 2011a), inspired by Lewis (1979), adopts the view that discourse is structured into Questions Under Discussion (QUDs), and relevant declarative sentences address or answer QUDs. Under this conception of discourse, what Vallduví calls the Ground of a sentence signals the identity of the QUD, while the Focus of a sentence gives an answer to that QUD. Rather than explaining question-answer congruence using alternative sets or open propositions, Roberts takes congruence to be a defining characteristic of Focus.

This framework takes the notion of Focus as a supplier of missing information and relates it to broader principles of discourse. Where Vallduví posits sentence-level IS representations which structure propositional content, Roberts instead reduces information-structural distinctions to relations between sentence form and the communicative goals which drive the entire discourse. This is formalized in a way that bridges the gap between pragmatic accounts like Vallduví’s and purely semantic accounts like Rooth’s. When a question is (explicitly or implicitly) introduced into the discourse, the alternative set denoted by the Hamblin semantics of that question becomes the current QUD. In order for the discourse to proceed felicitously, the next utterance must be *Relevant* to the QUD. An utterance is Relevant iff either: 1) its conveyed proposition is a member of the current QUD (i.e. it answers the QUD completely), 2) its conveyed proposition reduces the size of the QUD (i.e. it is a partial answer) or 3) it serves to introduce/address a sub-question of the QUD. (A question Q_A is a sub-question of Q iff a complete answer to Q necessarily provides a complete answer to Q_A , after Groenendijk and Stokhof 1984.) Roberts visualizes the set of QUDs in a discourse as a *QUD stack*, since questions must be addressed in the reverse order of their introduction into the discourse. I illustrate with an example.

- (5) A: What did everybody order at the restaurant?
 B: Well, I remember Dan ordered chicken penne. I don’t remember what Karen ordered. (B looks at C.)
 C: Karen ordered the same thing.
 B: Oh, right. And we both ordered seitan buffalo wings.

	QUD stack
After 1st utterance	$\{ordered(x, y) : x \in \{D, K, B, C\} \ \& \ y \in D_{FOOD}\}$
After 2nd utterance	$\{ordered(K, y) : y \in D_{FOOD}\}$ $\{ordered(x, y) : x \in \{K, B, C\} \ \& \ y \in D_{FOOD}\}$
After 3rd utterance	$\{ordered(x, y) : x \in \{B, C\} \ \& \ y \in D_{FOOD}\}$
After 4th utterance	\emptyset

In the above exchange, A’s multiple wh-question introduces a QUD corresponding to ‘who ordered what?’, whose denotation is the set of propositions of the form ‘x ordered y’, such that each possible QUD answer will have an ‘x ordered y’ proposition for each possible x in

the contextually given set of relevant humans (in this case it's Dan, Karen and interlocutors B and C). After the second utterance, two contributions to the discourse have been made. First, a partial answer to the QUD has been given, narrowing down the set of possible QUD answers to those that entail the proposition *ordered(D, chicken.penne)*; this effectively reduces the QUD to a smaller question 'what did Karen, B and C order?', which is reflected in the derivation above. Second, a sub-question corresponding to 'what did Karen order?' has been implicitly introduced by B's look to C after being unable to pair Karen with a food item. This new sub-question is added to the top of the QUD stack, and thus this question must be addressed before any other sub-questions. At this point, C must either offer the Relevant knowledge, or else admit that she does not know the answer, in which case the interlocutors would have to be content with a partial answer to the original QUD. As it happens, C does offer the knowledge, and the discourse proceeds with the only missing knowledge being the dishes ordered by B and C. After the fourth utterance addresses this, the QUD stack is empty, meaning the interlocutors are free to pose new questions to follow up, or to change the subject completely.

There is a direct mapping between a linguistic element's relationship to the QUD stack and whether that element is in Focus. Roberts borrows Rooth's notion of a Focus semantic value (FSV); the FSV of a sentence is the set of alternatives obtained by substituting a variable in for the Focused element(s). For example, in (6) below, if the direct object *chicken penne* is narrowly Focused, the FSV of the whole sentence is the set of propositions of the form 'Karen ordered x'. Farkas and Bruce (2010) point out that syntactic structure should be represented in this sort of discourse model, since both pragmatic and syntactic constraints apply to phenomena like discourse ellipsis. One way to instantiate this is to represent the Ground (i.e. the non-Focused part of the utterance) as an unsaturated syntactic tree, apart from the Focus. The derivation in Fig.2 below illustrates this using the notation of Tree Adjoining Grammar (TAG, Joshi 1985; Kroch and Joshi 1985; Schabes and Schieber 1990; Frank 2002).² The syntactic structure of the answer from example (6) is decomposed in the discourse model into a tree whose semantic interpretation corresponds to the Question Under Discussion (the Ground tree) and another tree that corresponds to the Focus. The Ground tree has an unsaturated node (denoted with the '↓' symbol). This unsaturated node introduces the set of alternatives—the FSV of this sentence is simply the set of propositions that could be obtained by substituting any DP into that node. In order to derive

²The formalism is meant to be simple and illustrative. There are of course many other ways to mathematically represent the split between Focus and Ground. I find this way to be especially intuitive. I hope the reader will agree.

the full propositional content, the Focus must be substituted into the unsaturated part of the Ground tree. We can capture the effect of Focus on phonological representation by having the split representation feed the prosodic derivation. More specifically, we want only the material in Focus to undergo the right-edge stress assignment algorithm (Liberman and Prince, 1977; Idsardi, 1992; Truckenbrodt, 1999, and many others) that determines English metrical phonology. This is shown in Fig.3.

- (6) Q: What did Karen order?
 A: She ordered chicken PENNE.

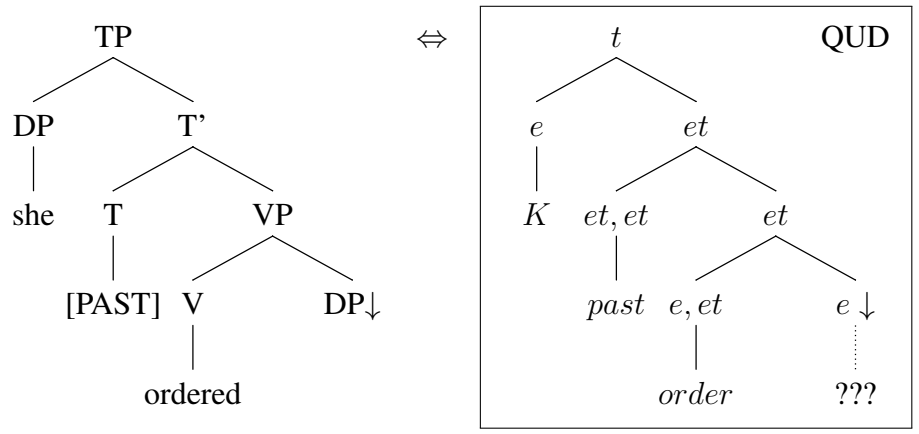


FIGURE 2: THE GROUND IS ISOMORPHIC TO A REPRESENTATION OF THE QUD

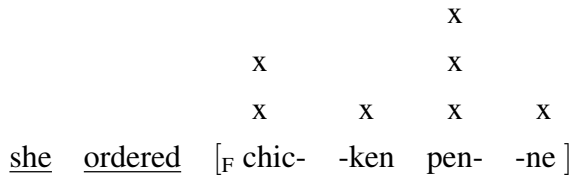


FIGURE 3: ONLY THE FOCUS UNDERGOES STRESS ASSIGNMENT

Sentences are modeled in discourse as a Ground, which signals the identity of the Question Under Discussion, and a Focus, which serves to select an answer to that QUD from the set of possible alternatives. The Focus of a sentence receives prosodic prominence, and the Ground does not. Prosodic contours within the Focus are determined by purely phonological factors which are outside the purview of this work. Representations like those in Figs. 2 and 3 will be used in later chapters to illustrate the role of Focus in determining the intonational possibilities of English and other languages.

2.1.2 Topichood

Many accounts of IS utilize some notion of Topic, a term which has unfortunately been adapted and modified so freely that it is often difficult to keep the various definitions straight. Here I outline three different kinds of so-called Topics that have been introduced in the literature: *aboutness topics* (Reinhart, 1981; Vallduví, 1990; Lambrecht, 1994; Frey, 2004, 2005), *familiar topics* (Rizzi, 1997; Belletti, 2004; Frascarelli and Hinterhöz, 2007) and *shifting topics* (Frascarelli and Hinterhöz, 2007; Brunetti, 2009). Büring's (1997; 2003) special notion of "Contrastive Topic" (CT), and how it compares to the idea of Contrastive Focus, is discussed in 2.1.3 below. Some of these notions are more useful than others, and the only variant which plays a role in the present work (in Ch.6) is the shifting topic.

One common definition of Topichood follows from Reinhart's (1981) assertion that a Topic signals what a sentence is "about". Aboutness often eludes precise definition, sometimes being taken as a primitive, but both Reinhart and Vallduví (1990) offer definitions³ that involve adding propositional knowledge under an "entry" for some entity. The following contrast illustrates.

- (7) a. John got a present from Mary.
b. Mary gave a present to John.

The sentences in (a) and (b) are truth-conditionally equivalent, but (a) seems to be a sentence about John, and (b) a sentence about Mary; under these accounts, the difference is how the proposition is added to the hearer's knowledge store⁴, i.e. how the propositional content is structured.

There are some problems with this approach, pointed out by Hendriks and Dekker (1996) and Hendriks (2002). Mainly, the approach assumes a rich internal structure for propositional semantics that is not necessarily justified. Consider again the example above; if the proposition *gave(M, J, gift)* is entered as a piece of knowledge about John, as in (a), then the following exchange should be somewhat odd. It is not.

- (8) A: John got a present from Mary yesterday.
B: Oh yeah? Who else did Mary give presents to?

³Vallduví uses the term *Link*, as mentioned before, but *Topic* has also been used within Vallduví's framework, e.g. in Eilam 2011.

⁴Or alternatively, how the proposition is added to the Common Ground, after Stalnaker (1974). For such an account, see Krifka (2007)

What's a fact about John in this case must also be a fact about Mary—we now know that Mary is a present-giver. Hendriks and Dekker argue that this renders the hypothesis of Topics as locations for information entry vacuous. Unless we assume *a priori* the reality of file cards or locations more broadly, we do not gain much insight from the analysis.

Let's briefly consider a more general notion of aboutness as presented in Frey (2004, 2005). Frey argues that there is a special medial position in German, to the left of sentential adverbs, that is reserved for Topics. He uses the following test (Frey, 2004, p.6).

- (9) Ich erzähle dir etwas über Maria.
 'I'll tell you something about Maria...'
 Nächstes Jahr wird Maria wahrscheinlich t_{Maria} nach London gehen.
 next year will Maria probably to London go
 'Next year, Maria will probably go to London.'

Fanselow (2006) shows *contra* Frey that in an acceptability judgment task, native speakers of German accept sentences like (9) with or without the movement of the topical element past the sentential adverb. Light (2012) further argues on the basis of this optionality (see Chapters 2 and 4) that cases like (9) are just as easily analyzed as instances of scrambling, in which case the movement need not be directly motivated by any kind of aboutness.

How, then, does one distinguish the different flavors of meaning in *John got a present from Mary* vs. *Mary gave a present to John*? One potentially useful idea is that the left edge often favors elements that are discourse-old or familiar. The notion of a familiar topic is illustrated by the following felicity contrast.

- (10) Mary is a very generous person. In fact, Mary gave a present to John yesterday /
 ?In fact, John got a present from Mary yesterday.

The sentence with *John* at the left edge is somewhat awkward when Mary is already being talked about and John has not been mentioned. Other languages such as Italian have a more robust contrast.

- (11) Q: 'How did you find out about Gianni?'
 A: #Ha telefonato GIANNI / Ha TELEFONATO, Gianni
 has telephoned Gianni / has telephoned, Gianni
 'Gianni called.'

- (12) Q: ‘Who were you just talking to?’
A: Ha telefonato GIANNI / #Ha TELEFONATO, Gianni

When Gianni is discourse-old, it is possible to right-dislocate the subject, both de-accenting it and placing a prosodic break between it and the preceding core clause. The standard “cartographic” approach of Rizzi (1997), Belletti (2004), Frascarelli and Hinterhözl (2007) and others posits special topic positions or Topic Phrases (TopP), the specifier of which attracts elements that are familiar in the immediate discourse. While this may be a useful characterization of the pragmatic license for right dislocation in Italian (and for other constructions in other languages as well), there is no reason to refer to this phenomenon as a kind of Topic, because the broader concept of Givenness (which will be discussed in 2.1.4 below) subsumes these facts and provides a more standard terminology. Givenness has at its core the idea that linguistic elements behave differently when their referents are salient in the discourse context. The criterion for Givenness, as we will see, is met by all of these instances of so-called familiar topics.⁵

Existing definitions of aboutness are either too vague or too theory-dependent to be useful for present purposes, and the concept of familiar topic can be seen as a special case of the independently needed information-structural concept of Givenness. But a third notion, the shifting topic of Frascarelli and Hinterhözl (2007) and Brunetti (2009), is useful as a descriptive term, though I suggest in Ch.6 that it is not independently needed in grammar. Shifting topics are marked in English by the “as for” construction and in Italian by left dislocation, as the following example from Frascarelli and Hinterhözl (2007, p.8) and its translation demonstrate.

- (13) Io, una cosa che ho trovato positiva è stata la comprensione.
I, one thing that have found positive has been the comprehension
‘As for me, one thing that I considered positive is the comprehension.’

The effect of both of these left-edge constructions is to shift the hearer’s attention away from some other entity and toward a newer entity that is part of the proffered proposition. In this case, the effect is to shift attention away from whoever had been previously mentioned and toward the speaker. The following example further illustrates.

⁵It should be noted that Vallduví (1990) refers to these right dislocations as *Tails* and would not call them Topics. That Vallduví’s distinct notions of Link and Tail have been referred to with the same terminology in different lines of research highlights the terminological labyrinth one must navigate when addressing issues pertaining to information structure. Vallduví and Engdahl (1996, p.510) gives a snapshot of this labyrinth as it was more than fifteen years ago. The situation has only gotten worse.

- (14) Q: How's Billy adapting to college?
A: Good. He's thinking about declaring a major already.
Q: Oh yeah? Which one?
A: Economics. As for Susie, she's narrowed it down to either economics or math.

Here we see the “as for” phrase shifting the questioner’s cognitive attention away from one entity (Billy) and toward another (Susan). More specifically, attention is being shifted between entities of the same semantic category (human). The following example shows that this construction can’t be used to change the subject to something unrelated.

- (15) Q: How's Billy adapting to college?
A: Good. He's thinking about declaring a major already.
Q: Oh yeah? Which one?
A: Economics. Anyway, how is your knee doing? /
#As for your knee, how is it doing?

One possible interpretation of this is that the construction shifts the conversation from a resolved QUD to a related QUD that suggests itself naturally to the interlocutors. In (14) the answerer may be expecting the next question to be about Susie, whereas the shifting topic in (15) represents a sort of reset of the discourse, resulting in infelicity. The felicitous alternative in (15) signals this reset explicitly with the word *anyway*. This could also be a reflex of language planning—in the case of (14), the conversation naturally brings Susie to mind, perhaps before the remaining semantic content associated with the sentence in question. This sort of alignment seems less likely for (15). In any case, there does seem to be a natural pressure to place shifting topics at the left edge of an utterance, the effects of which are briefly considered in Chapter 6.

Another Topic concept, Büring’s (1997; 2003) Contrastive Topic, is addressed below in the broader context of Contrast and whether or not it is a necessary component of IS.

2.1.3 Contrast

Studies of information structure often hold that constituents in a sentence can be marked as being “contrastive”. There are at least three general definitions of the term: 1) contrastive elements are marked with a special kind of pitch accent and have a particular relation to another Focused element in the discourse (Prince, 1981a; Büring, 1997, 2003; Tomioka,

2009), 2) contrastive elements signal selection from among alternatives, like Rooth's and Roberts' Focus, but further require that the set of alternatives is restricted by the context (Chafe, 1976; Vallduví and Vilkuna, 1998; Kratzer, 2004; Selkirk, 2007; Kratzer and Selkirk, 2009; Katz and Selkirk, 2011), and 3) contrastive elements have an antecedent in the discourse whose meaning differs along a single semantic dimension, e.g. 'red' vs. 'blue' (Wagner, 2006; Büring, 2008; Wagner, 2012).⁶ Cases that fall under definition 1 are typically called *Contrastive Topics* (CTs); cases that fall under definition 2 are instances of *Contrastive Focus* (CF); I call cases that fall under definition 3 instances of *Mutually Exclusive Contrast* (MEC), echoing Wagner (2006, 2012). I address these in turn.

CTs are characterized by a special fall-rise contour pitch accent, corresponding to a L+H* L⁻ H% tune in the terminology of Pierrehumbert (1980) (see Pierrehumbert and Hirschberg, 1990). Jackendoff (1972) calls this a *B-accent*, and distinguishes it from the normal falling pitch accent associated with Focus, called an *A-accent*. For simplicity's sake I refer to the fall-rise contour of CTs as a B-accent. The canonical example of CTs come from Jackendoff (1972, p.26, italics mark a B-accent).

- (16) Q: Who ate what?
 A1: *Fred* ate the BEANS...
 A2: FRED ate the *beans*...

In (A1), the B-accent on the subject creates the feeling that the answerer is going through a list of eaters, one by one, and pairing each person with a food item. In (A2), on the other hand, the B-accent on the object creates the feeling that the answerer is going through a list of food items. This creates the expectation that Fred was the only one who ate beans, an expectation which is not present in (A1).

Büring (2003) calls these Contrastive Topics, and analyzes them in terms of the role they play in answering the QUD. Following Roberts (1996), Büring posits that Questions Under Discussion are often answered by breaking them up into a series of sub-questions; this series of sub-questions is called a *strategy* for answering the QUD. Büring models these strategies with discourse trees like the ones in Fig.4, which he calls D-trees.⁷ The first strategy is indicated by (A1) in (16), and the second by (A2). Under Büring's analysis, the B-accent signals the nature of the strategy being used, and it does so in the following way (paraphrased from Büring 2003, pp.519-520).

⁶See Repp (2010) for more variations on the concept of Contrast.

⁷This was originally proposed in somewhat different form by Kuno (1982), who called the structures "sorting keys".

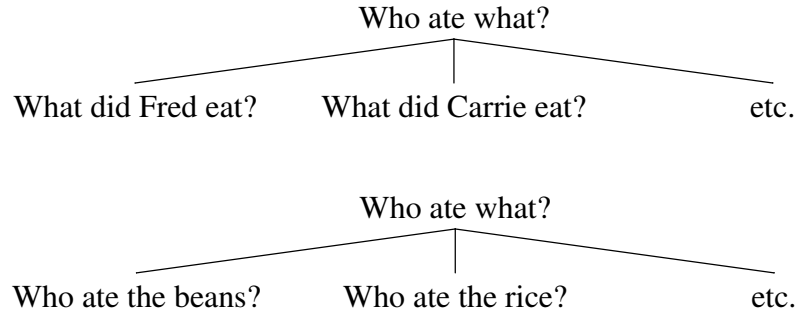


FIGURE 4: TWO POSSIBLE STRATEGIES FOR ANSWERING A QUD

1. For an utterance with a B-accented CT and an A-accented Focus, obtain a question by replacing the Focus with a wh-word and performing the required movements.
2. Now generate the set of questions Q' that can be obtained by replacing the CT with some alternative.
3. The utterance is felicitous iff it answers a sub-question that is part of a strategy containing more than one member of Q'

Applying this to (A1) in (16), we substitute an appropriate wh-word for the Focus to obtain the question *what did Fred eat?*; then, we generate a set of alternative questions of the form *what did x eat?*; finally, we know that (A1) is only felicitous if it is answering a sub-question that is part of a strategy containing at least one other sub-question of this same form. It is thus indicated that something like the first strategy in Fig.4 is in play. Under this analysis, the A-accent reflects the identity of the QUD, and the B-accent reflects *how* that QUD is being addressed.

But is the CT a necessary primitive category of information structure? Lai (2012) provides evidence that CTs are an epiphenomenon, a combination of Focus and a rising tone which signals “discourse non-finality”. On the basis of production and perception experiments, Lai argues that rising tones are used in a variety of environments to signal that the current discourse requirements have not yet been met, i.e. that the QUD stack is not yet empty. The results of these experiments do not support the hypothesis of a one-to-one mapping between the B-accent and CTs (see Ch.6). If we analyze Focus as a signal not only of the current Question Under Discussion, but also of any implicit strategy for answering that QUD, then we can account for the facts with a combination of Focus and Lai’s notion of discourse non-finality. Lai summarizes as follows (p.200).

- Accent placement indicates the form of the Question Under Discussion.
- When alternatives projected by a response via accent placement don't match the alternatives projected by the QUD, the speaker will infer that a strategy is being played.
- Rises signal discourse non-finality.

This requires a slight extension of the analysis of Focus, but the extension seems to be an advantageous one. We can now account for cases like the following, from Büring (2003, p.525), without positing a strict mapping between B-accented and CTs.

- (17) Q: What did the pop stars wear?
 A: The *female* pop stars wore CAFTANS...

The QUD, made explicit here, is not 'what did which gender pop star wear?', as the accent placement might suggest; however, we can assume that the Focus on *female* is signaling not the larger QUD, but rather the first sub-question in an implicit strategy like the one in Fig.5.

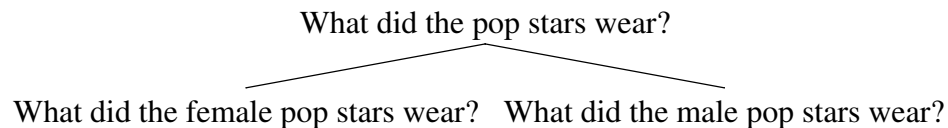


FIGURE 5: AN IMPLICIT STRATEGY

According to Lai, the existence of the B-accent is independent from the Focus structure and serves only to show that, at the point of uttering *female*, the pragmatic requirements imposed by the current discourse have not been met. This predicts that any non-final Focus should be able to be B-accented, and my intuition is that this is true. The following intonational variant of (17) is acceptable,⁸ and is natural under Lai's account, but is not straightforward under Büring's account.

- (18) Q: What did the pop stars wear?
 A: The *female* pop stars wore *caftans*, and the *male* pop stars wore KILTS.

For this case, we can use a combination of Focus and non-finality: the implicit sub-questions are marked by Focus on *female/caftans* and *male/kilts*, and any of *female, caftans*

⁸However, (17) seems slightly more natural. Perhaps this arises from an independent phonological pressure to minimize the number of B-accented.

or *male* can be marked with a B-accent to show that at those points during the utterance, the strategy has not yet been exhausted (and thus the QUD stack is not empty).

Apart from Contrastive Topics, there are also notions of Contrastive Focus in the literature which, like Rooth's or Roberts's Focus, involve selection from among alternatives, but in which the set of alternatives is rather restricted. Consider the following.

- (19) A: I heard you bought an SUV.
B: No, I bought a CONVERTIBLE.

Compare this to the following non-contrastive variant of the same sentence.

- (20) Q: What did you buy with all that bonus money?
A: I bought a CONVERTIBLE.

In (20) the set of alternatives introduced by the QUD is virtually unbounded—the answerer is asked to indicate what, from all of the possible things that could be purchased, she did in fact purchase. In (19), on the other hand, the set is restricted by the context to a very specific set of things. Under a Rooth/Roberts notion of Focus, we might encode this difference as a difference in QUD, where (20) addresses ‘what did you buy?’, and (19) addresses something like ‘did you buy an SUV, a sedan, a truck, a compact car or a convertible?’ In other words, (19) seems to presuppose⁹ that B bought some kind of automobile. Thus the set of alternative responses is much more limited than in (20).

It has been a point of contention, going back to a debate between Chomsky (1971) and Bolinger (1976), whether or not cases of so-called Contrastive Focus (CF) like (19) are, in the words of Chafe (1976, p.34), “qualitatively different from those which simply supply new information from an unlimited set of possibilities.” One diagnostic for these cases is that, as shown in (21), CF is allowed in cleft sentences, which carry a strong implicature of exhaustivity as in (22), where the cleft construction *it was Jill who gave Mary a present* suggests that Jill was the only one who bought a present.¹⁰

- (21) a. John didn't give Mary a present, [_{CF} JILL] gave Mary a present.
b. John didn't give Mary a present, it was [_{CF} JILL] who gave Mary a present.

⁹I don't mean this in the technical sense.

¹⁰Kiss (1998, 2007) posits a distinction on the basis of Hungarian between *identificational focus* and *information focus*, where the former roughly corresponds to a cleft in English, and the latter to non-exhaustive Focus. The difference is that Hungarian identificational focus actually *entails* exhaustivity. As Horvath (2010) notes, this can be analyzed without direct reference to Focus using an exhaustivity operator similar to ‘only’.

- c. Q: What did Mary get for her birthday?
 A: ??It was [_F a TELESCOPE] that she got.

(22) It was JILL who gave Mary a present. ?Bill gave her one, too.

Katz and Selkirk (2011) show that cases of CF exhibit higher peaks in pitch and duration than cases of non-contrastive Focus. It is these higher prominence Foci that are said to associate with *only*, as in the following (from Selkirk, 2007, p.129), all of which are taken to be an answer to the question ‘what happened?’

- (23) a. Wittgenstein only brought a glass of WINE over to [_{CF} ANSCOMBE].
 b. Wittgenstein only brought a glass of [_{CF} WINE] over to ANSCOMBE.
 c. Wittgenstein brought a glass of WINE over to ANSCOMBE.

The scope of *only* is the Focus with the higher level of prominence, marked *CF*, which corresponds to the Focus whose alternative set must be clearly delimited in the context. Sentence (a) in (23) is only felicitous when a set of individuals associated with Anscombe is evoked in the discourse context. Similarly, (b) is only felicitous when there is some other item or items that Wittgenstein could have been expected to bring to Anscombe.

The question now is whether CF needs to be distinguished as a separate ontological primitive from the broader, QUD-based notion of Focus. This is still an open question in the literature, but none of the claims made in this work require a categorical distinction. While Katz and Selkirk (2011) make a convincing case for a difference in phonetic realization between the two kinds of contexts, it is not a qualitative difference in pitch accent, but rather a relative difference in degree of prosodic prominence. To be conservative I instead adopt a nested Focus structure for these cases (see e.g. Büring, 2007; Rooth, 2009), where the contrastive elements bear an extra Focus mark and receive an additional layer of prominence.

(24) [_F Wittgenstein only brought a glass of [_F WINE] over to ANSCOMBE]

This raises the question of how these nested Foci should be interpreted. A purely QUD-based analysis is problematic. In addition to association with *only*, nested Foci are also found in the so-called farmer sentences of Rooth (1992). These sentences involve additional prominence on elements within a larger Focus domain which vary along a single semantic dimension, as in (25).

(25) $[_F \text{ An } [_F \text{ AMERICAN }] \text{ farmer was talking to a } [_F \text{ CANADIAN }] \text{ farmer. . .}]$

Under Rooth (1992), the three Foci are licensed as follows. First, the entire proposition has a Focus Semantic Value (FSV) of $\{\Phi_t\}$, or the set of all relevant propositions, and thus if any other proposition has been implied by the discourse (which is always true), then the entire sentence can be Focused. Second, the FSV of the DPs *an AMERICAN farmer* and *a CANADIAN farmer* is $\{x_e : P(x) \& \text{farmer}(x)\}$, or the set of all DP denotations that have some relevant property in addition to being a farmer. In (25) each DP is anaphoric to the FSV of the other—the presence of each DP licenses the Focus structure of the other.

While Rooth’s alternative semantics provides a complete formal description of this phenomenon, the QUD-based pragmatic approach, whose conceptual advantage is to explain *why* the system behaves this way, does not straightforwardly account for it. It is not necessary for any question about the nationality of farmers to have been proffered, implicitly or explicitly. Indeed, these examples are most naturally read as response to the QUD ‘what happened?’, in which case the Focus is the whole sentence, and default prosodic assignment should occur. Instead, the contrast between *American* and *Canadian* licenses strong non-default prominences on the contrasting elements. If Focus can indeed be fully explained by the structure of discourse itself, then these examples must be part of that story.

This brings us to a related but specialized definition of Contrast used in the analysis of Wagner (2006, 2012), which is crucial to the forthcoming discussion on the difference between Givenness and Focus. Wagner deems an element Contrastive iff it has a “mutually exclusive” antecedent in the discourse. Formally, a constituent $[ab]$ has a mutually exclusive antecedent $[ab']$ iff the universal closure (UniClo) of $[ab]$ (for all x , $[[ab]](x)$ is true) entails the falsity of the existential closure (ExClo) of $[ab']$ (there is an x s.t. $[[ab']](x)$ is true). Informally, $[ab]$ and $[ab']$ are Mutually Exclusive Contrasts (MECs) with each other iff they differ along only one semantic dimension. For example, in (25) the adjectives *American* and *Canadian* both differ along the dimension of nationality, and therefore the UniClo of the former, $\forall x. \text{American}(x) \& \text{farmer}(x)$, entails that the ExClo of the latter, $\exists x. \text{Canadian}(x) \& \text{farmer}(x)$, is false, and vice versa. Consider another example.

(26) I don’t like lengthy dissertations. I like CONCISE dissertations.

The DP *concise dissertations* is an MEC with an antecedent *lengthy dissertations*, because the UniClo of *concise dissertations* ‘for all x , x is a concise dissertation’ entails that the ExClo of the antecedent ‘there is an x such that x is a lengthy dissertation’ is false. In other

words, lengthy dissertations cannot also be concise dissertations. This notion of MEC describes the distribution of nested Foci in cases like (19) and (21) as well. Ideally, a pragmatic theory of Focus will provide a unified motivation for QUD-based Focus, contrastive Focus and MEC. This is the goal of Chapter 5 of this work.

To summarize thus far, I am making the following prior assumptions about the discourse-prosody interface. One of the aims of Chapters 5 and 6 is to fill in the question marks.

Concept	Ontological status	English realization	Function
Focus	???	Pitch accent (PA) placement	Selects an answer to the QUD, or to a sub-question that is part of a strategy for that QUD
Contrastive Focus	Nested Focus	Additional PA	Signals Mutually Exclusive Contrast (MEC)
Contrastive Topic	Epiphenomenon	PA placement/melody	A simultaneous signal of Focus and discourse non-finality
Shifting Topic	???	Left-edge linear order	A natural shift in attention from one entity to another

TABLE 1: THE DISCOURSE-PROSODY INTERFACE

I now turn to the discussion of Givenness, the last of the four IS notions explored in this chapter.

2.1.4 Givenness

Examples like the following from Ladd (1996, p.175) pose somewhat of a problem for the above Focus-based accounts of accent placement.

(27) She gave me a German book, but I don't READ German.

What are to be the alternatives here? Under Rooth, we may adjoin \sim to the VP in which case there must be an alternative of the form $\lambda x.P(x, German)$. That is, there should be some two-place predicate that takes *German* as its argument. Such an antecedent is not

found. Under Vallduví's and Roberts's construals, however, Focus does not necessarily have to correspond to a syntactic constituent. In this case we could say that the Ground or QUD associated with this sentence is $P(\textit{German})$, and that the Focus is a one-place predicate $\lambda x. \textit{I don't read } x$. This is more reasonable, but still not straightforward. If QUDs or open propositions are meaningful notions that drive discourse, then we expect some expectation on the part of the hearer that the speaker will address them, and yet cases like (27) are felicitous in contexts with no prior discourse goals or expectations. Consider an example of what I call a conversation starter.

(28) Context: Pat is reading a book about castles in Germany. Chris walks in, sees Pat, and utters the following sentence out of the blue in order to engage Pat.

I've never BEEN to Germany. Have you?

This is a felicitous way to start a conversation even if Pat is initially unaware of Chris's intent to engage linguistically. Any open proposition or QUD of the form $P(\textit{Germany})$ is not part of the discourse—in cases like this the “discourse” consists only of the ever-present QUD, ‘what's up?’. Rather, it is simply a matter of what is salient to Chris and Pat as individuals. Going back to Chafe (1974), it is in virtue of the referent of *Germany* being “in the consciousness” of the interlocutors at that moment that the object PP is de-accented.

Beginning with Schwarzschild (1999), formal semanticists have analyzed this phenomenon with a notion called Givenness, which is defined below (Schwarzschild, 1999, p.9).

An utterance U counts as GIVEN iff it has a salient antecedent A and:

- a. if U is of type e, then A and U corefer
- b. otherwise: modulo existential type shifting, A entails the existential F-closure of U.

BOX 1: SCHWARZSCHILD'S GIVENNESS

Schwarzschild works within the framework of assigning F-features to elements within which prosodic prominence is assigned, but he posits that F-features are purely phonological and receive no semantic interpretation. Pragmatic context influences accent only in that grammatical constraints exist that make Given nodes resistant to F-marking, placing those nodes outside the domain of accent assignment. In the above definition, “existential F-closure” is taken to be the result of replacing F-marked nodes with variables and existen-

tially binding them. Whenever the existential F-closure of a node on a syntactic tree is entailed by (the existential closure of) some salient antecedent, that node is marked as Given. In other words, a node is Given in the sense of Box 1 if it has a salient antecedent in the discourse or if it dominates something that does. F-feature assignment is then constrained such that F-features must be assigned to nodes that lack Givenness-marking. An additional constraint to minimize F-marking ensures that G-marked nodes remain de-accented.

In Ladd's example in (27), we can derive the accent pattern by showing that both the DP *German* and the VP *read German* are Given under Schwarzschild's technical definition, but that the verb *read* is not. The result is that only the verb must bear an F-feature. First, *German* is Given in that there is a salient antecedent: the German language is made salient by the preceding context if the book is taken to have been written in German. Under item (a) in Box 1, *German* should not bear an F-feature. It is easy to show that the larger VP should not receive an F-feature either, under item (b). If the type *e* semantic object referring to the German language is salient in the context, then so is the proposition that German is the language of the book. The VP is marked as Given because this proposition entails the existential F-closure of $[[\text{READ}_F \text{ German}]]$, which is $\exists P.P(\text{German})$. The verb itself, however, does not meet either of the criteria. Under Schwarzschild's constraints on accent placement, the verb bears the only strong pitch accent.

In many contexts, Givenness makes the same predictions as purely Focus-based accounts of accenting, and it has been claimed (beginning with Schwarzschild) that Givenness is sufficient to account for question-answer congruence. Consider again the simple example (2), repeated here.

- (29) Q: Who danced at the party?
 A: MARY danced. / #Mary DANCED.

The verb *danced* does not receive an F-mark because it is Given. The question, which is part of the context, suggests the proposition $\exists x.PAST(dance(x))$, which is identical to the existential F-closure of the intransitive VP. The subject, however, is not Given, and thus requires F-marking.

The idea that F-marking is not itself interpreted is problematic, however, because there are cases in which Given elements must bear sentential stress. Consider the following.

- (30) A waiter is helping a co-worker bring food out to a table of guests. Holding a plate of chicken in one hand and a plate of tofu in the other, the waiter turns to his co-worker and asks, “who ordered what?”
- A: The guy with the HAT ordered the TOFU. /
#The guy with the HAT ordered the tofu.

In this case it is necessary to accent both the subject and the object, as both constitute the answer to the multiple wh-question under discussion. Under Schwarzschild, one should be able to de-accent the entire VP *ordered the tofu*, as tofu is salient and the context entails that somebody ordered a plate of it. This is unavailable whether or not the subject is also Given—the set of possible tofu-orderers could be large enough that the individual in question is not particularly salient at the time of utterance. The existential closure of the VP’s denotation is entailed by the (non-linguistic) context, and thus *ordered the tofu* meets the Givenness requirement, as does *the tofu* since it has a salient type *e* antecedent. Yet the direct object bears prosodic prominence. In this case, a QUD-based Focus analysis is more helpful.

A quick terminological note is in order. In defining Givenness, Schwarzschild recognized that salience was crucial. The essence of the analysis is that if a constituent’s denotation is salient in the discourse context, it will lie outside the domain of accent assignment. This is a stronger requirement than simply being known to the hearer, which the word “Given” might imply. We are not talking about old vs. new information, but rather salient vs. non-salient denotations. Prince (1981b) points out the problems with using “Givenness”, and suggests that the term be avoided. Using her taxonomy we could refer to the phenomenon as Givenness_S, where the subscript *S* stands for ‘salience’. However, Schwarzschild’s term has become quite common in semantics, and thus I adopt it.

Schwarzschild’s framework assigns prominence via F-features which are constrained to avoid nodes of the syntactic structure that satisfy the Givenness requirement. Some have posited that Given nodes are overtly marked with a G-feature (Féry and Samek-Lodovici, 2006; Kucerova, 2007; Selkirk, 2007; Kratzer and Selkirk, 2009). This has been incorporated into an Optimality Theory (Prince and Smolensky, 1993) analysis of prominence assignment where Givenness competes with a semantic/pragmatic notion of Focus to explain cases like (30) (Féry and Samek-Lodovici, 2006). G-marking also allows for new hypotheses regarding IS-based syntactic movement (Kucerova, 2007). Under this kind of analysis, G-marking is licensed by the salience of a phrase’s denotation and interfaces with prosodic phonology by forcing the G-marked constituent to be de-accented. In addition,

there is a (Contrastive) Focus feature which places prominences on pragmatically prominent elements as in (30). We could account for (30) with a simple interface rule: “De-accent G-marked material, but don’t de-accent an entire Focus domain.” Figure 6 illustrates.

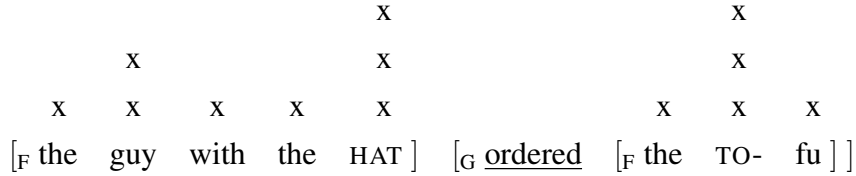


FIGURE 6: THE CONFUSED WAITER

In the case of a multiple wh-question there are two Foci, and by hypothesis the discourse-prosody interface dictates that each have a strong prominence. Thus, G-marking cannot de-accent the entire VP since the Focus *the tofu* is contained within it.

The analysis proposed in this work posits both Givenness and Focus as distinct phenomena. However, *contra* analyses of the kind presented in Selkirk (2007), the current work shows that Givenness and Focus should not be assigned the same status in grammar. Only Givenness is marked in the syntactic derivation of a sentence, while Focus is purely an interface phenomenon. Furthermore, as mentioned in 2.1.3, the current analysis does not assume a distinction between Contrastive Focus and more open-ended conceptions of Focus. The core argument for the existence of Givenness as a syntactic feature separate from Focus is given in Chapter 3. Before proceeding, I outline some additional syntactic and pragmatic assumptions.

2.2 Syntactic Assumptions

I assume the standard architecture for the grammatical system, as in Fig.7, where syntax is construed as a derivational computational system that determines the possible correspondences between the externalization of a sentence, or Phonological Form, and its core meaning, or Logical Form.

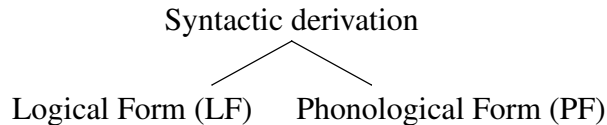


FIGURE 7: STANDARD GRAMMATICAL ARCHITECTURE

I assume a Minimalist view of the syntactic system (Chomsky, 1995, 2001) where sentences are constructed via merging, adjunction and agreement. The basic combinatorial operations are merging and adjunction; the former combines heads, arguments and specifiers into XPs, and the latter inserts optional structure such as modifiers. Lexical items carry morphological features which are either interpretable at LF or uninterpretable. Uninterpretable features enter into an agreement relation with interpretable features, and for some lexical items this triggers movement. Movement is taken to be a complex operation where structure within the tree is copied and merged (or possibly adjoined) at the point in the derivation where the agreement relationship is activated, and only the higher copy is pronounced. If a lexical item heads an XP, any interpretable features of that lexical item project upward to the entire XP.

The notation to be used is illustrated in Fig.8 with a simple example of wh-movement. Features are given as subscripts (*u* denotes ‘uninterpretable’) and unpronounced copies of constituents are placed in parentheses. In the example in Fig.8, the null complementizer carries an uninterpretable feature *WH*, a feature which is only interpretable on question words like the determiner *which*. The interpretable *WH* feature on the determiner projects to the dominating DP and enters into agreement with the complementizer, making that DP a target for movement to the specifier position of C, at the left edge of the clause. There is of course also head movement of the tense element *do*, the mechanics of which I am not concerned with. In Fig.8 I have omitted levels of structure that do not affect word order and are not relevant to analysis (e.g. the *vP* layer in which the subject is thought to originate).

The principle of feature projection is crucial to the analysis of Givenness set forth in the following chapters in that there are constraints both on accent placement in English and on scrambling in German that can be explained by the projection behavior of a Givenness feature. It is also crucial that the grammar allows for optional morphosyntactic features. We know that some features are obligatory in that they reflect inherent semantic facts about the lexical items they are associated with. For example, a pronoun must have a person feature and a number feature, as these reflect inalienable facts about that pronoun’s meaning. The effect of a discourse-related feature like Givenness is quite different. The meaning associated with Givenness is a fact about the discourse context, and not a fact about the denotation of the lexical item or phrase whose pronunciation it affects. Such a feature can associate freely as long as certain discourse requirements are met. Crucially, I propose that the meaning associated with the G-feature is a presupposition that is determined both by the context and by the denotation of the maximal projection of the lexical item with which

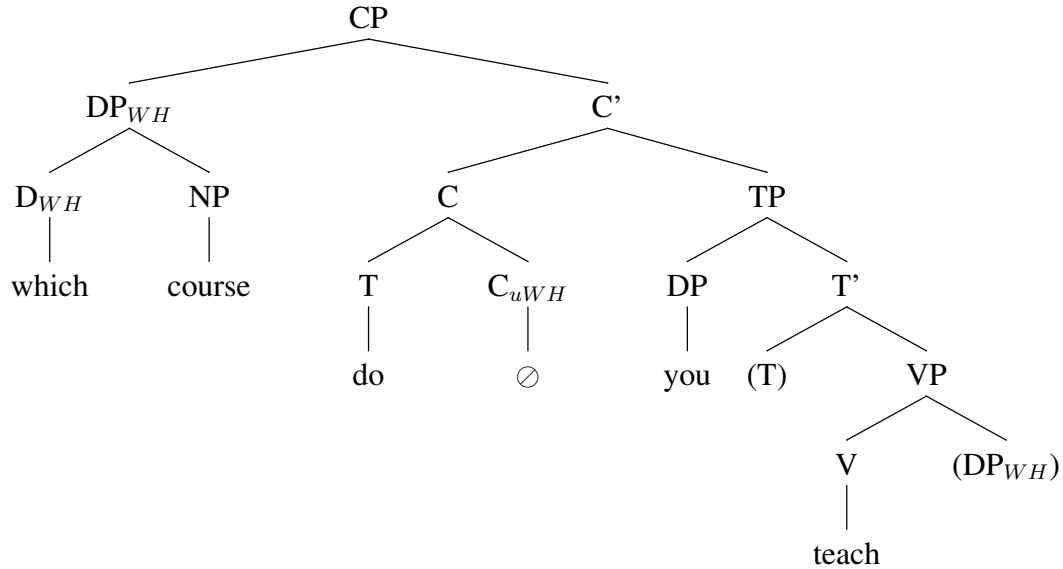


FIGURE 8: SYNTACTIC NOTATION

it is associated. This can be encoded in a Minimalist framework by positing an optional [GIVEN] morpheme which can be merged with any lexical item, and whose inclusion in a syntactic structure is never necessary for convergence.

While I assume that there is a Minimalist grammar (such as the one fully formalized in Stabler 1997) that generates the set of possible syntactic tree structures, I additionally utilize the notation of a different grammar formalism, TAG (Tree Adjoining Grammar, Joshi 1985; Kroch and Joshi 1985; Schabes and Schieber 1990; Frank 2002), to represent these tree structures in discourse, as was shown in 2.1.1. I draw a hard line between the set of rules that determines what is syntactically possible and the mechanism whereby structures are represented in active discourse. More specifically, I utilize the Substitution operation from TAG to enforce a split representation of each linguistic structure as a Focus and a Ground. The syntactic conventions used in this work are fully illustrated in Fig.9 below, which represents a possible answer to the question from Fig.8.

The sentence in Fig.9 has a structure derived via Minimalist principles applied to English lexical items. The propositional content of the sentence is contained within the TP node, and this is used to represent the semantic content of the sentence in the discourse. The QUD is ‘which course do you teach?’, whose meaning is the set of propositions of the form ‘(questionee) teaches X’. The Ground representation is the syntactic structure of the TP with the object DP node stripped away (as denoted by the down arrow); it is isomorphic

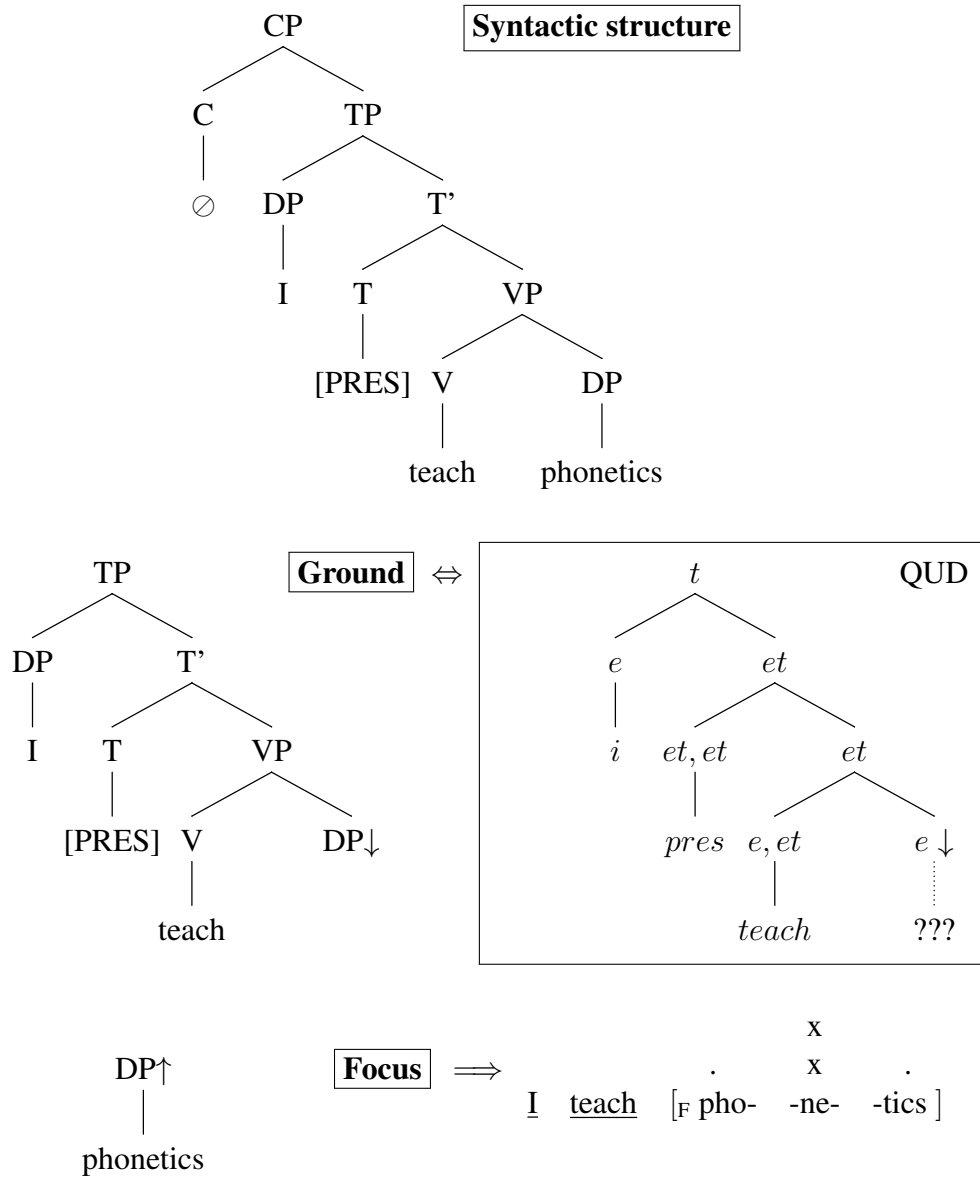


FIGURE 9: FULLY REPRESENTING A SENTENCE

to a structured representation of the QUD, i.e. for every node of the Ground there is a node on the QUD tree in the same position of the appropriate semantic type (see Schabes and Schieber, 1990). The node that was stripped away, the DP *phonetics*, constitutes the Focus. In order to retrieve the propositional content of the sentence, the Focus must be substituted in for the DP↓ node in the Ground tree. The split serves to feed the prosodic representation, which only assigns sentence-level stress within the Focused node.

Finally, scrambling provides a crucial test of the claims made about Givenness in the following chapters. Scrambling, taken here to be the optional short-distance movement of verbal arguments, occurs in many of the world’s languages. German is used at the test case in Chapter 4. It is hotly debated whether scrambling should be analyzed as traditional movement to an A-bar position (Saito, 1989; Müller and Sternefeld, 1994; Bailyn, 1995, and many others), or possibly to an A-position (Mahajan, 1990; Miyagawa, 1997), or as internal adjunction (Webelhuth, 1989; Wallenberg, 2010). While there is evidence for the traditional movement approaches, e.g. from binding and island constraints (see Bailyn, 2002, for a summary), the optionality and locality constraints of the operation makes an analysis in terms of adjunction appealing (see Wallenberg, 2010, for an extended argument). Luckily, it is not necessary to assume any of these particular approaches. The only assumption that must be made is that scrambling is indeed an instance of syntactic movement. Fanselow (2001) proposes that scrambled arguments are base-generated in a higher-than-canonical position, but this view is not mainstream and there are apparent counterexamples (see Bailyn, 2002) that are difficult to address. The primary motivation for Fanselow’s account is that more traditional accounts of scrambling are seen to be at odds with Minimalist assumptions about language. However, there are movement-based accounts that fit in nicely to the Minimalist program, such as Wallenberg’s adjunction-based analysis. Any movement-based analysis is compatible with the predictions made in Chapter 4 of this work, and regardless of the specific mechanisms, the resulting structure for an instance of scrambling is like the following.

- (31) Ich weiss [_{CP} dass der Hans [_{DP} den Brief] seiner Schwester *t*_{DP}
 I know that the.nom Hans the.acc letter his.dat sister
 geschickt hat]
 sent has
 ‘I know that Hans sent his sister the letter.’

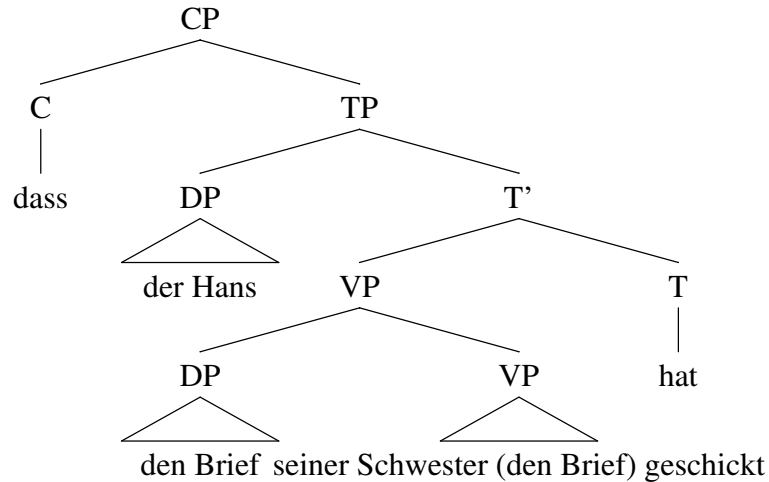


FIGURE 10: AN INSTANCE OF SCRAMBLING

To conclude this chapter, I now turn to a brief explication of the pragmatic framework adopted in the following chapters. This framework allows for a fully formalized analysis of how Contrastive Focus can be derived from wh-Focus, and of how Focus and Givenness interact to produce some of the linguistic tendencies that characterize the effects of information structure on prosody and syntax.

2.3 Pragmatic Framework

Linguistic communication is a cooperative process whereby interlocutors agree on intended propositional content. At the heart of pragmatics, beginning with Grice, is the observation that it is not enough to decode words and phrases from conventional semantic representations; interlocutors must be reasonable. Game-theoretic pragmatics (Parikh, 2001; Sally, 2002; Jäger, 2008; Parikh, 2010; Clark, 2011) is a simple mathematicization of this idea, founded on the premise that there is nothing specifically linguistic about the reasoning behaviors involved in choosing from among possible utterances and interpretations. This section provides a brief overview of some of the math and notation used in this framework.

2.3.1 Game theory

Game theory is a simple mathematical framework within which to model strategic interaction, and a *lingua franca* for describing human behavior across the social sciences. It

	<i>B stays silent</i>	<i>B betrays</i>
<i>A stays silent</i>	Both get 3 months	A gets 12 months, B is free
<i>A betrays</i>	A is free, B gets 12 months	Both get 6 months

FIGURE 11: THE PRISONER’S DILEMMA

formally describes and predicts the behavior of two or more agents in interactive environments where each agent’s decisions potentially affect the outcomes of the others’ decisions. Depending on the players’ strategies, i.e. sets of actions, the outcome of a game is better or worse for each player depending on their preferred outcomes. Preferences about the outcome of a game are encoded in a payoff function. Rationality is defined within this framework as the “pursuit of a complete and internally consistent payoff function.” (Dixit et al., 2009, p.770). The rational agent will act so as to ensure a preferable outcome for herself given her beliefs about how other agents will behave.

The mathematics of game theory is simple. Players take actions, and those actions have payoffs, or Utilities, that are dependent on the actions of the other players. Each player wants to maximize her own Utility, and each player knows that the other players also want to maximize their Utilities. A simple illustration can be found in the famous “prisoner’s dilemma”. The scenario is this: two criminal partners are interrogated separately by the police. There is only enough evidence for a more minor conviction than what is warranted, and so the police offer each prisoner a deal: rat your partner out for the major crime and go free; your partner will be sentenced to a year in prison. If neither partner spills the beans, they both get 3 months in prison. If they rat each other out, then they split the sentence, both doing 6 months. The matrix in Fig.11 shows the possible outcomes based on the decisions of the two participants.

This can be presented as a game where the two prisoners are the players, and both players have two possible actions, to cooperate (to stay silent) or to defect (to betray). The payoffs are simply the preferences of the players. Assuming both players wish to avoid prison, we can assign a payoff of 0 to one year in prison, a payoff of 1 to 6 months, a payoff of 2 to 3 months and the highest payoff of 3 to going free. This leaves us with the game shown in Fig.12. Prisoner A’s actions are shown on the vertical axis, and A’s payoffs are the first numbers of the pairs of numbers in the cells. B’s actions are on the horizontal axis, and B’s payoffs are the second numbers.

What is the outcome of this game? Obviously, the players would do better with the outcome $\langle cooperate, cooperate \rangle$ than they would with the outcome $\langle defect, defect \rangle$. However,

	<i>Cooperate</i>	<i>Defect</i>
<i>Cooperate</i>	2,2	0,3
<i>Defect</i>	3,0	1,1

FIGURE 12: GENERALIZED PRISONER’S DILEMMA GAME

$\langle cooperate, cooperate \rangle$ will not happen because each player wants to maximize their own payoff and thus, if they think the other player will choose to cooperate, they will choose to defect. Both players know that the other one will be tempted to defect, and so they dare not choose to cooperate, lest they end up with a zero payoff. Thus, the outcome of the prisoner’s dilemma played by rational players is $\langle defect, defect \rangle$. This outcome is referred to as a *Nash equilibrium* after game theory pioneer John Nash (1950,1951). An equilibrium is a state where neither player has any reason to change their strategy given the action of the other player. In other words, knowing that the other player will choose *defect* does not make cooperation a better strategy than defection.

The matrix notation in Fig.12 is generally used for games where actions are chosen simultaneously. But many games, including those relevant to the current study, are sequential. In a sequential version of the prisoner’s dilemma, the first prisoner would take an action, and then the second prisoner would act based on the first prisoner’s action. This is represented below as game tree (called the “extensive normal form” by game theorists), where each lower level of the tree represents a sequential move.

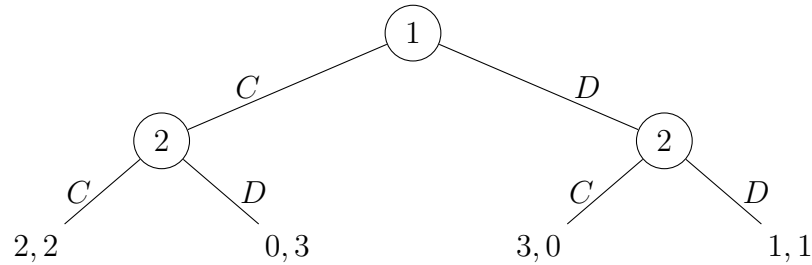


FIGURE 13: A SEQUENTIAL GAME

Here, the equilibrium is taken to be the outcome that optimizes Utility for each player contingent on prior moves.¹¹ The equilibrium can be determined by a *rollback* method, where we work backwards through the game, finding the best strategies for each player in each possible state, in order to determine which outcome will be reached by rational players. By using rollback we find that the sequential version of the prisoner’s dilemma

¹¹A Nash equilibrium in a sequential game is said to be *subgame perfect* if every choice made by each player leading up to the equilibrium outcome is an optimal choice.

has the same equilibrium as the simultaneous version. Once the first player has taken an action, no matter what the choice, the second player always does better by defecting. The first player, knowing this to be true, will choose the action a for which an $\langle a, \text{defect} \rangle$ outcome yields the highest Utility. This results in the equilibrium $\langle \text{defect}, \text{defect} \rangle$.

One of the core claims of game-theoretic pragmatics is that meanings are equilibrium strategies in a special kind of game called a *coordination game*. Schelling (1960) first characterized what is known as a pure coordination game, a non-competitive game in which players are confronted with multiple viable strategies and given no game-internal bias toward choosing one strategy over another. Consider an example where players are asked to simultaneously guess a number, either one, two or three, and given a positive payoff if they pick the same one.

	<i>One</i>	<i>Two</i>	<i>Three</i>
<i>One</i>	5,5	0,0	0,0
<i>Two</i>	0,0	5,5	0,0
<i>Three</i>	0,0	0,0	5,5

FIGURE 14: PURE COORDINATION

With this payoff structure, the most likely outcome is that the players will fail to coordinate. This is because there are three equally positive outcomes for both players, and it is impossible for either player to predict the actions of the other. In some cases a player might have a prior *belief* about the default preferences of the other player. This can be encoded as a probability distribution over actions for that other player. In this case, the best the players can do is to choose an action that maximizes the probabilistically weighted average of the different possible outcomes after taking that action. This weighted average is called the *Expected Utility* of that action.¹² But if all actions are believed to be equiprobable, then each action for each player yields the same Expected Utility, and therefore best the players can do is guess randomly. That is to say, there are three Expected-Utility-maximizing equilibria in the game in Fig.14. This places the probability of a positive payoff at just $\frac{1}{3}$.

Contrary to this prediction, Thomas Schelling noticed that players coordinate at a rate much higher than chance in games like this. His explanation is that certain actions are more salient to the players, i.e. certain actions seem to “suggest themselves”. In an open-ended pick-a-number game, for example, players are highly likely to choose significant

¹²When a Nash equilibrium relies on maximizing Expected Utility, i.e. when the equilibrium is calculated based on prior beliefs about the probability of certain actions, it is a *Bayesian Nash equilibrium*.

numbers like 1 and 100, rather than, say, 47 or 8. This makes coordination more likely than chance. These salient actions are so-called Schelling points, and they can be formalized within the payoff structure of a coordination game by adding Utility to the salient actions. This transforms the coordination game into one that has an obvious optimal strategy. The players will coordinate around the action that maximizes their payoffs.

	<i>One</i>	<i>Two</i>	<i>Three</i>
<i>One</i>	6,6	0,0	0,0
<i>Two</i>	0,0	5,5	0,0
<i>Three</i>	0,0	0,0	5,5

FIGURE 15: A SCHELLING POINT

This is a way of encoding the intuition that players prefer to choose more salient actions, and that the players know this about each other, which allows successful coordination. Of course, this is only possible insofar as the players are working off of a common representation of the game. This involves knowing what is salient for the other player vs. what is salient for purely private reasons. The experiments of Mehta et al. (1994) and Bardsley et al. (2010) highlight this ability; subjects often pick privately salient numbers (like their birthday) when asked simply to pick a number, but when asked to pick the same number as someone else, these privately salient numbers are almost never picked.

In game-theoretic pragmatics, communication is modeled as a pure coordination game in which two interlocutors are trying to converge on correct meanings for each other's utterances. Semantic interpretation, then, is the process of finding a Schelling point in this game. In this way, figuring out an implicature or disambiguating an ambiguous utterance is the same as trying to pick the same number. The decision task at hand is fundamentally the same, though it looks more complex on the surface. This superficial complexity arises from the richness of the context. Imagine the pick-a-number game being played in a context in which both players had just had a conversation about the number two (maybe they both find it lucky). This will undoubtedly change the outcome of the game. So, we know that the kind of shared salience that determines focal points is relative to a context. And since linguistic utterances are always situated in complex networks of common knowledge, the Schelling point of a semantic interpretation game is not always obvious.

Let's consider a simple case where the Schelling point concept could be applied to language.

- (32) A: Hey, look at **the cat**!
 B: She’s got peanut butter on her nose! By the way, the other cat has some on her tail.

Typically a definite description refers to something that is unique, at least within the context (Russell, 1905; Strawson, 1950; Roberts, 2002, 2003). Yet this discourse is felicitous even when both cats are present and visible. The catch is that the cat with peanut butter on its nose is more *salient* within the context. So we may say that the definite description *the cat* is compatible with both possible referents, but that there is a clear choice between the two due to salience. This is modeled as a simple coordination game.

	<i>Interpret cat₁</i>	<i>Interpret cat₂</i>
<i>Intend cat₁</i>	2,2	0,0
<i>Intend cat₂</i>	0,0	1,1

FIGURE 16: CHOOSING THE SALIENT REFERENT

2.3.2 Signaling

Language is perhaps best modeled as a signaling game, a class of game first described by Lewis (1969). This is a game with sequential moves and two players, a Sender and a Receiver. The Sender is assigned a *type* prior to play, and the Receiver does not know what type the Sender is. The Sender’s first move is to send a *message* to the Receiver. The Receiver then takes some action. The Utility of the outcome for both players is dependent on the type of the Sender, the message sent, and the action of the Receiver.

A signaling game can be formalized as a tuple $\langle \{S, R\}, T, \delta, A, M, U_S, U_R \rangle$, where S and R are the two players, the Sender and the Receiver, T is the set of possible types, δ is a probability distribution over those types, A is the set of possible actions for the Receiver, M is the set of messages, and U_S and U_R are the Utility functions for the Sender and Receiver, respectively—both functions of the Sender’s type, the Sender’s chosen message, and the Receiver’s chosen action. In signaling games, the first move belongs to Nature, who is a non-rational “player” who probabilistically assigns the Sender’s type.¹³ If the Receiver is rational, she will choose the action that maximizes her Expected Utility, which in this case is the weighted average over types of the different possible payoffs for the chosen action.

¹³Nature is analogous to the coin flip that begins a football game, though sometimes the coin is weighted.

$$EU_R(a, m) = \sum_{\forall t \in T} prob(t) * U_R(a, t, m)$$

BOX 2: EXPECTED UTILITY IN A SIGNALING GAME

If the Sender is rational, she will assume that the Receiver is rational, and choose a message that maximizes her own Expected Utility based on the actions she thinks the Receiver will take. Fig.17 represents a signaling game version of the prisoner’s dilemma. N_δ represents Nature, who uses a probability distribution δ to choose a type for the Sender. The Sender (S) can send one of two messages, after which the Receiver (R) can either cooperate or defect.

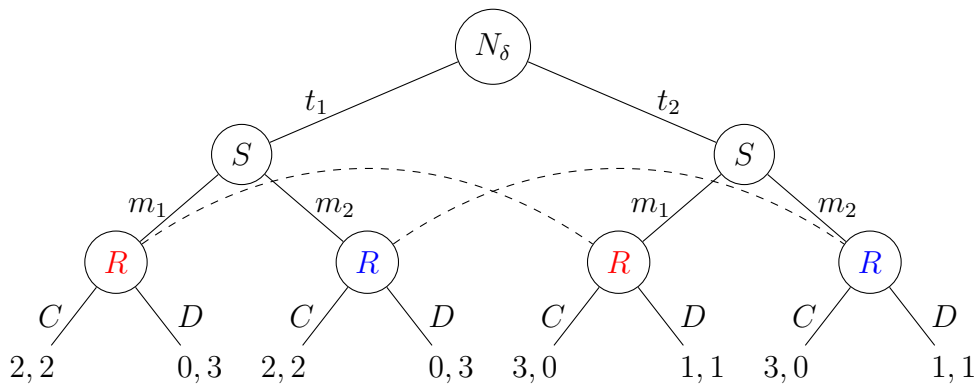


FIGURE 17: PRISONER’S DILEMMA AS A SIGNALING GAME

In this game, a t_1 player is a *cooperator*, someone who always cooperates (i.e. doesn’t rat the Receiver out), and a t_2 player is a *defector*. The Sender is of one of these types, determined probabilistically prior to the game, and the Sender transmits some message, either m_1 or m_2 . Let’s assume that m_1 is something like ‘I’m going to defect’ and m_2 is something like ‘I’m going to cooperate’. After the message is sent, the Receiver can choose either to cooperate or to defect.

The payoffs in this game are assigned such that the message does not actually matter. Say that the Receiver has just received m_2 . The Receiver knows that she is at one of the blue nodes on the game tree. The optimal choice for the Receiver depends on the probability distribution over types, δ . Let’s consider the case where the Receiver believes both types to be equally probable ($\delta = \langle \frac{1}{2}, \frac{1}{2} \rangle$). In this case, the best strategy is to defect, regardless of which message has been sent. The Expected Utility of defecting is $(\frac{1}{2} \times 3) + (\frac{1}{2} \times 1) = 2$, whereas the Expected Utility for cooperating is only $(\frac{1}{2} \times 2) + (\frac{1}{2} \times 0) = 1$. But this same exact situation would hold if the Receiver had received m_1 instead, because the Utility of cooperating vs. defecting is independent of the message that has been sent. This can be

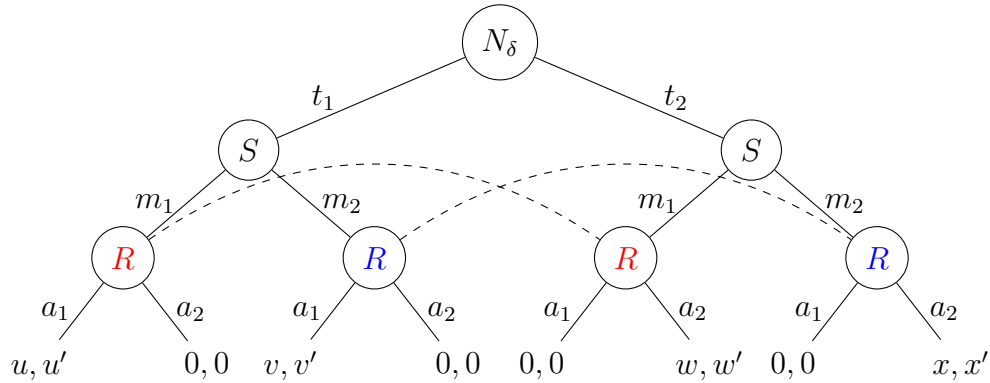


FIGURE 18: COORDINATION WITH SIGNALING

taken to encode the fact that in a prisoner's dilemma game there is incentive to lie. The Sender may say they are going to cooperate, but they could still defect to get that higher payoff. A more complex variant of this game could decrease the payoff for the Sender if his message is a lie. This would model a situation where lying has independent negative consequences, e.g. if the Sender has a reputation to maintain (see e.g. Andreoni and Miller, 1993). A sufficiently high penalty for lying could change the equilibrium strategy from $\langle \text{defect}, \text{defect} \rangle$ to $\langle \text{cooperate}, \text{cooperate} \rangle$.¹⁴

An important sub-class of signaling games is the class of coordination games with signaling. In these games, the payoffs of the two players are aligned, as they are for Schelling's coordination games. When the Sender is of type t_i and the Receiver takes action a_j , the payoff for both players is zero when $i \neq j$. In other words, when there is a mismatch between the behaviors of the two players, neither player benefits. This somewhat simplifies the payoff structure of the game, and leaves us with the structure in Fig.18.

This is analogous to the coordination games in Figs. 14 and 15, but with three important differences. Firstly, the signaling game is played sequentially rather than simultaneously. Secondly, the first rational player, the Sender, has a type, chosen probabilistically by Nature, that affects payoff and is not known to the Receiver. Finally, the Sender sends a message to the Receiver, where the message potentially affects the payoffs for the outcomes.

¹⁴The proper equilibrium concept for signaling games is a refinement of the Nash equilibrium concept called Perfect Bayesian Equilibrium (PBE, Harsanyi, 1968; Fudenberg and Tirole, 1991). PBE is the Bayesian counterpart to a subgame perfect equilibrium. The idea behind PBE is that equilibrium strategies are evaluated with respect to beliefs that can be updated as the game is played. This excludes, for example, actions that would only be optimal if the Sender were of a type which is excluded by the Sender's message. Since such scenarios do not arise in the simple games I use, I do not fully consider the requirements of PBE when calculating equilibria. Rather, I simply take the equilibrium strategy in a signaling game to be that obtained by using *rollback* (see discussion of Fig.13) to maximize the Expected Utility for both players.

It is this kind of game that will be used in Chapter 5 to model Focus, where the Foci of a sentence are taken to be messages in an information-transmitting signaling game. The core claim of that chapter is that a signaling model of language use unifies QUD-based and contrastive instances of Focus and maintains the explanatory power of the pragmatic approach. The main advantage of using game theory in this case is that well-established behavioral principles from other fields can be invoked to explain linguistic data. This allows me to argue that several interesting phenomena related to Focus are not arbitrary conventions of language, but rather byproducts of the way strategic behavior is applied to linguistic communication. This is in stark contrast to the conception of Givenness I argue for, which is part of the syntactic derivation of a sentence, and thus subject to some arbitrary distributional constraints.

I now conclude this chapter by underlining one more crucial property of cooperative games: the outcome of a cooperative game depends on how the players internally represent the possible moves in the game. In other words, salience is a property of *representations* of actions, and not of actions themselves. We must say something about how representations give rise to salience. This process is referred to as *framing*.

2.3.3 Framing

Schelling points are not always reliable. Importantly, coordination around a Schelling point requires certain salient properties of an action to come to mind for all players. This in turn requires the players to have similar internal representations of what the possible actions are. After Bacharach (1993, 2006), the way in which individual players represent their options in a game is called a *frame*. A frame is a set of predicates that serve as labels for a player's actions. One can think of a frame as the set of salient attributes that come to mind when considering an action. For example, consider again the Schelling point game in Fig.15, repeated below.

	<i>One</i>	<i>Two</i>	<i>Three</i>
<i>One</i>	6,6	0,0	0,0
<i>Two</i>	0,0	5,5	0,0
<i>Three</i>	0,0	0,0	5,5

One possible frame is $F_1 = \langle 1st, \neg 1st, \neg 1st \rangle$, where the number *one* has a special property of being the first in a sequence, and the other two numbers are represented simply as the numbers that are not first in the sequence. We may say that an action whose label is unique

within its frame is a salient action. F_1 for both players yields the payoff structure in Fig.15, where *one* is a Schelling point.

Successful coordination can be inhibited if players frame their actions differently. If one player represented the game in Fig.15 with F_1 , but the other player with a different frame $F_2 = \langle \neg last, \neg last, last \rangle$, coordination would not occur. Consider another example. Imagine a coordination game where players are asked to circle one of the letters in the scene in Fig.19. This scene could be represented in at least two different ways depending on which properties are more salient to the participant.

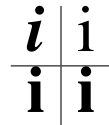


FIGURE 19: MULTIPLE POSSIBLE FRAMES

You could frame the four options either as $\langle italic, regular, regular, regular \rangle$ or alternatively as $\langle bold, nonbold, bold, bold \rangle$. Depending on which property is more salient to you, a different action will suggest itself, and you will choose a different Schelling point. If the other participant has framed the game differently from you, then she will pick a different character, and you will get no prize.

The importance of frames to cooperative reasoning is supported by experimentation in Bacharach and Bernasconi (1997). In this same work, the authors define a frame as involving *families of attributes*, where each available action for a player must evoke the same families. The authors (p.6) note that, in the context of their experiments, “when attributes do come to mind they come in clusters. . . it is nearly impossible to notice that ‘U’ is a vowel without noticing that other objects are consonants.” In Fig.19, the letters can be framed with respect to italicization, boldness or both, but one cannot mix and match. In other words, the set of attributes contained in a frame must be mutually exclusive—while *bold* and *nonbold* are mutually exclusive, *bold* and *italic* are not, and thus a frame like $\langle italic, nonbold, bold, bold \rangle$ is not allowed.

The role of framing in determining the outcome of a coordination game can be formalized as a mapping from frames onto Utilities. This formalization is based on the intuition that players in coordination games are not merely choosing actions, but rather they are choosing from among the set of *labels* (i.e. attributes, see Sugden 1995) attached to the available actions. These labels are supplied by the frame. Continuing the example in Fig.19 with this in mind, we can summarize the different outcomes in the following way.

1. Under the frame $\langle italic, regular, regular, regular \rangle$, the players have two choices with respect to the labeling of their move: they can pick an *italic* letter, or they can pick a *regular* letter.
2. If each player decides to pick a regular letter, there is a one in three chance of coordinating.
3. If each player decides to pick an italic letter, they will definitely coordinate.
4. Under this frame, it is better if the players choose *italic* as the label for their action.
5. Under the frame $\langle bold, nonbold, bold, bold \rangle$, the same reasoning leads to the selection of the non-bold letter.
6. If the players are operating under different frames, coordination is less likely.

There is a simple rule: given a particular set of labels for the actions in a game, choose the action whose label is least represented in the set of labeled actions. This is formalized as a transformation on Utilities: the Utility for an action in a coordination game with framing and labels is inversely proportional to the probability of choosing an action with that same label at random. This takes the pure coordination game in Fig.20 and transforms it into the one in Fig.21, which is similar to the game in Fig.15 and has a clear Schelling point.

	a_1	a_2	a_3	a_4
a_1	1,1	0,0	0,0	0,0
a_2	0,0	1,1	0,0	0,0
a_3	0,0	0,0	1,1	0,0
a_4	0,0	0,0	0,0	1,1

FIGURE 20: COORDINATION GAME WITH NO LABELS

	<i>italic</i>	<i>regular</i> ₁	<i>regular</i> ₂	<i>regular</i> ₃
<i>italic</i>	1,1	0,0	0,0	0,0
<i>regular</i> ₁	0,0	$\frac{1}{3}, \frac{1}{3}$	0,0	0,0
<i>regular</i> ₂	0,0	0,0	$\frac{1}{3}, \frac{1}{3}$	0,0
<i>regular</i> ₃	0,0	0,0	0,0	$\frac{1}{3}, \frac{1}{3}$

FIGURE 21: COORDINATION GAME WITH LABELS SUPPLIED BY A FRAME

I argue in Chapter 5 that if we use signalling games to model Focus assignment, framing gives us the concept of Mutually Exclusive Contrast (MEC) for free. Under this account, we can collapse Contrastive Focus and QUD-based Focus into a single pragmatic generalization, where QUDs provide just one way among others of framing the interpretation of an utterance. By applying the restrictions of framing theory to this account, we do not need to make any stipulations of MEC. Rather, it is an intrinsic property of the pragmatic reasoning mechanism underlying the assignment of phonological Focus.

In this chapter we have reviewed some key concepts of the study of information structure, established some assumptions about the nature of syntax, and outlined a simple game-theoretic framework to model pragmatic choice in language use. With this foundation in place, we now turn to the first core claim of this work: Givenness exists independently of Focus, and behaves like a syntactic feature.

Chapter 3

Givenness as a Formal Feature

3.1 Why are both Givenness and Focus necessary?

Considering again the simple case of question-answer congruence, there are two ways in which we can account for the accent pattern according to the information-structural notions outlined in the last chapter.

- (1) Q: Who danced?
A: MARY danced

The observed intonation is due either to Focus on *Mary*, induced by the Question Under Discussion (QUD), or to the predicate *danced* being Given in light of the preceding question. With this overlap in function it is natural to wonder whether Focus and Givenness are separate phenomena, or if they can in fact be unified. If unification were possible it would be optimal, per Occam's Razor, but I hold that the facts are not consistent with such an analysis. To make the case I briefly outline the proposed unification of Wagner (2006, 2012) where Given elements de-accent only when the accent shifts to a sister element within an XP in Mutually Exclusive Contrast (MEC) to an antecedent in discourse. I take this to be the most promising attempt at unification, and yet there are problems that I argue make it untenable. The current proposal shows that analyzing Givenness and Focus as separate phenomena accounts for the difficult cases which Wagner's analysis brings to light, as well as several cases that Wagner cannot account for. This ultimately leads to the syntactic account of Givenness argued for in the latter part of this chapter and the next chapter. Specifically, I propose that there exists a Givenness feature that does *not* require MEC, and that cases where MEC is required are cases where that Givenness feature is blocked and therefore

prominence is determined solely by Focus. Under this conception of information structure, Focus is taken to be constrained by general pragmatic principles that conspire to impose the MEC requirement.

Section 3.1.1 summarizes Wagner's proposed unification of Givenness and Focus. Section 3.1.2 provides my argument against it, and introduces the claim that only adjunct structures in English force the MEC requirement posited by Wagner. Section 3.2 presents the results of two judgment task experiments in order to show the generalizability of that claim. Section 3.3 provides an analysis of the data in terms of syntactic feature projection.

3.1.1 Wagner's unified analysis of Givenness and Focus

Let's begin with what is deemed to be a canonical example of Givenness within a Focused argument NP. Examples like this have been used as a strong case for the existence of Givenness as a feature separate from Focus (e.g. Roberts, 2006; De Kuthy and Meurers, 2011)

(2) Q: Mary's rich uncle buys and sells expensive convertibles. He's coming to Mary's wedding. I wonder what he got her as a gift.

A: He got her [_F a CHEAP convertible] / ??He got her [_F a cheap CONVERTIBLE]

Wagner (2006, 2012) notes these examples are not licensed merely by Givenness in the sense of Schwarzschild (1999) (see 2.1.4). Rather, they require an antecedent that is a Mutually Exclusive Contrast (MEC) to the prominent element (see 2.1.3). That is, in order for prominence to shift away from some element in a phrase, (1) the element has to be Given, and (2) the phrase containing that element must have an antecedent in the discourse whose denotation is mutually exclusive with that of the de-accenting phrase.¹ The following example illustrates.

(3) Q: Mary's rich uncle buys and sells expensive convertibles. He's coming to Mary's wedding. I wonder what he got her as a gift.

A: He got her [_F a blue CONVERTIBLE] / #He got her [_F a BLUE convertible]

(after Wagner 2012, p.13)

¹Büring (2008) offers an alternative formulation of this idea that uses F-marking instead of G-marking; see Wagner (2012, pp.25-26) for a response. I argue later in this chapter that cases like (2) are indeed to due to Focus, not Givenness, but *contra* Büring I argue that Givenness nevertheless has independent status in grammar.

In (2), the MEC antecedent is *expensive convertibles*. We know that cheap convertibles cannot also be expensive convertibles, and under Wagner’s analysis this licenses a shift in accent within the NP *cheap convertible*. In the case of *blue convertible*, even though *convertible* is Given in the sense of Schwarzschild, the NP within which the attempted accent shift would take place, *blue convertible*, has no MEC antecedent. Thus, the de-accenting is infelicitous.²

Wagner suggests that this unifies the distinct information-structural notions discussed above. If Givenness always requires MEC, there is no longer a need for separate Focus or Contrastive Focus features. Consider again the case in which a multiple wh-question requires stress on both arguments, even when the VP is semantically Given.

- (4) Q: (Holding a plate of tofu and a plate of chicken:) Who ordered what?
 A: The guy with the HAT ordered the TOFU /
 #The guy with the HAT ordered the tofu

Wagner’s analysis rules out the impossible de-accenting by requiring an antecedent MEC of the form ‘x ordered the tofu’, which is not necessarily true in this context. If the question had been ‘who ordered the tofu?’, then the Hamblin semantics of that question would introduce alternatives any one of which could serve as an MEC antecedent. However, since the question is ‘who ordered what?’ and not ‘who ordered the tofu?’ the set of alternatives evoked by the context are not of the form ‘x ordered the tofu’, but rather of the form ‘x ordered y’. Thus there is no sufficiently salient antecedent to satisfy the MEC requirement.

Further initial support for the generalizability of the MEC requirement is found in the following (after Wagner 2012, p.5).

- (5) a. Q: I heard that somebody shot Smith, and that he’s been recovering in the hospital. Is he OK now?
 A: Actually, something bad happened again. You’ll never guess: Someone shot SMITH! / #Someone SHOT Smith!
- b. Q: I heard that somebody shot Smith, and that he’s been recovering in the hospital. Is he OK now?
 A: Actually, something bad happened again. You’ll never guess: Someone STABBED Smith! / #Someone stabbed SMITH!

²It would be most natural in (3) to use the anaphoric NP *blue one* instead of the full NP *blue convertible*, in which case the accent does fall on *blue*. A proposed explanation for this is provided in 3.3. In short, I posit that some elements like *one*, which are inherently anaphoric, resist accent independently.

The same reasoning is applied to (5) as was applied to the convertible example in (2) and (3), but here the accent is shifting within a VP rather than an NP. In (5-b) the VP *stabbed Smith* contrasts with an antecedent VP *shot Smith*, and the direct object *Smith* is Given. Therefore prominence shifts from *Smith* to *stabbed*. In (5-a) on the other hand, the shift is not licensed because *shot Smith* does not contrast with itself. Notice, however, that MEC does not quite work here. It's not the case that $\forall x.stabbed(x, Smith)$ entails the falsity of $\exists x.shot(x, Smith)$. This leads us to Wagner's elaborations on the contrast requirement.

Wagner extends his analysis to account for two problematic cases: 1) when the domain of accent shift is the entire clause (e.g. when shifting from predicate to subject), a weakened definition of MEC is needed to account for the facts, and 2) in cases like (5), objects are required to move to a propositional node at LF. Let's begin with the former.

Consider the following example, where an entire predicate is de-accented.

(6) Mary WENT SWIMMING. After that, JANE went swimming.

There is no mutual exclusivity relation between *Jane* and *Mary*. If the second clause has the denotation $swim(Jane)$, its UniClo is identical to itself (there are no variables); similarly, $swim(Mary)$ is its own ExClo. We cannot say there is any MEC relationship here because $swim(Jane)$ does not entail that $swim(Mary)$ is false—Jane's swimming does not exclude Mary's swimming. Examples like these lead Wagner to postulate a different analysis for de-accenting sentence predicates: the mutual exclusivity requirement must hold not between a Given constituent and its antecedent, but rather between the application of an exhaustivity operator to the Given constituent, and the Given constituent's antecedent. In other words, the de-accenting of *went swimming* is licensed by the fact that, were Jane the *only* swimmer, this would entail the falsity of the antecedent *Mary went swimming*. This is stated formally below.

$$[[Exh]] = \lambda a.\lambda b. [[ab]] \ \& \ \forall b' \in C : [[ab']] = 1 \rightarrow ([ab] \Rightarrow [ab'])$$

Given a sentence $[ab]$, de-accent a only if there is an antecedent in the discourse $[ab']$ s.t.
 $Exh(a)(b) \Rightarrow \neg[ab']$

BOX 3: MUTUAL EXCLUSIVITY UNDER EXHAUSTIVITY

It is speculated that perhaps this stipulation is an inadequacy of the formalism used, rather than a deep difference between the two cases (p.23). In this chapter I show that the differ-

ence goes beyond the formalization, which should cast some doubt on a unified theory of IS-based accent shift.

The second problematic case involves the de-accenting of direct objects without any apparent contrasting antecedent for the VP.

(7) Smith got away from the scene of the crime in Mary's cheap convertible.

Q: Then what happened?

A: The car broke down, and a detective ARRESTED Smith.

There is no mutually exclusive antecedent of the form $\lambda x.P(x, Smith)$. Wagner claims that the de-accenting is licensed because Given objects move at LF yielding a structure like the following.

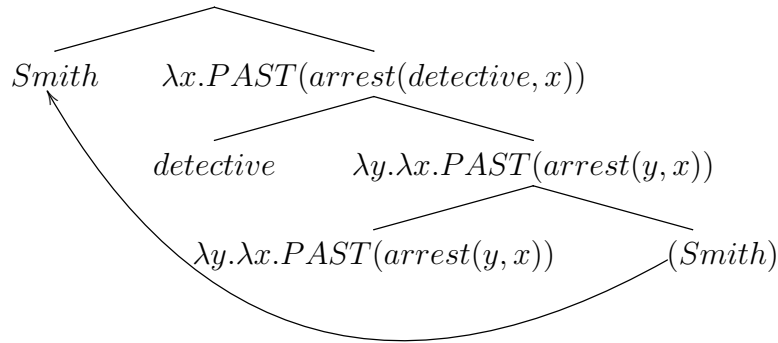


FIGURE 22: MOVEMENT AT LF

Post-movement, the domain of accent shift is now the whole proposition rather than the predicate *arrested Smith*, in which case Wagner hypothesizes that the MEC requirement is weakened by the exhaustivity operator from Box 3. The result is that the direct object can be de-accented as long as there is some antecedent in the discourse of the form $P(Smith)$ whose truth would be excluded if Smith's being arrested were the only thing that happened to Smith. In other words, the salience of some other property of Smith is the only requirement for de-accenting.

In sum, Wagner offers an analysis of intonation in English where given some constituent $[ab]$ in a syntactic derivation, the default intonation pattern places stronger prominence on the rightmost constituent b , but where prominence can shift from b to a when the following conditions are met.

1. The sub-constituent b is GIVEN, i.e. its denotation has a salient antecedent in the discourse context, or else is entailed under existential closure by a salient subset of the context.
2. The constituent $[ab]$ has a *mutually exclusive* antecedent in the discourse, i.e. it contrasts with some preceding element.

The analysis requires one caveat and one assumption. The caveat is that when $[ab]$ is an entire clause, mutual exclusivity is weakened; the only constraint is that the application of an exhaustivity operator similar to *only* to $[ab]$ must exclude the antecedent. The assumption is that direct objects move to a propositional node at LF.

3.1.2 Arguments against Wagner

There are some empirical problems with Wagner's analysis which cast doubt on whether de-accenting should be treated as a unified phenomenon. First, and this is perhaps a technical point, the caveat that accent shift at the sentence level is constrained by mutual exclusivity under an exhaustivity operator breaks down in cases where the antecedent that is taken to license the accent shift is entailed by the sentence in question. Secondly, and more importantly, the assumption that objects move to a propositional node at LF, effectively weakening the contrast requirement for de-accenting, is problematic for three reasons: 1) de-accenting within DPs with no propositional node is acceptable in contexts with no explicitly contrastive antecedent, 2) apparent Givenness-marking does not obey island constraints, and 3) no specific predicate of a de-accented direct object needs to be mentioned or implied in discourse.

Let's address these issues in turn, beginning with mutual exclusivity under exhaustivity. The *Exh* operator is semantically the same as *only*— $Exh(a)(b)$ is true so long as any statement $[ab']$ that is also true is entailed by $[ab]$. For example, the sentence *only John and Mary went swimming* is true when, *modulo* domain restriction, any other true statements about who was swimming (i.e. *John went swimming* and *Mary went swimming*) are entailed by the operand of $[[only]]$. Consider again example (6), repeated below.

- (8) Mary went SWIMMING. After that, JANE went swimming.

The application of this operator to a proposition like *Jane went swimming* certainly does exclude the antecedent *Mary went swimming*; however, we can manipulate the example

so that the antecedent is entailed by the accent-shifting sentence, in which case mutual exclusivity under *Exh* no longer holds.

(9) Mary went SWIMMING. In fact, EVERYBODY went swimming.

If we apply *Exh* to the de-accenting sentence we get a denotation that is true as long as any contextually relevant statement of the form ‘x went swimming’ is entailed by *everybody went swimming*. This is true of all possible alternatives, and thus this condition is vacuous—the application of *Exh* to ‘everybody went swimming’ is truth-conditionally equivalent to ‘everybody went swimming’. Of course, everybody going swimming cannot entail that there is somebody (Mary) who is not swimming. Therefore, applying *Exh* does not exclude the antecedent in (9) or in any other similar example.

Is there some other way in which an example like (9) represents MEC? It is worth considering the possibility of contrast between events in a neo-Davidsonian event semantics (Davidson, 1967; Parsons, 1990). If the subject *everybody* can be interpreted as a collective Agent of a swimming event, then the two sentences in (9) encode different events with different Agents, in which case the UniClo of an event-based denotation, $\forall e.swim(e) \ \& \ past(e) \ \& \ Agent(everybody, e)$, excludes its antecedent without any reference to *Exh*. However, this is not fully generalizable, as evidenced by the following.

(10) I don’t think the city is safe anymore. My COUSIN lives in the city, and she says it’s deteriorating fast.

Though mentioning unsafe conditions in a city makes it salient that there are people who live in that city, allowing Givenness, there is no specific event or state evoked by the context, and thus no Experiencer to be excluded by the neo-Davidsonian UniClo of *my cousin lives in the city*. In other words, (10) cannot be an instance of contrast between events because no specific event is invoked in the discourse which is distinct from and excluded by $\lambda e.live(e) \ \& \ pres(e) \ \& \ in(e, city) \ \& \ Experiencer(cousin, e)$. The easiest way to account for examples of this type is simple Givenness with no contrast requirement.

There is another problem with unifying Givenness, Focus and Contrast: one must posit LF-movement of G-marked objects, and this makes false predictions regarding de-accenting within DPs and islands. Recall example (7), repeated below.

(11) Smith got away from the scene of the crime in Mary's cheap convertible.

Q: Then what happened?

A: The car broke down, and a detective ARRESTED Smith.

Here, it is said that *Smith* moves to a propositional node at LF, partitioning the semantic structure into the moved object *Smith* and $\lambda x.past(arrest(detective, x))$. Wagner gives the following example as further support for the LF movement approach, reasoning that DPs should disallow the broader pragmatic license for de-accenting in (12) because there is no propositional node within the DP for the de-accented element to move to.

(12) You should hire a DJ. #The PRESENCE of a DJ makes a big DIFFERENCE at a party.

The mere salience of DJs in the context is not a sufficient license for accent shift, and thus the example seems not to be parallel to (11). However, there is an issue with this particular case. The noun *presence* is semantically rather empty, and in almost any context meets the criteria of Schwarzschildian Givenness. We expect such a word to resist accent *a priori*. A better test case is one where the accent shifts within a DP to a word with non-Given semantic content. Below is a such an example, showing that accent shift within a DP can be acceptable without a mutually exclusive antecedent.

(13) My mother asked if we were moving to the city. I told her that the VIOLENCE in the city is a TURN-OFF.

Here we have a clear case of de-accenting within a DP (*city* would bear some accent if its denotation were not salient), and there is no mutually exclusive antecedent for *violence in the city*. At the very least, it is not clear that DPs can be used as evidence for LF movement. More likely, cases like (13) are instances of Givenness with no contrast requirement.

It is also possible to de-accent within islands. The following illustrates de-accenting of an element that, were it to move, would violate the Coordinate Structure Constraint (Ross, 1967).

(14) a. *[_{PP} From which store] did you buy a necklace t_{PP} and a belt from Macy's?
b. Oh, you went to Sak's? Yesterday I bought a NECKLACE from Sak's and a BELT from MACY'S.

We could construct similar examples for other island constraints, but Wagner (2012, p.27) points out that other islands have propositional nodes, allowing movement within them rather than out of them, making these cases inconclusive under his analysis. The felicity of (14) is conclusive, however, given that the PP should not be able to move at all. An *in situ* analysis of this sentence predicts an antecedent of the form $\lambda x.P(x) \ \& \ from(Saks)(x)$ whose existential closure is made false by the universal closure (UniClo) of the first conjunct NP, $\forall x.necklace(x) \ \& \ from(Saks)(x)$. This prediction is not borne out. Even if we allow the possibility that only the DP *Sak's* is de-accented rather than the whole PP—and we should, since prepositions resist accent regardless of information structure—we are still left with a false prediction.

- (15) a. *_{[DP} Which store] did you buy a necklace from t_{DP} and a belt from Macy's?
 b. Oh, you went to Sak's? Yesterday I bought a NECKLACE from Sak's and a BELT from MACY'S.

Under this configuration, the illegality of the DP movement to a propositional node also requires an *in situ* analysis, which should require an element in the prior discourse to contrast with 'necklace'. Such a contrast does not exist in (15-b).

Finally, let's take a closer look at examples like (5)/(16). These seem on the surface to suggest that some form of MEC is necessary to shift accent onto the verb.

- (16) a. Q: I heard that somebody shot Smith, and that he's been recovering in the hospital. Is he OK now?
 A: Actually, something bad happened again. You'll never guess: Someone shot SMITH! / #Someone SHOT Smith!
 b. Q: I heard that somebody shot Smith, and that he's been recovering in the hospital. Is he OK now?
 A: Actually, something bad happened again. You'll never guess: Someone STABBED Smith! / #Someone stabbed SMITH!

(after Wagner 2012, p.15)

In (16-a) there is no contrast under Wagner's analysis, because the clausal sister to the LF-moved object *Smith* and its potential antecedent are identical— $\lambda x.\exists y.past(stab(y, x))$ is not mutually exclusive with itself. But this identity relation offers independent explanation for the infelicity of de-accenting. In this case, to de-accent would be to shift accent from one Given constituent to another Given constituent. This is not motivated, and since

one cannot de-accent an entire utterance, an entirely Given utterance results in default, right-edge prosody. The following illustrates that in straightforward cases of all-Given utterances, prominence falls in the same place as it would were the utterance entirely new.

- (17) Q: You got a new computer?
A: Indeed, I got a new COMPUTER.

The true test case is one where the verb is not Given and also lacks any contrastive antecedent. *Contra* Wagner, felicity in such cases is possible. Recall the phenomenon of de-accenting in conversation starters.

- (18) Context: Pat is reading a book about castles in Germany. Chris walks in, sees Pat, and utters the following sentence out of the blue in order to engage Pat.

I've never BEEN to Germany. Have you?

- (19) Context: June comes home to find her roommate watching a documentary about Leo Tolstoy. June sits down next to her roommate and utters the following sentence.

My great-grandfather was FRIENDS with Tolstoy.

- (20) Context: Driving on the interstate, passing a road sign reading "Dayton, OH", a passenger utters the following to the driver.

I used to LIVE in Dayton.

The evidence against LF-movement, the inconsistent presence of Contrast at the propositional level, and the ability of constituents to de-accent when salient in the non-linguistic context with no prior discourse, when taken together, all point toward a simple Givenness-based account. This requires a separate notion of Focus to explain cases where some form of contrast is in fact required. The next important question, then, is this: when can de-accenting be the result of Givenness, and when must it be a reflex of Focus? The short answer is that Focus is the only route to de-accenting in English (and thus a *wh*-question or explicit contrast is required) when accent is shifting onto an adjunct. In 3.3 I analyze this distribution as being a consequence of feature projection, an analysis which I extend to German in Chapter 4. But first, I give evidence for the adjunct generalization in English.

3.2 Constraints on G-marking

In the previous section I showed that some utterances require a Mutually Exclusive Contrast (MEC), either via an explicitly contrastive antecedent or via a Question Under Discussion (QUD), to license a shift in prosodic prominence, while other utterances allow prominence shift via salience or Givenness alone. In this section I show that the constraint that governs when MEC is required is syntactic. In English, MEC is required to shift accent from a constituent to a modifying adjunct. In all other cases, Givenness alone is a sufficient license. This generalization is supported by two audio-based acceptability judgment tasks showing that native speakers of English are more likely to prefer accent shift in Given contexts when the accented element is not an adjunct. The next section gives an analysis of this in terms of feature projection.

3.2.1 Distinguishing contexts

In order to determine when a contrastive antecedent is required for de-accenting, we first need to decide which different information-structural possibilities to consider. Although the notion of MEC is meant to unify QUD-based and contrastive accent placement, it may be useful to keep these contexts separate to assess whether there are any differences between the two. The third context we need to consider is the case where there is no MEC. In such a context, the de-accented element is merely salient, and this alone is a sufficient license for the prominence shift. We can refer to this as the “Givenness” context, since Givenness in a sense similar to Schwarzschild (1999) is the only distinguishing property.

Now we consider the possible syntactic contexts. It proves useful to distinguish the kinds of constituents that can be involved in prominence shift. For example, in (3) a noun *convertible* is de-accented, which shifts prominence onto a modifying adjective *blue*, resulting in BLUE convertible. By contrast, in (11) an argument DP *Smith* is de-accented, shifting accent onto a verb *arrested*, resulting in ARRESTED Smith. When we look at the examples from Wagner (2012) that require an MEC without assuming LF movement or Exhaustivity, we find that there are two categories: 1) where accent is shifting from a modified noun phrase to its modifying adjunct, as in BLUE convertible, and 2) where accent is shifting within a sentence that is entirely Given, as in example (16). As argued in 3.1.2, the MEC requirement for the entirely Given case is most likely epiphenomenal—one cannot de-accent an entire sentence, and given no strong reason to do otherwise, it seems natural to revert to default prosody when a sentence is all-Given.

This leaves us with the case of modifying adjectives. The following two minimal pairs highlight the difference between adjective and non-adjective cases.

- (21) a. Convertibles can be very dangerous. I don't like them. So I was a little disturbed when Jack decided to buy his NIECE a convertible.
b. #... when Jack decided to buy his niece a BLUE convertible.
- (22) a. My mother asked if we were moving to the city. I told her that the VIOLENCE in the city is a TURN-OFF.
b. #I told her that the VIOLENT city is no place to LIVE.

Shifting accent onto an adjective is illegal unless there is an MEC antecedent. Note that the prosody in (22-b) would be fine if *the violent city* were contrasting with another city, e.g. *the peaceful city*. The examples below show that adverbs also behave this way. Although it is almost always more natural to place a modifying adverb after a Given VP rather than before, it is more acceptable for a VP with a left-adjoined adverb to bear default prosody even when the modified VP is Given. These examples all share a Given context, and fall into five syntactic categories based on what kind of constituent is de-accented.

- (23) Fred really loves to dance...
- a. Just yesterday, he left the BUILDING dancing. (adjunct)
b. Just yesterday, he said he wanted to TEACH dancing. (argument)
c. Just yesterday, he made the whole FACULTY dance. (predicate)
d. Just yesterday he tried to impress me with wild DANCING. /
#Just yesterday he tried to impress me with WILD dancing. (modified NP)
e. Just yesterday, he was in his office dancing WILDLY /
?Just yesterday he was in his office wildly DANCING. /
#Just yesterday he was in his office WILDLY dancing. (modified VP)

We see that in both the modified NP and modified VP cases, where accent is shifting onto an adjunct, this non-MEC context is not a sufficient license. Shifting accent *from* an adjunct, however is perfectly natural in this context, as is shifting from argument to verb and from predicate to subject. Now let's look at the same syntactic environments when there is an explicit contrasting antecedent.

- (24) a. I don't just like PASTA al dente, I like RICE al dente, too. (adjunct)
 b. I don't just like to COOK rice, I like to EAT rice, too. (argument)
 c. It's not just ME who loves rice, my MOTHER loves rice, too (predicate)
 d. Some people prefer BOILED rice, but I prefer STEAMED rice. (modified NP)
 e. You can't just watch the rice off and on; you have to watch it CONSTANTLY.
 / ?...CONSTANTLY watch it. (modified VP)

Here we see that all environments allow de-accenting, albeit with some degradation in acceptability for left-adjoined adverbs. Finally, let's look at question-answer contexts.

- (25) a. Q: What is that sound overhead?
 A: Those are BIRDS overhead. (adjunct)
 b. Q: What are your feelings about Alfred Hitchcock?
 A: I HATE Hitchcock. (argument)
 c. Q: Who in your family likes Alfred Hitchcock?
 A: My NEPHEW likes Alfred Hitchcock. (predicate)
 d. Q: What kind of movie is The Birds?
 A: It's a SCARY movie. (modified NP)
 e. Q: How enthusiastic are you about watching these Hitchcock DVDs with me?
 A: I'm watching them RELUCTANTLY. /
 ?...RELUCTANTLY watching them. (modified VP)

Perhaps as expected, these pattern with the MEC cases. That the Givenness context stands apart from the other two contexts is the basis for the hypothesis that Givenness is indeed a separate phenomenon from Focus. The table below summarizes the distribution of de-accenting in the above examples.

	Merely salient	Salient w/ MEC antecedent	Part of QUD
Adjuncts	✓	✓	✓
Arguments	✓	✓	✓
Predicates	✓	✓	✓
Modified NPs	x	✓	✓
Modified VPs	x	✓	✓

TABLE 2: THE DISTRIBUTION OF DE-ACCENTING

The proposed generalization based on this table is that salience alone cannot shift prosodic prominence onto an adjunct—either a contrasting antecedent or an appropriate question-answer context is required. This generalization is taken to be evidence that Givenness-marking is subject to different distributional constraints than contrastive and wh-Focus.

But before we can develop this idea further, more evidence is needed that this adjunct constraint is robust in English. The proposed generalization is based on intuitions about a handful of examples which are somewhat subtle. Unlike word orders and morphological forms, the accent patterns in question are always derivable somehow (i.e. by contrastive or wh-Focus), and as Eilam (2011, p.5) points out, speakers are likely to “contextualize” sentences, assigning implicit discourse contexts that might affect acceptability judgments. By eliciting judgments from naïve subjects under experimental conditions, it is possible (1) to situate examples in rich pragmatic contexts, and (2) to control for interspeaker variability and implicit contextualization by averaging over many subjects. To this end, 3.2.2 and 3.2.3 present results from two controlled judgment tasks which show that, though people’s intuitions on these matters are not always strong, the proposed generalization holds overall.

3.2.2 Experiment 1

Method

An acceptability judgment task was implemented as a web-based questionnaire. Twelve target sentences were recorded and then digitally manipulated using cross-splicing in Praat to create two pronunciations for each sentence, one with nuclear stress at the right edge of the clause, and one where the clause-final constituent is de-accented, moving the accent leftward. Half of the sentences with de-accenting shifted accent onto an adjunct (three to an adjective and three to an adverb), while the other half shifted to a non-adjunct. The former category of sentences were classified as “ADJ” sentences, and the latter as “NADJ” sentences.

All sentences were recorded twice with default prosody. Cross-splicing was used to create both pronunciation variants for each sentence. To obtain the non-default pronunciation, independent recordings were made of the varying words (e.g. *friends* and *Tolstoy*, or *red* and *convertible*) in contexts that gave them strong accent when desired (e.g. “I’m FRIENDS with him”) or flat, de-accented intonation (e.g. “But I don’t WANT to read Tolstoy”), and then the target words were spliced into one of the recordings with default prosody. For the default pronunciation, a “same-splice” was created by substituting the target words in

one default recording for the target words in the other. The table below illustrates the four possible utterance types.

	NADJ
Default	My great-grandfather was friends with TOLSTOY.
Non-default	My great-grandfather was FRIENDS <u>with Tolstoy</u> .
	ADJ
Default	He offered to buy my brother a red CONVERTIBLE.
Non-default	He offered to buy my brother a RED <u>convertible</u> .

TABLE 3: FOUR UTTERANCE TYPES

33 subjects were each given 12 written dialogs that served as discourse contexts for target sentences. After each dialog, subjects were asked to listen to two sound files corresponding to the default and non-default pronunciations of the target sentence for that context (the presentation order of the sound files was balanced across items). Subjects were then asked to indicate whether they strongly preferred the first sound file, weakly preferred the first sound file, weakly preferred the second, or strongly preferred the second. Preferences corresponded to how “natural” the pronunciation seemed given the context.

Each sentence was situated in one of three categories of discourse context: one where the non-default pronunciation reflected the de-accenting of a salient, Given element with no contrast or wh-question (the “GIVEN” condition), one where the non-default pronunciation shifted accent onto a contrastively Focused element (the “CF” condition), and one where the non-default pronunciation shifted accent onto a wh-Focus (the “WHF” condition). The three conditions are illustrated below for one of the target sentences.

- (26) A: My roommate and I have trouble sharing the TV sometimes. The other day, I wanted to watch the Phillies game, and she insisted on watching some documentary about Tolstoy!
- B: I watched that documentary, too.
- A: You did? I thought you hated documentaries.
- B: Normally I do, but I was interested in this one. *My great-grandfather was friends with Tolstoy.*
- (‘Tolstoy’ = GIVEN)

- (27) A: Hey, are you coming to the party tonight?
 B: No, Im staying home. There's a documentary on PBS about Tolstoy.
 A: Oh yeah. Wasn't your great-grandfather his neighbor or something?
 B: Yes. But more than that. *My great-grandfather was friends with Tolstoy.*
 ('friends' = CF, contrasts with '(only) neighbors')
- (28) A: Whats on TV tonight?
 B: There's a documentary about Tolstoy. I was planning on watching that. My great-grandfather knew him when he lived in Russia.
 A: Really? What was his relationship with him?
 B: *My great-grandfather was friends with Tolstoy.*
 ('friends' = WHF)

Subjects were placed into three groups such that for any given sentence, 11 subjects saw that sentence in a GIVEN context, 11 saw it in a CF context, and 11 saw it in a WHF context. The experiment was balanced so that every subject saw an equal number of GIVEN, CF and WHF contexts. Items were grouped into six conditions reflecting the combination of discourse context (GIVEN/CF/WHF) and syntactic categorization (NADJ/ADJ). Preferences were recorded and coded on a scale of 1 to 4, where 1 represents a strong preference for the non-default, de-accenting utterance, and where 4 represents a strong preference for default, right-edge nuclear stress. Under this coding, an average default preference score that is close to 4 signals that the sentences in that condition tended to disprefer de-accenting.

Intuitions about examples (23), (24) and (25) predict that the "GIVEN ADJ" condition should show the highest average default preference score.

Results

The aggregate responses to the questionnaire show three trends. Though the second trend is perhaps counterintuitive, we will see that all three trends are consistent with the generalization that Givenness-marking cannot be used to shift accent onto an adjunct.

1. Only the GIVEN ADJ condition shows an average default preference score that is significantly above indifference (indifference being halfway up the scale, or 2.5).
2. There is an overall effect of ADJ status on mean default preference score, such that CF ADJ and WHF ADJ conditions show average default preference scores near the indifference point, rather than below it as one might expect.

3. Looking only at strong preferences, the best model of the data is one where being in the GIVEN ADJ category is the only significant predictor of strong default preference.

Let's address these points in turn. The graph in Fig.23 illustrates the first two trends. Recall the six conditions: GIVEN ADJ tests preferences about shifting prominence from a Given element onto a modifying adjunct, GIVEN NADJ tests preferences about shifting prominence from a Given element onto a non-adjunct, and similarly for shifting to a contrastively Focused adjunct or non-adjunct (CF ADJ and CF NADJ) and for shifting to a wh-Focused adjunct or non-adjunct (WHF ADJ and WH NADJ). For each of these six conditions, Fig.23 shows the average default preference score, where 4 is a strong preference for the non-de-accenting, right-edge default intonation, and where 1 is a strong preference for the non-default intonation. The dotted line is drawn at the indifference point. Any condition whose score is reliably above that line disprefers de-accenting. Any condition whose score is reliably below that line prefers it. Any condition whose confidence interval³ passes through the indifference line shows no clear preference.

We see that, as we would expect given the intuitions about the examples given in this section, naïve subjects reliably prefer the default pattern only in the condition where there is no MEC antecedent and stress falls on an adjunct (GIVEN ADJ). What is perhaps surprising is that both the CF ADJ and WHF ADJ conditions show indifference rather than a preference for the accent-shifted variant. This is further illustrated by Fig.24, which shows the raw number of responses that prefer either pronunciation.

In the non-Given adjunct conditions the preferences for default vs. non-default are roughly equal. There are three possible explanations of why this is so:

1. Subjects choose randomly due to both options being equally natural
2. Subjects choose randomly due to both options being equally unnatural
3. Some trials yield a true preference for accent shift, and others do not.

Experiment 2 is designed to disambiguate from between these three options. We will see that the third option is indeed the case, and that this behavior is consistent with the analysis given in this chapter, given some simple assumptions about how subjects interpret the discourse contexts.

³Error bars reflect 95% confidence intervals which were calculated using a bootstrap method that does not assume a normal distribution.

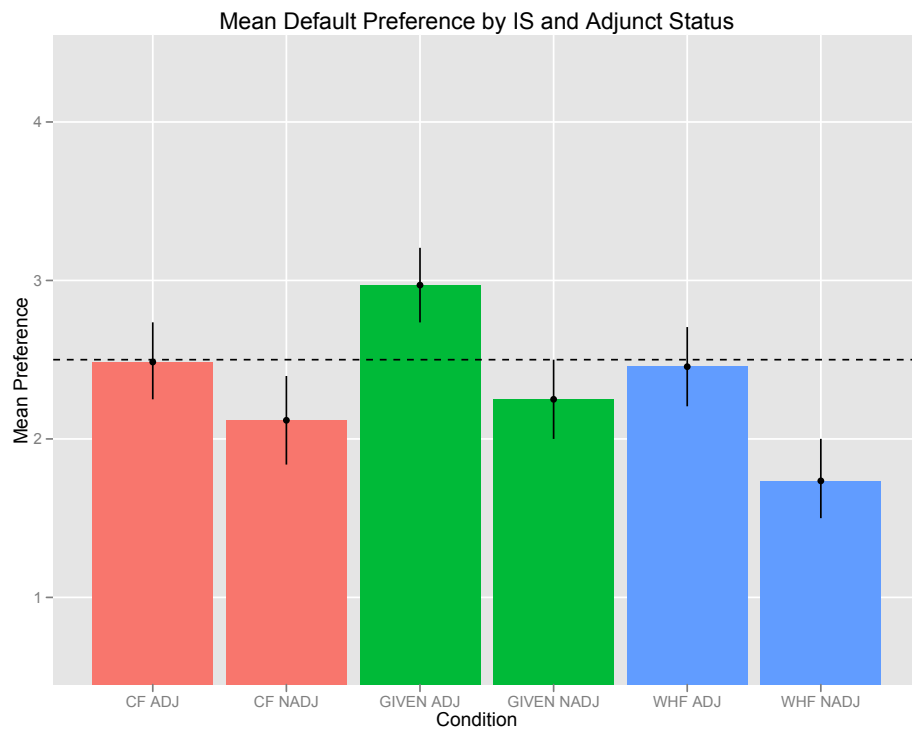


FIGURE 23: MEAN PREFERENCE SCORE

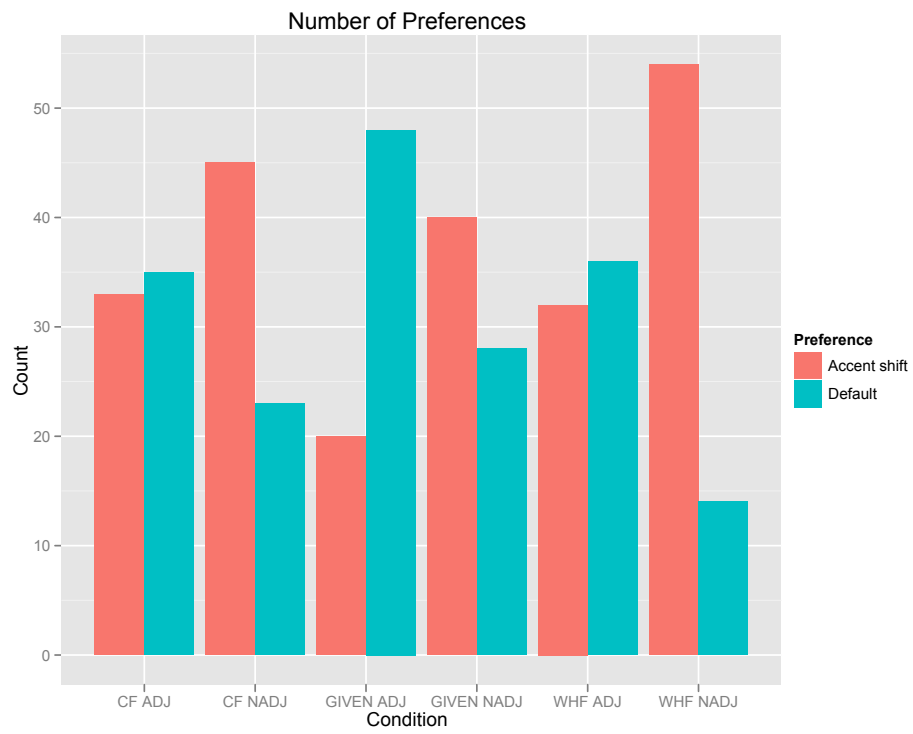


FIGURE 24: RESPONSES

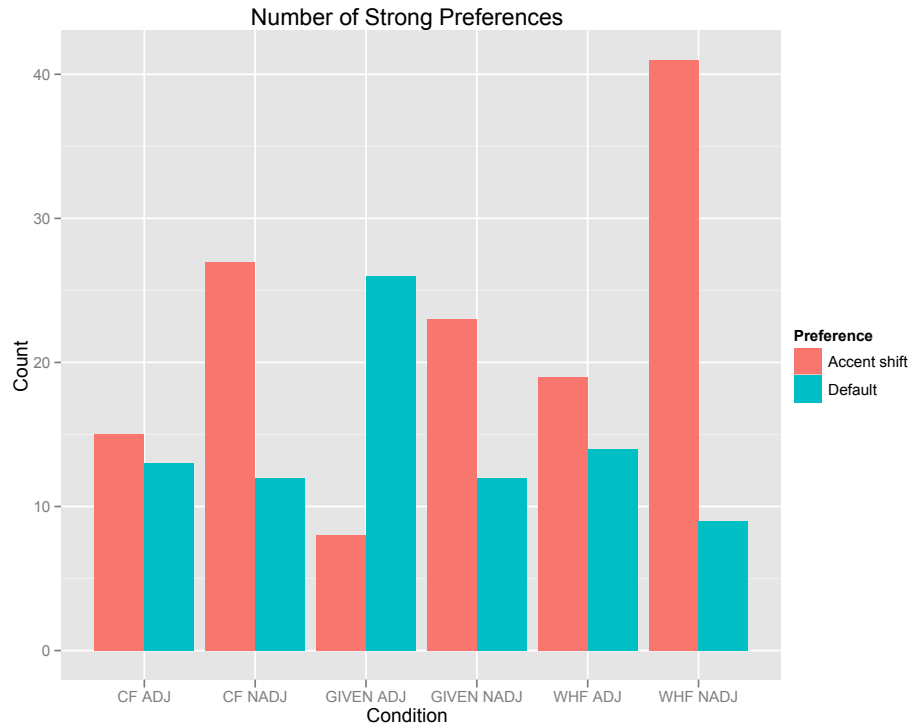


FIGURE 25: STRONG PREFERENCES

Finally, when we look only at *strong* preferences, we find that the overall effect of adjunct status is less apparent, as will be discussed momentarily. Fig.25 shows the number of strong preferences (either 1 or 4 on the scale). This result looks more in line with the prediction that the GIVEN ADJ cases will be considered uniquely bad.

Statistics and discussion

As it turns out, GIVEN ADJ status predicts strong default preferences better than it predicts weak default preferences. We can show this using mixed effects regression modeling. Tables 4 and 5 give two binomial regression models of overall preference, both with random effects terms for subject and item. The dependent variable for both models is a binary variable representing whether there is a preference for the default intonation. For the model in Table 4, there are two independent predictor variables: whether the discourse context is a GIVEN context and whether the sentence is an ADJ sentence. For the model in Table 5, there is a single predictor: whether the sentence is classified as GIVEN ADJ. Again looking at overall preferences rather than just strong preferences, both models provide significant

	Coefficient	Standard Error	Wald's Z	p-value
Intercept	-1.29	0.35	-3.7	<0.001
GIVEN	0.82	0.24	3.42	<0.001
ADJ	1.34	0.43	3.15	0.001

TABLE 4: GIVENNESS AND MODIFICATION AS INDEPENDENT PREDICTORS

	Coefficient	Standard Error	Wald's Z	p-value
Intercept	-0.51	0.29	-1.74	0.08
GIVEN ADJ	1.05	0.34	3.08	0.002

TABLE 5: GIVENNESS PLUS MODIFICATION AS A SINGLE PREDICTOR

	Coefficient	Standard Error	Wald's Z	p-value
Intercept	-2.12	0.36	-5.97	<0.001
GIVEN	0.51	0.27	1.88	0.06
ADJ	0.67	0.42	1.57	0.12

TABLE 6: INDEPENDENT PREDICTORS OF STRONG PREFERENCES FOR DEFAULT

	Coefficient	Standard Error	Wald's Z	p-value
Intercept	-1.77	0.27	-6.54	<0.001
GIVEN ADJ	0.87	0.34	2.57	0.01

TABLE 7: SINGLE PREDICTOR OF STRONG PREFERENCES FOR DEFAULT

predictors of the data, with the two-predictor model providing a better fit.⁴ This means that the data regarding overall preference is consistent with two different accounts, with the first appearing more likely: 1) there is an overall tendency to disprefer shifting prominence to adjuncts, which combines with a slight relative preference for default intonation in the Given contexts to produce a high average default preference score for the GIVEN ADJ condition, or 2) the particular combination of GIVEN and ADJ contexts is dispreferred.

The model in Table 4 seems to cast doubt on the proposed generalization in that there is nothing special about the GIVEN ADJ condition (i.e. the elevated default preference is epiphenomenal under this model). Crucially, however, the proposed generalization finds support when we look at strong preferences. Tables 6 and 7 show models equivalent to those in Tables 4 and 5, respectively, with weak preferences omitted. In that case only the latter model, which is in line with the proposed generalization, provides statistically significant predictors of preference. The picture painted by these models is as follows.

⁴Comparing the two models using the Akaike Information Criterion (AIC), the first model yields AIC = 489 while the second yields the higher AIC = 496, meaning the second model is less probable.

- Subjects are more likely to (at least weakly) prefer default intonation when the de-accented variant places nuclear stress on an adjunct.
- Subjects are more likely to strongly prefer default intonation when the de-accented variant places nuclear stress on an adjunct that is not Focused via MEC or via the current QUD.

The second point is as expected. But what accounts for the overall uncertainty regarding adjuncts? One may be tempted to think that it is entirely due to the adverbial cases in the ADJ condition. But this is not the case. Recall that the availability of post-verbal adverb placement renders both options somewhat odd.

- (29) Fred loves to dance. Just yesterday, he was in his office dancing WILDLY /
 ?Just yesterday he was in his office wildly DANCING. /
 #Just yesterday he was in his office WILDLY dancing.

The questionnaire participants were forced to choose, and the degraded status of both options could in principle have obscured any relative differences in acceptability, prompting random selection. However, the graph in Fig.26, showing mean default preference scores with adverbial sentences omitted, does not bear this scenario out. The graph looks just like the equivalent graph that includes adverbials (Fig.23), but with larger confidence intervals due to data being omitted. Means for the ADJ conditions are still not below the indifference line.

As mentioned above, we cannot tell whether this uncertainty in the data is due to reluctance toward both variants or whether it is due to true variation in preferences. Experiment 2 sheds more light on this by eschewing the forced choice methodology for a simple up-or-down judgment task. We will see that there appears to be true variation in preferences for ADJ sentences. Following the discussion of experiment 2 I provide a plausible explanation of this variation which is consistent with the proposed generalization about G-marking.

To summarize thus far, intuitions about a small handful of examples suggested that Givenness alone, i.e. in the absence of a contrastive or question-answer context, cannot place stress on an adjunct. This predicts the distribution for de-accenting found in Table 8. Testing a wider variety of examples on 33 naïve subjects suggested the distribution in Table 9. This is consistent with the current account, but with the caveat that adjuncts slightly degrade the acceptability of de-accenting across the board. There are two possible sources of this effect: (1) the ADJ items for some reason allow both prosodic patterns in

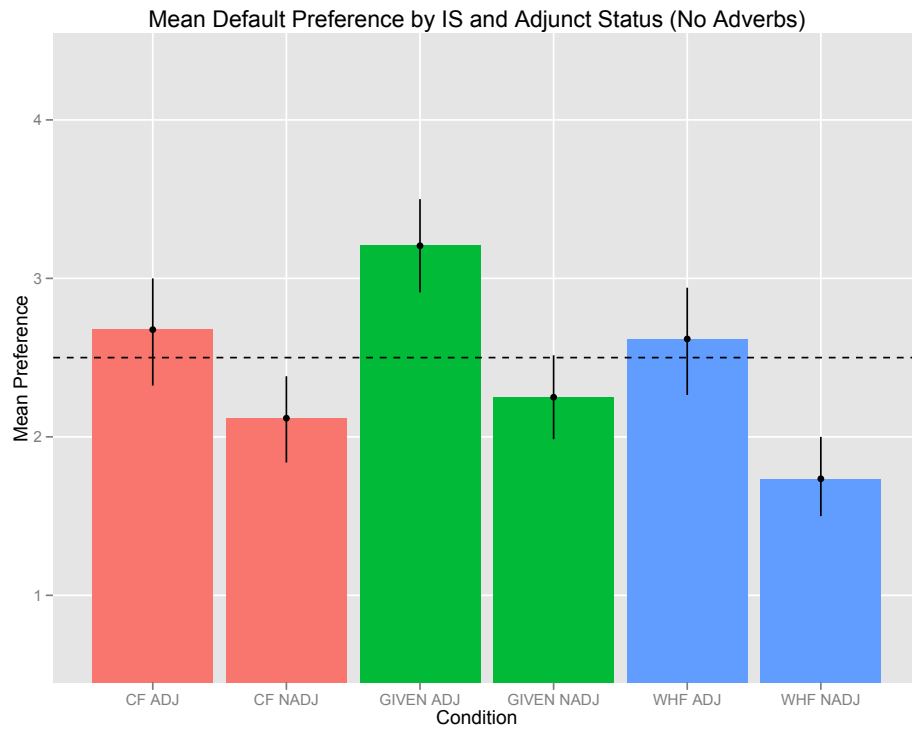


FIGURE 26: NO ADVERBS

	Merely Salient	Salient w/ MEC antecedent	Part of QUD
Non-modified	✓	✓	✓
Modified	x	✓	✓

TABLE 8: PREDICTED ACCEPTABILITY OF DE-ACCENTING

	Merely Salient	Salient w/ MEC antecedent	Part of QUD
Non-modified	✓	✓	✓
Modified	x	?	?

TABLE 9: OBSERVED ACCEPTABILITY OF DE-ACCENTING

the WHF and CF contexts, or (2) the elevated default preference for the ADJ conditions is the result of variation between trials in whether accent shift is deemed acceptable. If the first is true, and there is something about adjunct structures in general which makes default prosody fully acceptable, then the only evidence for any special interaction between GIVEN and ADJ status lies in the data regarding strong preferences. This would place the proposed generalization—that Givenness marking is unique in its unavailability with adjunct structures—on somewhat shaky ground. But if the second is true, and CF ADJ and WHF ADJ conditions yield some trials where accent shift is acceptable and others where it is not, then the adjunct effect can be accounted for as a byproduct of the fact that CF and WHF contexts are subsets of GIVEN contexts,⁵ where variability in subjects’ ability to infer the intended discourse structure from the written dialogs leads to the GIVEN ADJ effect “bleeding” over into CF ADJ and WHF ADJ conditions. (In other words, subjects may sometimes fail to recognize an MEC antecedent, but can still analyze non-adjunct cases as instances of Givenness-marking.) A re-implementation of the questionnaire replicates the results of this experiment and shows that the second scenario is indeed the case. In 3.2.3 I outline the results of this re-implementation and go into further detail about the likely source of the observed adjunct effect. In the end, I show that the results of both experiments are fully consistent with the proposed generalization.

3.2.3 Experiment 2

Method

The current experiment re-implements the questionnaire under lab conditions as a simple “yes/no” judgment task for individual utterances—rather than a forced choice task—where reaction time is measured for each response. The idea is to disambiguate between the two possible sources of the adjunct effect discussed above: either the CF ADJ and WHF ADJ conditions allow both prosodic patterns equally, or they create variation in acceptance responses. If the latter is correct, then we can explain the adjunct effect as a byproduct of subjects’ using Givenness instead of Focus to analyze some trials in the CF and WHF conditions. This, I argue below, is indeed the case.

For this experiment, each subject (36 subjects total) listened to each of the 12 sentences three times—once per information-structural context. Subjects were placed into two

⁵Consider for example the sentence pair, “I didn’t buy SUEDE shoes. I bought LEATHER shoes.” The first sentence creates a CF context for the second sentence, but the de-accented noun *shoes* in the second sentence also meets the criterion of Givenness. This is true of all CF and WHF instances in the experiments.

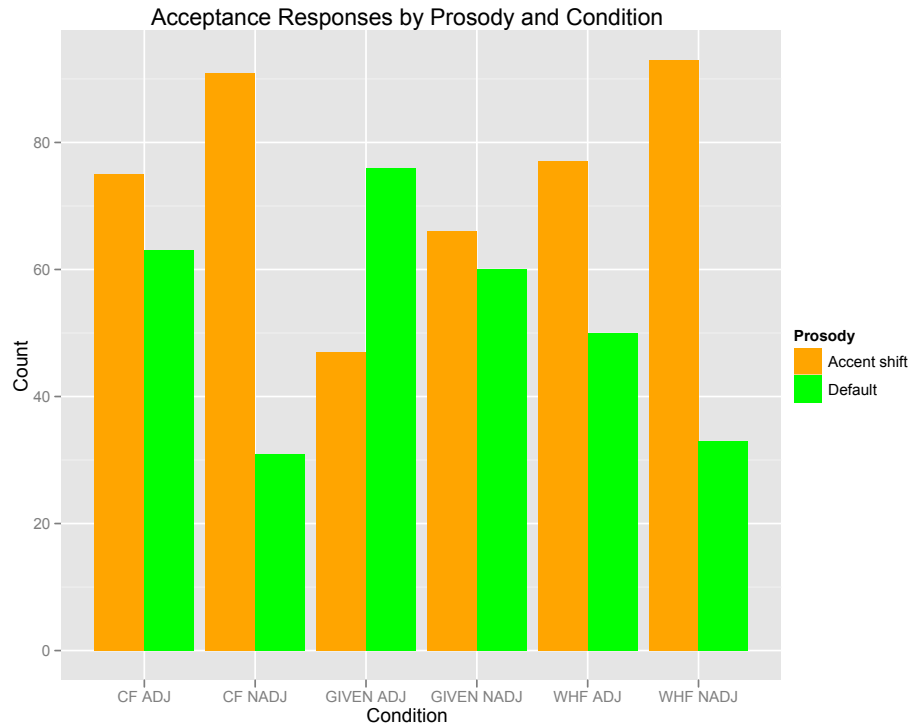


FIGURE 27: ACCEPTING RESPONSES

groups, where group 1 heard sentences 1-6 with default prosody and sentences 7-12 with accent shift, and where group 2 heard sentences 1-6 with accent shift and sentences 7-12 with default prosody. Order of presentation was randomized. For each of the 36 sentence-context pairs, subjects were asked to listen to one of the cross-spliced pronunciations and judge whether the pronunciation was a “natural” way to say that sentence in that context.

Results

Figure 27 shows that the lab experiment replicates the basic result of the web experiment—the ADJ conditions, as well as both GIVEN conditions, show elevated preferences for the default, and the GIVEN ADJ group is the only group which shows more default preferences than non-default preferences. The graph shows the total number of “yes” (i.e. accepting) responses for the different conditions, broken down by whether the subject had heard the default or non-default pronunciations.

For the second time, we see an overall effect of ADJ status. And when we consider reaction time, we find a direct analogy to the strong preference data from the first

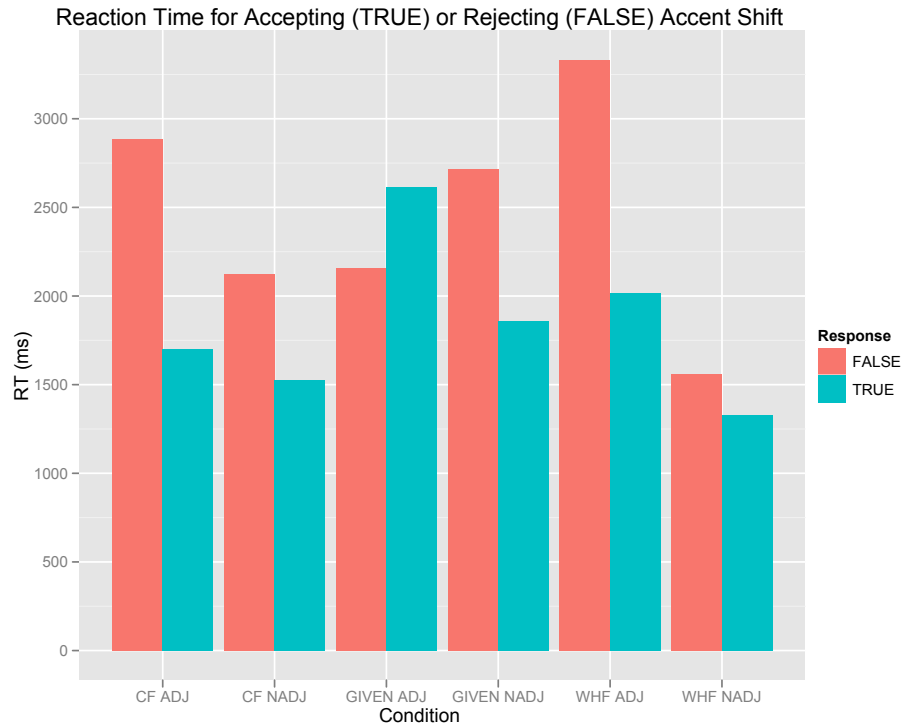


FIGURE 28: REACTION TIMES

questionnaire—trials with quick responses show a stronger unique effect of GIVEN ADJ status. Figure 28 shows reaction times for accepting/rejecting accent-shifted utterances. There is not a lot of difference between the conditions with the salient exception of the GIVEN ADJ condition, where reaction times for accepting are quite high. This is the only condition where it takes subjects longer on average to accept an accent shift than to reject it.

Perhaps more clearly, consider Figure 29. This shows the average proportion of default preferences (i.e. acceptances of default and rejections of non-default) by condition, broken down by whether reaction time is less than one second. Recall the two possible models based on the web experiment results (Tables 4-7).

1. Preferring default intonation is correlated independently w/ Givenness and whether accent would shift onto an adjunct
2. Preferring default intonation is uniquely likely when Givenness and adjunct status combine

Looking at the “slow” trials (the yellow bars), it seems like we are looking at model (1).

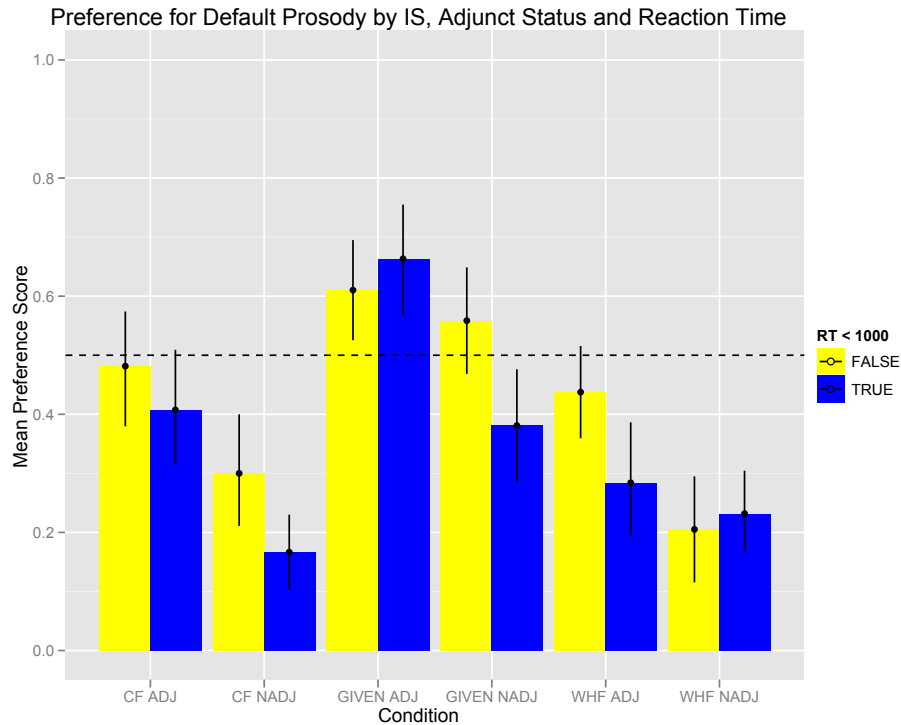


FIGURE 29: SUPPORTING DEFAULT PREFERENCE

But looking at the “fast” trials (the blue bars), it seems we are looking at model (2). This is directly analogous to the web-based experiment, where strong preferences were in line with model (2) but not weak preferences.

Importantly, it is not the case that default and non-default prosody are equally acceptable in CF ADJ and WHF ADJ conditions. Fig.29 shows that whether a subject was presented with default or non-default prosody, that subject was more likely to give whichever response supports a default preference (i.e. accepting the default or rejecting the non-default). Thus there is true variability with respect to whether or those conditions yield acceptance of accent shift.

Note that there is still an elevated level of default preference in the CF ADJ condition. Interestingly, this is entirely driven by acceptances of default prosody. If we look only at the rate of rejection of non-default prosody, as in Fig.30, we see a much cleaner result, where the GIVEN ADJ condition is truly unique in the degree to which it prompts fast rejections. This is very much in line with my account of the adjunct effect, to which I will turn momentarily. First, I back up these results with the same kind of statistical modeling used in analyzing experiment 1.

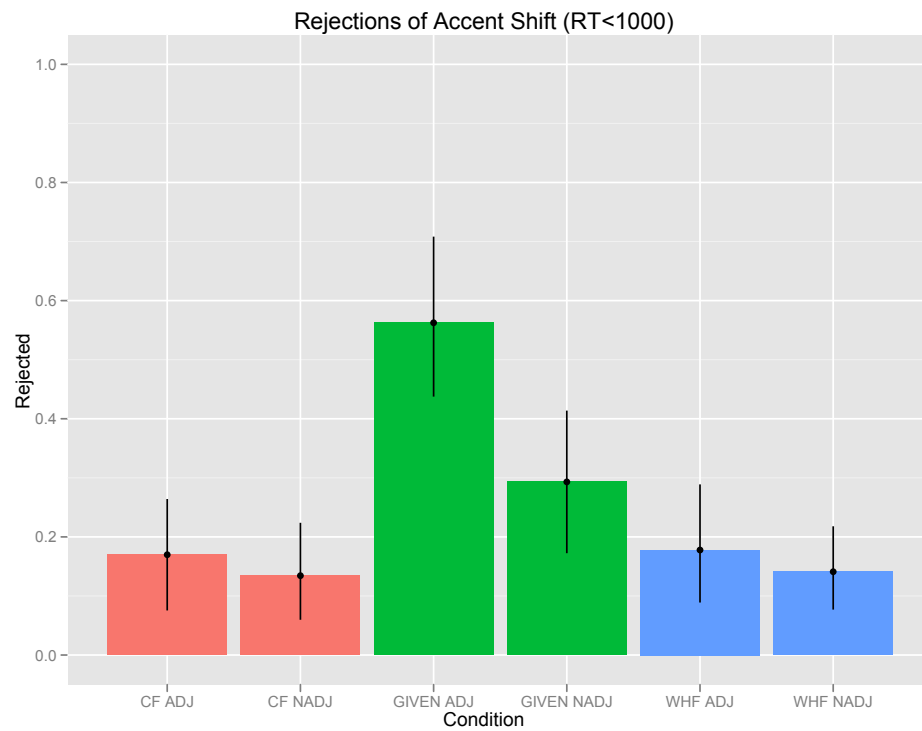


FIGURE 30: FAST REJECTIONS

Statistics and discussion

The following two models test for predictiveness of GIVEN, ADJ and GIVEN ADJ statuses in determining whether the subject’s response accepts the default / rejects the non-default. Reaction time is not a factor here, and model (1) is the best fit.

	Coefficient	Standard Error	Wald’s Z	p-value
Intercept	-1.25	0.14	-8.74	10^{-16}
GIVEN	1.06	0.13	8.47	10^{-16}
ADJ	0.84	0.16	5.06	10^{-7}

TABLE 10: INDEPENDENT PREDICTORS, REACTION TIME NOT CONSIDERED

	Coefficient	Standard Error	Wald’s Z	p-value
Intercept	-0.63	0.12	-5.25	10^{-7}
GIVEN ADJ	1.06	0.17	6.31	10^{-10}

TABLE 11: SINGLE PREDICTOR, REACTION TIME NOT CONSIDERED

Now, we add reaction time into the mix, modeling whether the conditions predict “quick” responses ($RT < 1s$) in support of default prosody. Here, model (2)—the single predictor model—is an equally good fit based on AIC comparison, and its predictors are more significant.

	Coefficient	Standard Error	Wald’s Z	p-value
Intercept	-2.18	0.19	-11.66	10^{-16}
GIVEN	0.71	0.15	4.66	10^{-6}
ADJ	0.47	0.20	2.35	0.02

TABLE 12: INDEPENDENT PREDICTORS OF QUICK DEFAULT PREFERENCE

	Coefficient	Standard Error	Wald’s Z	p-value
Intercept	-1.85	0.14	-12.80	10^{-16}
GIVEN ADJ	0.92	0.19	4.93	10^{-7}

TABLE 13: SINGLE PREDICTOR OF QUICK DEFAULT PREFERENCE

Finally, modeling confirms that when we look at rejections of accent shift, as in Fig.30, the adjunct effect is not significant ($p = 0.67$ under independent predictor model), but the effect of GIVEN ADJ status is highly significant ($p < 10^{-5}$ under single predictor model, which is a better fit based on AIC comparison).

To sum up, the two experiments taken together offer support for the intuition-based hypothesis that there is something uniquely bad about using Givenness to shift accent onto an adjunct. Namely, when intuitions are strong, and when responses are quick, the GIVEN ADJ utterances are judged to be much worse than other utterance types. But beyond this, there is an additional effect: the ADJ and GIVEN items seem to create some *a priori* reluctance to accept accent shift. To finish this section, I provide a detailed account of why this effect might arise, which finds support from the behavior of a simple computational model of these judgment tasks. Putting it all together, I argue that these results are fully derivable from a specific dispreference for GIVEN ADJ instances.

Modeling the adjunct effect

We begin first with the premise that Focus and Givenness are processed independently, a straightforward claim under the current hypothesis that they are indeed distinct phenomena. One corollary of this is that if a de-accented element is both discourse-salient and non-Focused, it should be possible for a subject to recognize the element as Given even if the wrong Focus structure has been assigned. That is to say, it should be possible to “not notice” a contrastive antecedent or particular QUD structure (especially in a cross-modal task such as was given in these experiments, where the discourse context was set up via reading rather than spoken language) but to accept an accent-shifted pattern anyway, as long as the de-accented phrase is interpreted as Given.

A second premise also follows straightforwardly from the current hypothesis: the scenario just described above, where an element is recognized as Given even if an erroneous Focus structure is assigned, should not be possible in the ADJ cases. This is because any attempt to parse an accent-shifted ADJ sentence with G-marking will fail to produce the observed prosodic contour. If the Focus structure is not correctly assigned in these cases, then accent shift should be dispreferred, plain and simple.

Finally, all target sentences in these experiments exhibit the property that the de-accented element in the accent-shifted variant meets a Schwarzschildian criterion for Givenness. This is logically true for instances of wh-Focus—a QUD by its very nature is highly salient in the discourse, and thus everything entailed under ExClo by the QUD is Given. It would not have to be true for instances of CF, as illustrated by so-called farmer sentences (Rooth, 1992).

(30) [F An AMERICAN_F farmer was talking to a CANADIAN_F farmer. . .]

Here, while the second instance of *farmer* is Given, the first is not. However, this kind of cataphoric CF is not represented in any of the experimental items. Therefore, as it happens, all judgments of accent-shifted sentences are judgments of sentences containing a de-accented phrase with a discourse-salient meaning.

Putting it all together, it is important to recognize that judgments about CF and WHF sentences are unlikely to be entirely due to subjects' assignment of Foci, but rather a composite of judgments about Focus structure and judgments based on an alternative parse where the accent pattern is derived via Givenness-marking. This predicts an overall elevation in rejection of accent shift / acceptance of default prosody in the ADJ cases, because under the current hypothesis those judgments *cannot* be a composite of Givenness-based and Focus-based responses.⁶ Moreover, the similar elevation in the GIVEN NADJ condition is consistent with the claim that Givenness is considered separately from Focus, and it is in line with the intuition that Givenness-marking is always optional.

In order to show that this account makes the correct qualitative predictions about the relative acceptability of de-accenting in the various conditions, I implement a computational model of the judgment task which reflects the premises discussed above, and which is based on the current hypothesis that GIVEN ADJ sentences with accent shift are not easily parsed. The algorithm is given in Boxes 4 and 5, where Box 4 models judgments of accent shift and Box 5 models judgments of default right-edge prosody. The probability values p , q , r , s and d are held constant across default and non-default cases, and across different simulated tasks. Because these probability parameters are tweaked to give the closest fit between simulated and actual data, one should not read too much into the quantitative correspondences, nor should one take the model to be an attempt at modeling any deep facts about processing. Rather, the model simply shows that the premises outlined above really do predict the trends that we see.

Fig.31 shows the aggregated results⁷ of 10,000 simulations of experiment 2 using the algorithm in Box 4, which when supplied with a certain set of values for p,q,r,s and d yields a good fit for the obtained data.

The same set of values was used for the simulations used for Figs. 32 and 33. Fig.32

⁶Of course, it is not the case that rejections of GIVEN ADJ sentences are at ceiling. There are a number of likely reasons for this, including but not limited to differences in "contextualization" as discussed in Eilam (2011, p.5). Though the experiments were designed to give explicit discourse contexts, the contexts were rather simple, and thus likely open to additional contextualization.

⁷The black bars represent observed mean values, with error bars supplied via a bootstrapping method. The red 'X' marks indicate the value output by the model simulation. A red X which intersects with the error bar for the real value is considered to be a good fit for that condition.

For three possible intended structures $S1 = [A]_F B$, $S2 = [A_F B]_F$ and $[AB_G]_F$:

- w/ probability p , assign the “correct” (i.e. intended by the experimenter) QUD-based Focus structure
- w/ probability $1 - p$, assign broad QUD-Focus
- w/ probability q , assign the “correct” Contrastive Foci
- w/ probability $1 - q$, assign no Contrastive Foci
- if $S1$ or $S2$ has been assigned, accept shift w/ high probability r
- if shift not accepted on the basis of Focus, then attempt to derive $S3$
- if derivation crashes, reject shift w/ high probability s

BOX 4: SIMPLE MODEL OF JUDGING ACCENT SHIFT

For three possible intended structures $S1 = [A]_F B$, $S2 = [A_F B]_F$ and $[AB_G]_F$:

- w/ probability p , assign the “correct” (i.e. intended by the experimenter) QUD-based Focus structure
- w/ probability $1 - p$, assign broad QUD-Focus
- w/ probability q , assign the “correct” Contrastive Foci
- w/ probability $1 - q$, assign no Contrastive Foci
- if $S1$ or $S2$ has been assigned, reject default prosody w/ high probability r
- if default not rejected on the basis of Focus, then attempt to derive $S3$
- if derivation crashes, accept default w/ high probability $s+d$, where d encodes a prior preference for default prosody.

BOX 5: CORRESPONDING MODEL OF JUDGING DEFAULT PROSODY

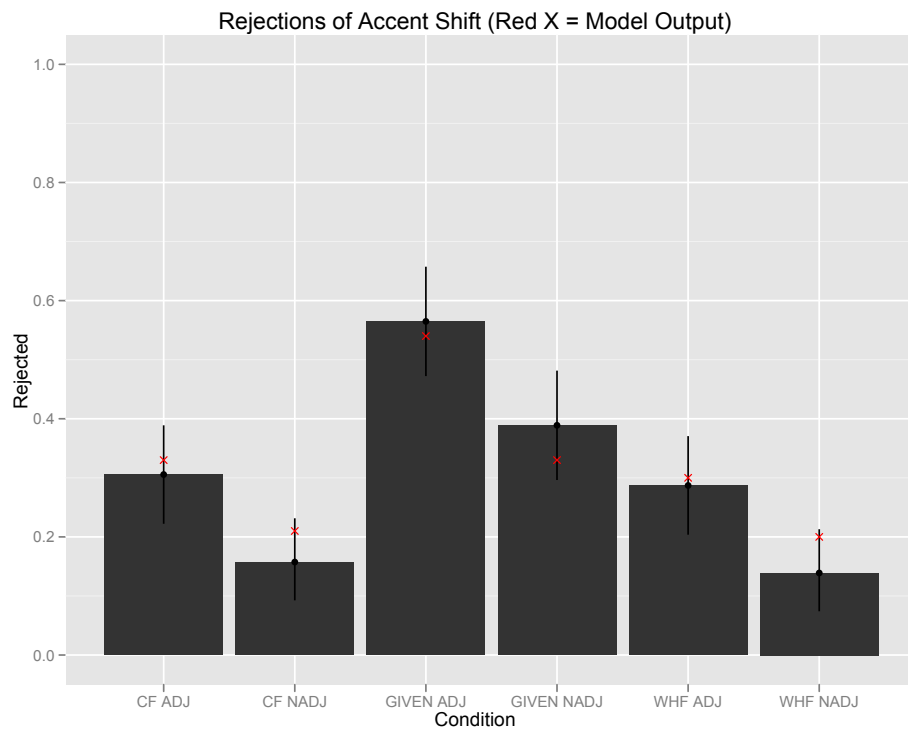


FIGURE 31: COMPARISON TO MODEL

shows the same simulation but with cases of erroneous Focus structure assignment removed. We see that this subset of the data fits nicely with the subset of the human data which contains only fast reaction times (which in turn bears close resemblance to the strong preferences from experiment 1). This seems intuitively correct, since the accent-shifted trials for which a subject misperceives the intended discourse structure are the same trials where there is a mismatch between what the subject is expecting and what the subject hears. It would not be surprising if such situations cause an increase in reaction time, especially if subjects re-read the dialogs in an attempt to resolve the mismatch. This possibility would also explain why the CF ADJ condition shows a more persistent elevation in acceptances of the default than in rejections of accent shift (see Figs. 29 and 30). Because QUDs are a basic intrinsic property of discourse, one might expect that explicit Questions Under Discussion would be less likely to be missed by a subject during a trial than an MEC antecedent would be. With the non-default utterances, mismatches are perhaps sometimes rectified if the subject can re-read in search of an MEC antecedent. But with default utterances, failure to assign the intended CF would not result in any prosody-context mismatch, and the utterance would likely be quickly accepted. This correctly predicts that the ADJ effect should be somewhat elevated for acceptances of the default in the CF condition, even if the “slow” trials are omitted.

Finally, the same set of parameters used to simulate experiment 2 can be used to simulate experiment 1. The forced choice task is simulated with the algorithm in Box 5, where virtual subjects have a prior preference to prefer the default prosody, encoded by the d term which is added to the probability s . Fig.33 shows the results—the same parameters used to model the rejection rate of non-default prosody in experiment 2 carry over nicely to the model of the forced choice task. The model again shows that the proposed syntactic constraint on Givenness-marking combined with probabilistic failure to assign the intended Focus structure provides a plausible account for the data obtained in both experiments.

In sum, all of the significant trends found in these data are consistent with the proposed generalization. The examples in (23), (24) and (25) together with these experimental results suggest a robust syntactic constraint on the distribution of de-accenting: in cases where mere salience is the license for de-accenting an XP, one must accent the entire XP including any adjoining elements. I now turn to the syntactic analysis of this phenomenon.

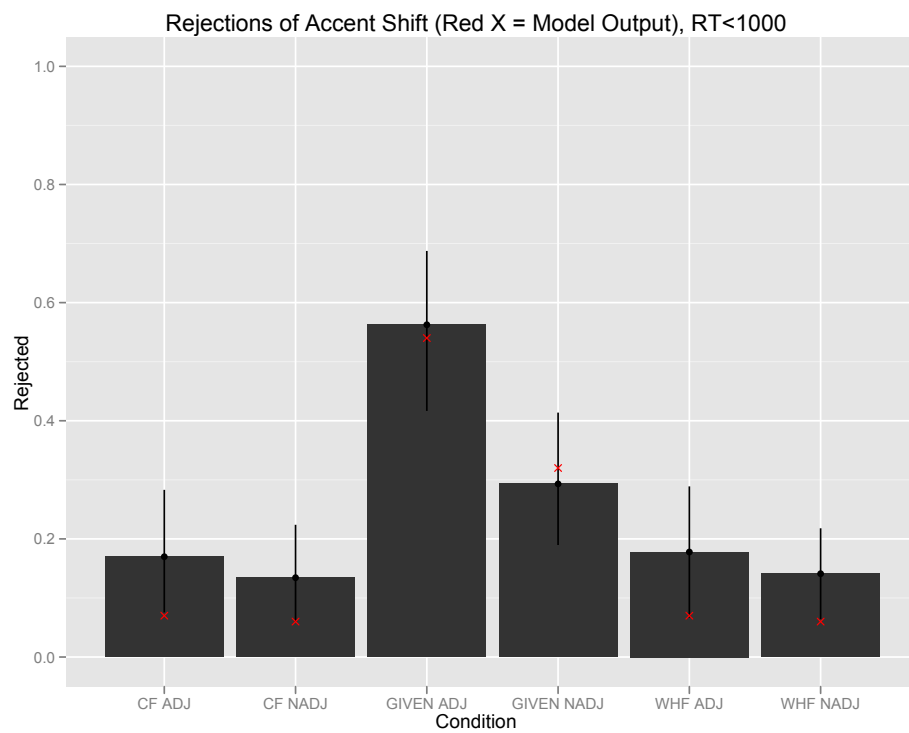


FIGURE 32: COMPARISON TO MODEL

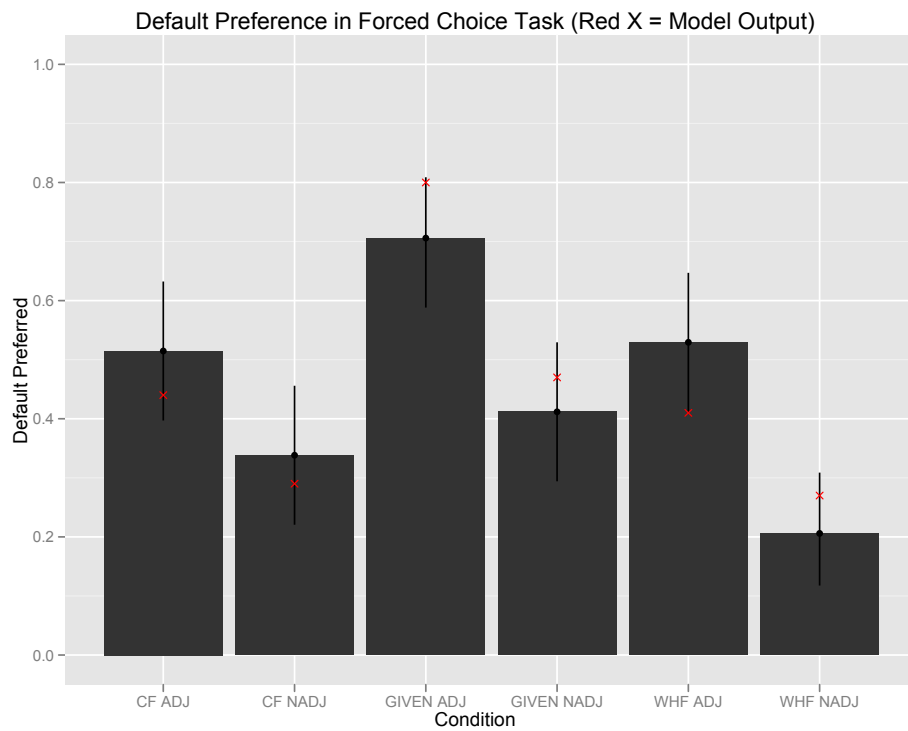


FIGURE 33: COMPARISON TO MODEL

3.3 Analysis

I claim that shifting nuclear stress to an adjunct is only acceptable when there is an antecedent in Mutually Exclusive Contrast (MEC) with the XP within which the shift is taking place, or else when the adjunct represents material that is not shared by all possible answers to the current Question Under Discussion (QUD). Going forward, I will group the QUD and MEC cases together as instances of Focus. The cases where no MEC or QUD congruence is required for de-accenting are taken to be instances of Givenness. In these terms, Givenness is marked on XPs, including any adjoining elements.⁸ This can be accounted for in terms of feature projection. I propose an optional formal G(ivenness)-feature which in English forces a flat intonational contour and introduces the presupposition that the G-marked XP is entailed under existential closure by a salient subset of the discourse context, where the discourse context is taken to be the set of relevant shared-knowledge propositions accessible during the current discourse. This can be formulated as follows, where C is the discourse context and where ExClo is an existential closure operation such that the following holds.

- $\text{ExClo}(\lambda x. [\dots x \dots]) \stackrel{\text{def}}{=} \exists x. [\dots x \dots]$
- $\text{ExClo}(x_e) \stackrel{\text{def}}{=} \exists y. y = x$
- $\text{ExClo}(\phi_t) \stackrel{\text{def}}{=} \phi.$

XP_G presupposes: $\exists \phi \in C. \text{salient}(\phi) \ \& \ \phi \rightarrow \text{ExClo}([\text{XP}])$

BOX 6: GIVENNESS PRESUPPOSITION

While the formal statement may need to be tweaked to cover all cases, the presupposition in Box 6 captures the basic idea that G-marked elements must be salient within the discourse context.

⁸Schwarz (p.c.) points out a *prima facie* counterexample in the following.

- (i) Sue really loves red. She painted her room COMPLETELY red

This would appear to be an instance of de-accenting within an adjunct structure with no MEC interpretation of the adjunct. However, the apparent problem is ameliorated if the adverb is interpreted as being contrastive along an implicit scale. Evidence for this is found in the unacceptability of the following.

- (ii) Sue really loves red. #She painted her room PARTIALLY red

The intonation in (i) suggests that the room was painted completely red *as opposed to* being painted partially red, the latter being less remarkable. If the adverb *completely* is taken to contrast with an implicit adverb ‘partially’, this rightly predicts the unacceptability of (ii).

Givenness is taken to be a formal feature, meaning it is present in the syntactic derivation of a sentence. Under the syntactic assumptions laid out in Chapter 2, the G-feature of a G-marked lexical item should project to the maximal XP of which that lexical item is a head. This is a basic and well-established behavior for other features, e.g. the WH-feature that marks wh-phrases for movement in languages like English. Figure 34 illustrates how the lexically supplied WH-feature of the determiner *which* projects to the DP *which professor*. By analogy, Figure 35 shows how a G-feature projects from the noun *convertible* to the NP *red convertible*. Because Givenness is optional, it is not taken to be a feature of the lexical item *convertible*. Rather, it is optionally merged into the structure at the morphological level—the noun *convertible* merges with a silent [GIVEN] morpheme to create a G-marked noun. This noun heads two nested noun phrases, [NP convertible] and the maximal projection [NP red [NP convertible]], and the G-feature necessarily projects to the maximal NP. This has the consequences shown in Fig.36. Marking *convertible* requires one to de-accent *red convertible*, and presupposes that the denotation of the maximal NP, ‘red convertible’, is salient within the context. Thus, de-accenting only *convertible*, shifting accent onto *red*, when only ‘convertible’ is Given is impossible to derive via G-marking. By hypothesis, the only way this intonation pattern (RED convertible) can be achieved is via Focus on the adjective, which introduces an MEC/QUD requirement.

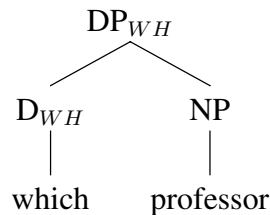


FIGURE 34: WH-FEATURE PROJECTION

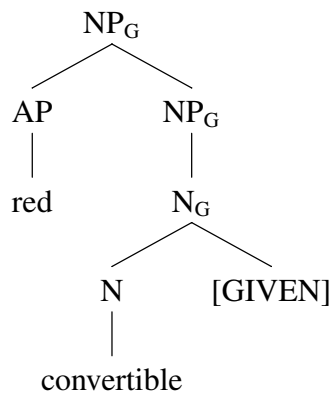
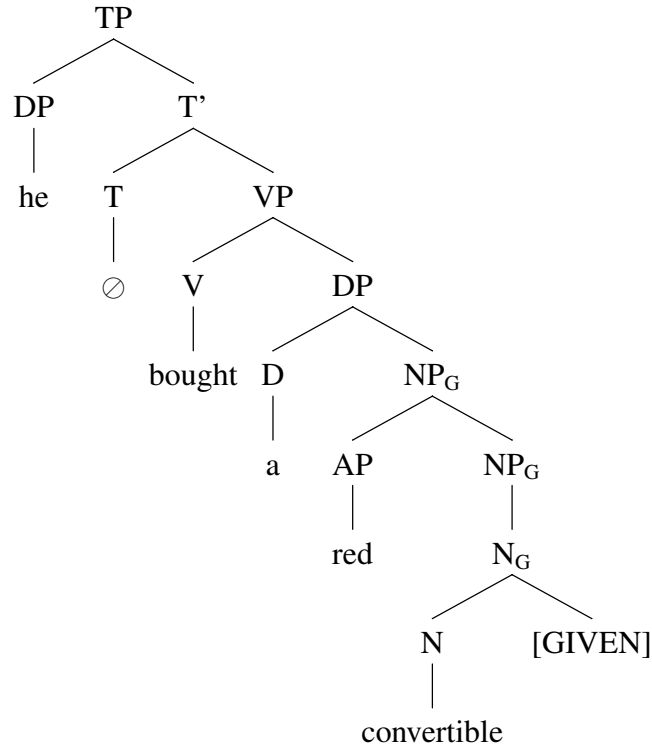


FIGURE 35: G-FEATURE PROJECTION



Prosody	\cdot \cdot \cdot \cdot
Presupposition	$\exists \phi \in C. \text{salient}(\phi) \ \& \ \phi \rightarrow \exists x. \text{red}(x) \ \& \ \text{convertible}(x)$

FIGURE 36: THE CONSEQUENCES OF FEATURE PROJECTION ON G-MARKING

G-feature projection has implications beyond adjunction structures. Any time a head is G-marked, that head’s maximal projection must be G-marked as well, and thus the denotation of the entire phrase must be salient and de-accented. This includes specifiers as well as adjuncts. Therefore, we might expect to see an effect on the availability of accent shift to a specifier. However, such effects are difficult to test, due to the optional nature of G-marking, and how it interacts with how stress is assigned. Consider the following example.

- (31) A: I’m thinking about dropping my Spanish class and enrolling in German instead.
 B: Why?
 A: My BOYFRIEND might take German.

Here we have a *prima facie* counterexample to the feature-projection account of de-accenting. The specifier of TP, the subject *my boyfriend*, bears accent while the predicate, *might take German*, which includes the tense head *might*, is pronounced with flat intonation. If this were indeed an example of G-marking on a predicate that does not project to the subject, it would spell trouble for the current analysis. However, examples like this are inconclusive because functional heads such as *might*, and almost any other head whose specifier could be accented in English, would not be prosodically prominent even under default stress assignment. The default pronunciation, as in (32), places stronger prominence on the subject than on the functional head. In other words, the tense resists accent *a priori*.

(32) Guess what? My BOYFRIEND might take GERMAN.

Therefore, we might obtain the prosody consistent with (31) by G-marking only the VP, *take German*. The prominence would then shift to *boyfriend*, because *might* is not able to bear strong sentential stress for independent phonological reasons. A more proper representation of the de-accenting in (31) would thus be, “My BOYFRIEND might take German”, which would have the structure shown in Fig.37 below. This is analogous to the structure given in Fig.36, where the G-feature only needs to project to the NP to derive the intended accent pattern, since the D head would lack stress by default.

Because of the tendency of heads to resist accent, many apparent examples of de-accented predicates are inconclusive. However, there is some evidence to be found regarding de-accented predicates which supports the current analysis. Consider the following acceptability contrast in the placement of adverbs.

- (33) a. Guess what? My boyfriend might actually take German. /
 Guess what? My boyfriend actually might take German.
 b. I’m thinking of switching from Spanish to German.
 My BOYFRIEND might actually take German, too./
 ???... My BOYFRIEND actually might take German, too.

In the default case there is variability in whether the adverb is left-adjoined to T’ or to VP, such that the tensed element *might* can either precede or follow the adverb. However, when we place the sentence in a context where the predicate is Given, the adverb must follow the tense head. This is explained under the current analysis by the fact that adverbs like *actually*, unlike tense and other functional heads, do not resist accent. Therefore, to de-accent the adverb when it is left-adjoined to T’ would require the entire predicate to be

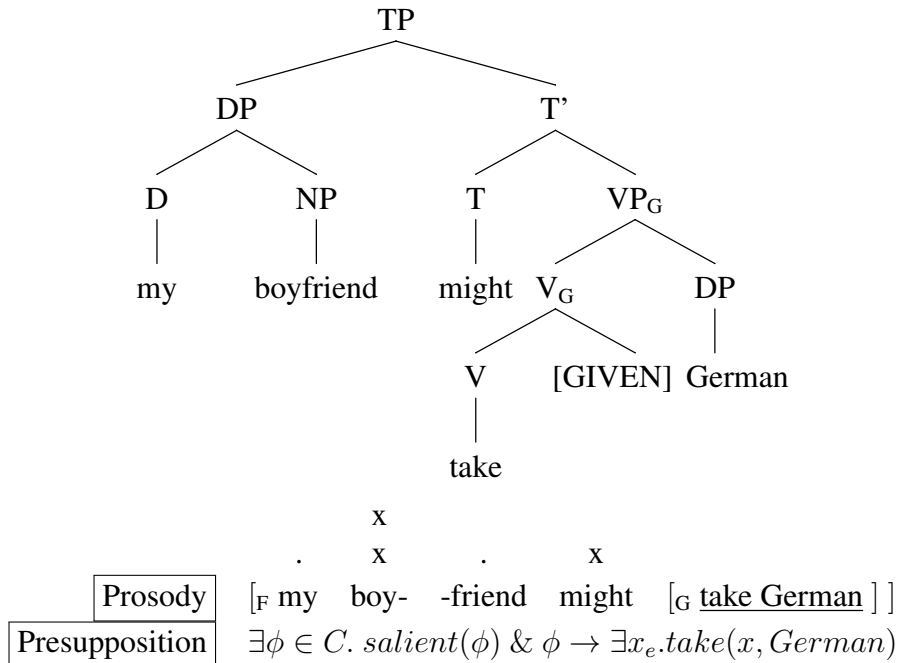


FIGURE 37: G-MARKING A VP

G-marked. Such a configuration is impossible, because the G-feature would project to TP, marking the entire sentence as Given.

The tendency for certain elements to resist accent *a priori* can also be called upon to explain one apparent counterexample to the de-accenting generalizations I have argued for, pointed out by Ahern (p.c.). Example (34) contrasts with (21) in that it allows apparent de-accenting within an adjunct structure with no MEC antecedent.

- (21) a. Convertibles can be very dangerous. I don't like them. So I was a little disturbed when Jack decided to buy his NIECE a convertible.
 b. #... when Jack decided to buy his niece a BLUE convertible.
- (34) ... when Jack decided to buy his niece a BLUE one.

Here, I do not take it to be the case that the anaphor *one* is G-marked. In fact, to merge a [GIVEN] morpheme into the structure at the level of the anaphor, by analogy to Figs. 35 and 37, would be redundant—the anaphor *one* must, by its own definition, refer to a discourse-salient antecedent entity, and like a functional head it never receives accent by default. These are taken to be inherent morphological properties of *one*, which preclude the need for the formal G-feature to be merged into the structure at all. Thus, no feature

projection must take place and (34) is allowed.

I end by taking stock of the possible information-structural derivations of a particular intonation pattern. Consider de-accenting within the NP *red convertible*. The resulting intonation pattern, “RED convertible”, can be derived either via Contrastive Focus on *red*, which reduces the relative prominence of *convertible*, or via narrow wh-Focus on *red*. It is ungrammatical to G-mark *convertible* without G-marking the whole NP, and thus the pattern cannot be derived via Givenness. The result is that either an MEC antecedent or a congruent QUD is required to license this intonation pattern. These possibilities are illustrated in Figure 38.

[_F red] convertible
 [_F [_F red] convertible]
 * [_F red [_G convertible]]

FIGURE 38: DERIVING ACCENT SHIFT TO AN ADJUNCT

Compare this to the possibilities shown in Fig.39, where no adjunct is present. The VP *drive convertibles* with the intonational contour “DRIVE convertibles” can be derived in three ways, with Givenness available as a mechanism for de-accenting.

[_F drive] convertibles
 [_F [_F drive] convertibles]
 [_F drive [_G convertibles]]

FIGURE 39: DERIVING ACCENT SHIFT TO A NON-ADJUNCT

Sentences containing the six derivations in Figs. 38 and 39 are shown in (35) below.

- (35) a. Q: What color convertible do you drive?
 A: I drive a RED convertible.
- b. I don't drive a blue convertible, I drive a RED convertible.
- c. #I know a lot about convertibles because I drive a RED convertible.
- d. Q: Do you drive convertibles, or just sell them?
 A: I DRIVE convertibles.
- e. I don't sell convertibles, I DRIVE convertibles.
- f. I know a lot about convertibles, because I DRIVE convertibles.

In this chapter we have examined the distribution of de-accenting by information-structural and syntactic contexts. Separating Given contexts from MEC and QUD contexts, we find

that Given contexts are unique in prohibiting accent shift onto an adjunct. This is accounted for by positing an optional G-feature which marks XPs as Given, and the expected projection behavior of this feature explains the adjunct effect. We will see in Chapter 5 that Focus does not exhibit any of these projection behaviors, and therefore Focus is proposed to be purely a phenomenon at the phonology-discourse interface, rather than a feature represented in the syntactic derivation of a sentence. But first, the next chapter gives evidence from German for the proposed G-feature.

Chapter 4

Givenness in German

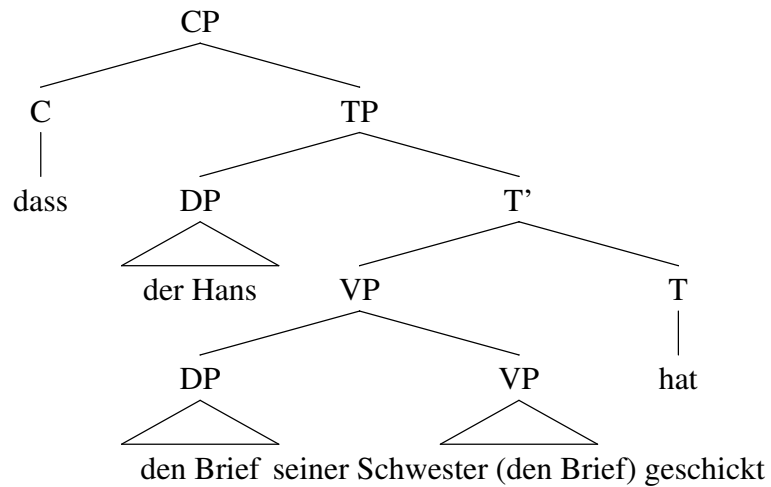
4.1 Scrambling

In this chapter I argue that the syntactic analysis of Givenness proposed for English de-accenting in Chapter 3 also extends to syntactic phenomena in German. The main test case for this claim is found in the effects of scrambling on Givenness-marking possibilities. We saw in Chapter 3 that adjunct environments limit the space of possible information-structural derivations for de-accenting patterns in English. In this chapter I give evidence that scrambling configurations are similarly limiting. This is straightforwardly predicted by the analysis given for English. Before making this argument, I briefly review some literature on scrambling tendencies in German.

As mentioned at the end of 2.3, I take scrambling to be the optional short-distance movement of material within the VP domain. This could be analyzed as A-bar movement (e.g. Saito, 1989; Müller and Sternefeld, 1994; Bailyn, 1995), as A-movement (e.g. Mahajan, 1990; Miyagawa, 1997), or as internal adjunction (e.g. Webelhuth, 1989; Wallenberg, 2010). The only assumption that my argument requires is that scrambling in German is indeed movement, and not a base-generated phenomenon as in Fanselow (2001) (see Bailyn 2002 for an argument against base-generation). Assuming that scrambling is movement, variant (a) in (1) below is taken to be an instance of default word order, while variant (b) instantiates scrambling of the direct object, yielding the structure in Ch.2 Fig.10, repeated below.

- (1) a. Ich weiss dass der Hans seiner Schwester den Brief geschickt hat.
I know that the Hans his sister the letter sent has

- b. Ich weiss dass der Hans den Brief seiner Schwester geschickt hat.
 I know that the Hans the letter his sister sent has



While scrambling is usually described as being optional, there are tendencies for certain environments to prefer or disprefer scrambling. I now describe two such tendencies.

4.1.1 IS effects

Effects of information structure on scrambling have been reported, beginning with Lenerz's (1977) observation that scrambling tends not to result in a Focused element preceding a non-Focused element, as seen when comparing the following two examples.

- (2) Q: Wann hast du das Buch gelesen?
 when have you the book read
 'When did you read the book?'
 A: Ich habe GESTERN das Buch gelesen. / Ich habe das Buch GESTERN gelesen.
 I have yesterday the book read / I have the book yesterday read
 'I read the book yesterday.'
- (3) Q: Was hast du gestern gelesen?
 what have you yesterday read
 'What did you read yesterday?'
 A: Ich habe gestern das BUCH gelesen. / *Ich habe das BUCH gestern gelesen.
 I have yesterday the book read / I have the book yesterday read
 'I read the book yesterday.'

(Lenerz 1977, pp.20-21)

The first formulation of the answer in (2), *ich habe gestern das Buch gelesen*, represents the unmarked order in that it is grammatical regardless of contextual factors. The second formulation of the answer in (2) shows the object *das Buch*, which is part of the QUD, scrambling past the Focused adverbial *gestern*. Example (3) shows the asymmetry in question: it is unacceptable in this context to scramble the Focused direct object leftward past the non-Focused, de-accented adverbial.

One possible analysis of this effect is that instances of scrambling like in (2) involve movement (e.g. of *das Buch*) that is directly motivated by Givenness—the referent on the non-focused DP is necessarily Given, and thus it is perhaps the presence of a G-feature which is prompting movement to the left edge of the VP domain, as below.

- (4) Q: ‘When did you read the book?’
 A: Ich habe [_G das Buch] [_F GESTERN] ([_G das Buch]) gelesen.

Scrambling is usually taken to be optional—it is not ungrammatical to leave a Given element *in situ*. But the G-feature may be seen as one way of getting a Given element to scramble leftward, which instantiates a general typological principle: wherever possible, Given information tends to precede new information in a clause (see e.g. Tickoo, 1992; Kaiser, 2002; Kucerova, 2007; López, 2009; Wallenberg, 2010; Büring, 2011; Stevens, 2012). This is not to say that it is never possible to scramble a Focused constituent leftward. In fact it is quite common in some contexts; however, there seem to be other, independent motivating factors. One such factor is a strong preference for definite DPs to precede indefinite DPs, to which I now turn.

4.1.2 Definiteness effects

The following from Abraham (1986, p.18) shows another effect on scrambling which appears to be independent of IS.

- (5) a. Ich habe meinem BRUDER den Brief geschickt. / Ich habe den Brief meinem
 I have my brother the letter sent / I have the letter my
 BRUDER geschickt.
 brother sent.
 ‘I sent my brother the letter’

- b. Ich habe meinem BRUDER einen Brief geschickt. / *Ich habe einen Brief
 I have my brother a letter sent / I have a letter
 meinem BRUDER geschickt.
 my brother sent.
 ‘I sent my brother the letter.’

We see here that the indefinite DP *einen Brief* is unable to scramble, even when it is part of the Question Under Discussion. This is indicative of an effect of specificity: scrambling should not result in a non-specific DP preceding a specific one. One reflex of this is that definite DPs tend to precede indefinite DPs independent of any right-edge Focus effects.

- (6) Q: Wem hat Hans ein Buch gegeben?
 who.dat has Hans a book given
 ‘To whom did Hans give a book?’
 A: Ich glaube dass Hans dem SCHÜLER ein Buch gegeben hat. / *Ich glaube
 I believe that Hans the student a book given has / I believe
 dass Hans ein Buch dem SCHÜLER gegeben hat.
 that Hans a book the student given has
 ‘I believe that Hans gave a book to the student.’

(Choi 1996, pp.184-185)

Examples like this show failure of an indefinite DP to scramble. On the other side of the coin, definite DPs appear to be able to scramble solely in virtue of being definite. Fanselow (2012) lays out the case, showing that definite DPs scramble leftward in cases where there is no IS-based reason to do so, considering the case of idiomatic expressions.

- (7) Vielleicht hat er die Flinte zu früh ins Korn geworfen.
 perhaps has he the gun too early into-the corn thrown
 ‘Perhaps he gave up too early.’

Here, an idiomatic phrase is split up—the direct object *die Flinte* is scrambled out of its canonical position below the adverbial *zu früh*. This does not affect the IS-syntax mapping in any way, and yet this is the most natural word order for this sentence.

In the absence of the adverb *vielleicht* it is natural to raise the direct object to Spec,CP yielding *die Flinte hat er zu früh ins Korn geworfen*. This seems to support the idea that the left periphery of a German sentence is filled via first scrambling past the subject (Frey, 2006). Examples like these are considered in detail in Fanselow and Lenertová (2011). Crucially, this is said to be evidence of an effect of definiteness that is independent of IS—

it cannot be the case that *die Flinte* is of a different information-structural category than the remainder of the idiom, *ins Korn werfen*. This provides an independent license for scrambling, which will be crucial for constructing a test case for the behavior of Givenness in German. Ultimately, we will find cases where scrambling motivated by definiteness, like in (7), is expected to be possible, but is ruled out entirely by the same constraint that rules out *BLUE convertible_G* in English.

4.2 G-marking and Scrambling

I now turn to the interactions between Givenness-marking and scrambling which provide independent evidence for the analysis developed in Chapter 3. German appears to behave just like English with respect to Givenness-marking. De-accenting is possible, and the restriction on G-marking adjunct structures applies just as in English. The following minimal pairs, based on (21) and (22) from Chapter 3, demonstrate this behavior.¹

- (8) a. Kabrios sind gefährlich. Deshalb war ich so verärgert dass Jack es
 convertibles are dangerous therefore was I so upset that Jack it
 notwendig gefunden hat seiner NICHTE ein Kabrio zu kaufen.
 necessary found has his niece a convertible to buy
 ‘Convertibles are dangerous. So I was pretty upset when Jack felt it necessary
 to buy his niece a convertible.’
- b. #... seiner Nichte ein BLAUES Kabrio zu kaufen
 ...his niece a blue convertible to buy
 ‘... to buy his niece a blue convertible.’
- (9) a. Meine Mutter hat mich gefragt ob wir in die Stadt ziehen. Ich habe ihr
 my mother has me asked whether we in the city move I have her
 gesagt dass die KRIMINALITÄT in der Stadt ABSTOSSEND ist.
 told that the crime in the city repellent is
 My mother asked if we were moving to the city. I told her that the violence in
 the city is a turn-off.
- b. #... diese KRIMINELLE Stadt kein Ort ist um sich dort AUFZUHALTEN.
 ...this criminal city no place is around self there to-stay
 ‘... the violent city is no place to be.’

¹Acceptability judgments were elicited from three German-speaking informants. One informant found the de-accenting in (8-a) to be somewhat odd, but nonetheless found (8-a) much more acceptable than (8-b).

This suggests a syntactic G-feature for German as well. As emphasized in the previous section, German has an additional test case which English does not possess: scrambling.

4.2.1 A test case for Givenness effects

The projection requirements of the G-feature prohibit any configuration like the one in Fig.40, where an XP consists of a moved ZP and a smaller instance of XP, with only the smaller XP G-marked. This and the adjunct structures covered in the last chapter are special cases of a general prohibition on G-marking XPs which are not maximal projections of their head.

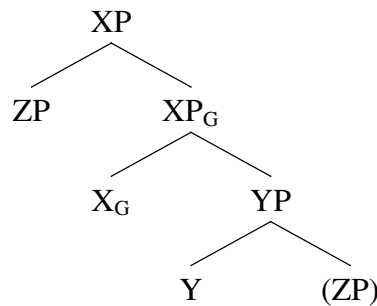


FIGURE 40: ILLEGAL DUE TO G-FEATURE PROJECTION

This kind of configuration, where an XP dominates another XP node as well as a moved ZP, is just the kind of configuration that is created by scrambling under any non-base-generated analysis. To take the specific case of scrambling in ditransitive constructions, we should test whether the structure in Fig.41 is possible.² The current hypothesis predicts impossibility for Fig.41.

The definiteness effects discussed above provide an independent motivation for scrambling: placing a definite DP before an indefinite DP provides motivation for the structure in Fig.41. Thus, we should test whether a VP like the following, which is motivated by definiteness effects and exhibits the intonation pattern that would result from the structure in Fig.41, can be licensed by Givenness of the remnant VP (*einem Ritter gegeben hat*).

- (10) den Heiligen GRAL einem Ritter gegeben hat
 the.acc holy grail a.dat knight given has
 ‘gave the Holy Grail to a knight’

²I assume an applicative head Appl which introduces a possessive meaning, such that for certain ditransitive verbs like *give* and *offer*, the semantic argument to the verb is something like *POSSESS(x, y)*. Not much hinges on this particular assumption.

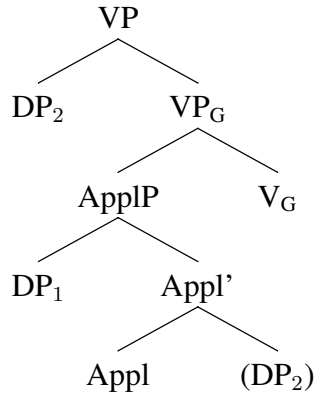


FIGURE 41: AN ILLEGAL SCRAMBLING CONFIGURATION

Assuming that moved XPs are interpreted as variables at LF (see Fig.22 in Chapter 3), the ExClo of the remnant VP as per the analysis given in Chapter 3 is something like $\exists x.\exists y.GIVE(x, POSSESS(knight, y))$. The test case for our prediction is the sentence in (10) situated in a discourse context which saliently entails this ExClo. Such a context, with no MEC antecedent for ‘gave the Holy Grail to a knight’, should not license the intonation in (10).

4.2.2 Judgments and analysis

The following three examples illustrate a difference between Focus and Givenness-marking that is analogous to the contrasts drawn in Chapter 3. I begin with the test case built up in (10). First, let’s verify that the intonation pattern in (10) is derivable via Focus-marking. Example (11) illustrates that the intonation can be licensed by contrastive Focus on the scrambled direct object *den Heiligen Gral* ‘the Holy Grail’. Example (12) shows that the same intonation can also be licensed when the direct object selects a unique answer to the Question Under Discussion. The three informants whose judgments were used to evaluate these examples all found the scrambling in (11) to be slightly more natural than the scrambling in (12), but crucially all three found the scrambled configuration with the intonation pattern given to be an acceptable variant in both contexts.

- (11) A: Gerüchten zufolge hat Arthur einem Ritter Excalibur gegeben!
 rumors according-to has Arthur a knight Excalibur given
 ‘Rumor has it that Arthur gave Excalibur to a knight!’

B: Ich habe gehört, dass Arthur den Heiligen GRAL einem Ritter gegeben hat
I have heard that Arthur the holy grail a.dat knight given has
'I heard that Arthur gave the Holy Grail to a knight!'

(12) Q: Was hat Arthur einem Ritter gegeben?
what has Arthur a knight given
'What did Arthur give to a knight?'

A: Ich habe gehört, dass Arthur den Heiligen GRAL einem Ritter gegeben hat

Now we want to test the prediction that this same intonation pattern is *not* licensed by discourse-salience of the remnant VP alone. We want a context that makes the ExClo of that VP, $\exists x.\exists y.GIVE(x, POSSESS(knight, y))$ a salient proposition. The context in (13) does this, and as predicted, all three informants independently judged the scrambled configuration with the intonation pattern given to be completely unacceptable.

(13) A: Die Ritter der Tafelrunde verlangen immer so extravagante
the knights the.gen round-table demand always such extravagant
Weihnachtsgeschenke.
christmas-gifts
'The Knights of the Round Table always demand such extravagant Christmas gifts.'

B: Wirklich?
Really?

A: Ja.

#Ich habe gehört, dass Arthur den Heiligen GRAL einem Ritter gegeben hat /
Ich habe gehört, dass Arthur einem Ritter den Heiligen GRAL gegeben hat

The context saliently suggests that the knights receive Christmas gifts, which entails the ExClo of the remnant VP and makes it Given. There is an independent test of whether this is true; example (14) below shows that the equivalent English discourse context makes the semantically identical VP *given to a knight* susceptible to de-accenting.

(14) A: The Knights of the Round Table always demand such extravagant Christmas gifts.

B: Really?

A: Yeah. I heard that the Holy GRAIL was given to a knight

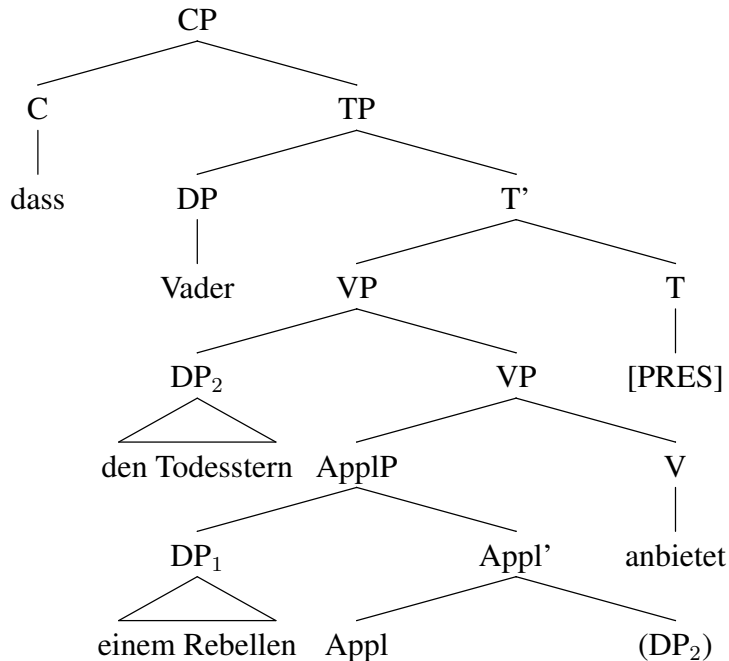


FIGURE 42: DOING BUSINESS WITH THE REBELS

It is therefore surprising, in the absence of the feature-based explanation suggested by Chapter 3, that the combination of direct object scrambling and de-accenting of the lower VP *einem Ritter gegeben* should be illegal in this context.

Let's consider another sentence with the same properties. Consider the CP *dass Vader den Todesstern einem Rebellen anbietet* 'that Vader is offering the Death Star to a rebel.'³ This has the structure shown in Fig.42.

Examples (15) and (16) again show that de-accenting below a scrambled DP is acceptable when the scrambled DP is a Focus. Example (17) again confirms the prediction that a scrambled DP cannot bear the rightmost pitch accent in a Givenness context.

- (15) A: Hast du schon die Nachricht gehört? Anscheinend hat Vader einem
 have you already the news heard apparently has Vader a.dat
 Rebellen die AT-ATs gegeben!
 rebel the AT-ATs given
 'Have you heard? Apparently, Vader gave the AT-AT units to a rebel!'

³(Darth) Vader is a villain from Star Wars, who opposes the rebels, and the Death Star is his space station. The reason I have used names of specific entities like 'den Heiligen Gral' and 'den Todesstern' in these examples is to create definiteness effects without also biasing the definite DP toward being Given, as anaphoric uses of the definite article would.

- B: Ich habe gehört, dass Vader den TODESSTERN einem Rebellen anbietet
 I have heard that Vader the Death-Star a.dat rebel offers
 ‘I heard that Vader is offering the Death Star to a rebel.’
- (16) Q: Was bietet Vader einem Rebellen an?
 What offers Vader a rebel on
 ‘What is Vader offering to a rebel?’
- A: Ich habe gehört, dass Vader den TODESSTERN einem Rebellen anbietet
- (17) A: Man sagt dass Vader mit den Rebellen Geschäfte macht.
 one says that Vader with the rebels business makes
 ‘Word on the street is, Vader has been doing business with the rebels.’
- B: Was hast du gehört?
 what have you heard
 ‘What have you heard?’
- A: #Ich habe gehört, dass Vader den TODESSTERN einem Rebellen anbietet /
 Ich habe gehört, dass Vader einem Rebellen den TODESSTERN anbietet.

Again, we can independently test whether the salience of ‘doing business’ really does entail, under common-sense contextual assumptions, that offers are being made, thereby rendering the remnant VP Given. Example (18) gives the English passive equivalent; no accent is necessary on the VP at all. The absence of an MEC antecedent for the VP is no problem in English, because this is a passive construction. The entire VP can be G-marked with no negative consequences for intonation or felicity. The German scrambling equivalent exhibits a recursive VP structure where the argument corresponding to *the Death Star* must be dominated by a G-marked VP node if the verb is to be G-marked at all.

- (18) A: Word on the street is, Vader has been doing business with the rebels.
 B: Really? What have you heard?
 A: I heard that the DEATH Star was offered to a rebel

Table 14 summarizes the judgments obtained for German ditransitive sentences.

	Remnant VP Given	DO Focused
DO scrambled	x	✓
DO in situ	NA	✓

TABLE 14: ACCEPTABILITY OF RIGHTMOST ACCENT ON THE DIRECT OBJECT (DO)

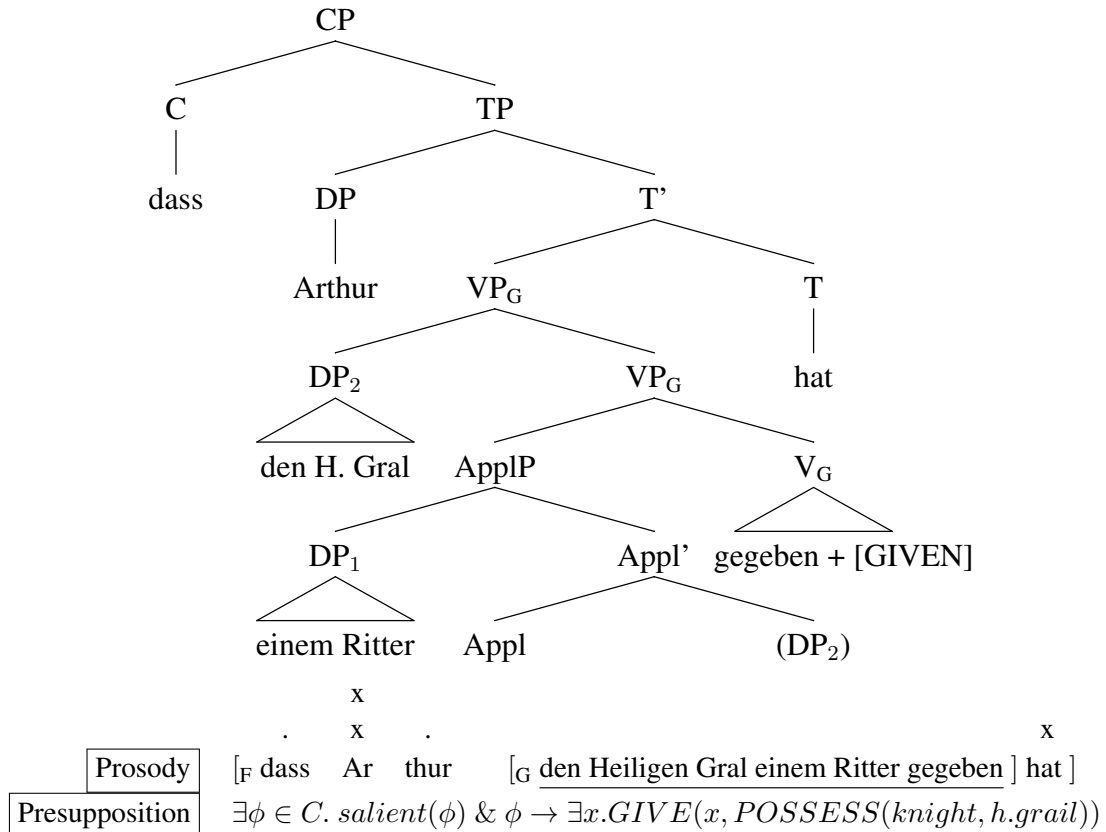
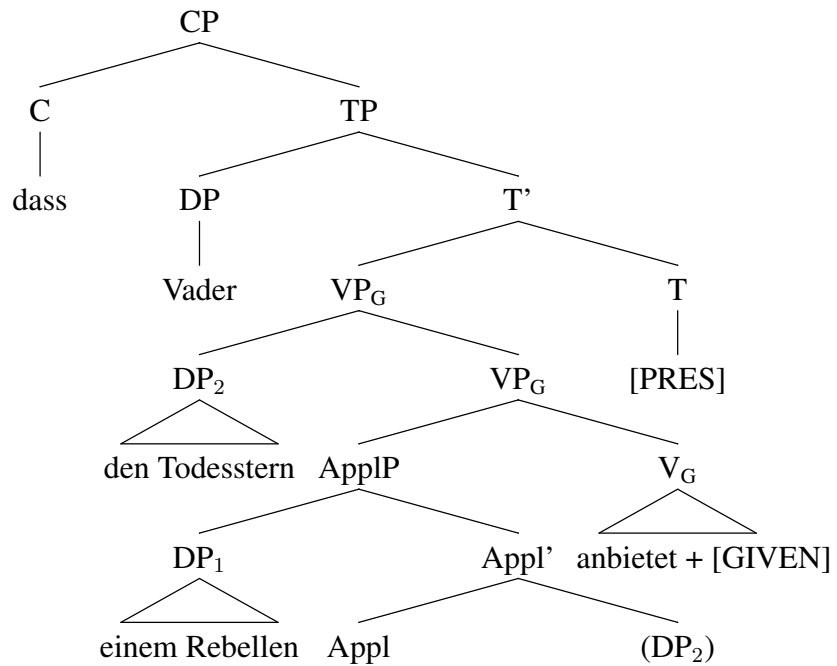


FIGURE 43: ARTHUR AND THE GRAIL

These judgments fall in line with the predictions made by the analysis in Chapter 3: Givenness exists as a formal feature in German just as it does in English, and this has consequences for scrambling possibilities. These consequences are illustrated in Figures 43 and 44, which are directly analogous to Figure 36 in Chapter 3.

So we see that scrambling in German is restricted in exactly the same way that adjunct structures are restricted vis-à-vis Givenness-marking. This further serves to validate the idea that Givenness is a syntactically encoded property of XPs, just like the *wh*-feature which drives *wh*-movement in questions. This analogy between G-marking and *wh*-movement is further considered in the following section, where the interaction between Givenness and pied piping is considered. This is followed by some notes on the interaction between Givenness and V2 syntax in German main clauses. I conclude this chapter with an interim summary before switching gears and diving deeper into the nature of Focus.



Prosody
 Presupposition

$\begin{matrix} x \\ \cdot & x & \cdot \end{matrix}$
 [F dass Va der [G den Todesstern einem Rebellen anbietet]]
 $\exists \phi \in C. \text{salient}(\phi) \ \& \ \phi \rightarrow \exists x. \text{OFFER}(x, \text{POSSESS}(\text{rebel}, d.\text{star}))$

FIGURE 44: VADER AND THE DEATH STAR

4.3 Further Evidence

In this section I consider two more pieces of evidence for a G-feature in German. The first piece of evidence comes from Wagner (2012), who demonstrates that German differs from English in whether de-accenting can apply within a prepositional phrase. This difference is reduced to a difference in “pied piping”: in German, prepositions cannot be stranded under wh-movement, but in English they can. While Wagner uses this as support for his LF-movement analysis of Givenness which I argued against in Chapter 3, these data fit into the current analysis as well.

The second piece of evidence is somewhat more tentative: in a transitive sentence with a phonologically heavy tensed verb in second position, informants prefer some accent on the verb in contexts where the VP is Given but no MEC antecedent for the sentence is present. I address the two cases in turn.

4.3.1 Pied piping

Wagner (2012) notices an interesting difference between German and English with regard to de-accenting within prepositional phrases. Consider the following pair of examples from Wagner (2012, pp.27-28)

- (19) Q: If you need an ATM, why don't you go to the gas station?
A: I didn't even know there was an atm IN the gas station
- (20) a. #Ich wusste ja gar nicht dass da ein Geldautomat IN
I knew actually at-all not that there an ATM in
der Tankstelle ist
the gas-station is
b. Ich wusste ja gar nicht dass da ein GELDAUTOMAT in der Tankstelle ist

Here we see that in English it is perfectly acceptable, in a context where ‘gas station’ and ‘ATM’ are Given, to utter the PP *in the gas station* with stress only on the preposition, the DP sister to the preposition having been de-accented. One may expect the German equivalent, IN der Tankstelle, to be just as acceptable, since German also has Givenness-marking. Yet, the analogous German sentence prohibits accent on the preposition in this context.

Wagner takes this as evidence for LF-movement of the *the gas station*, as per the analysis summarized in 3.1. The unavailability of IN der Tankstelle is then explained by the fact

that in German, it is never possible to move a DP that is embedded in a PP. In other words it is not possible to strand a preposition, as it is in English.

- (21) a. Who are you going to the talk with?
 b. With whom are you going to the talk?
- (22) a. *Wem gehst du zum Vortrag mit?
 whom go you to-the talk with
 b. Mit wem gehst du zum Vortrag?
 with whom go you to-the talk

German is thus considered an obligatory pied-piping language, where pied piping refers to the property of PPs inheriting the wh-feature of their embedded DPs, forcing movement of the entire PP, as in (21-b). This is optional in English but obligatory in German. Under Wagner, the inability of the DP *der Tankstelle* to move out of its PP accounts for the failure of that DP to de-accent in a Given context. The same facts fit into the current analysis as well. Assume that pied piping involves an aggressive form of feature projection whereby a syntactic feature of a DP under a PP node can (in English) or must (in German) be inherited by the PP.⁴ This is illustrated in Fig.45.

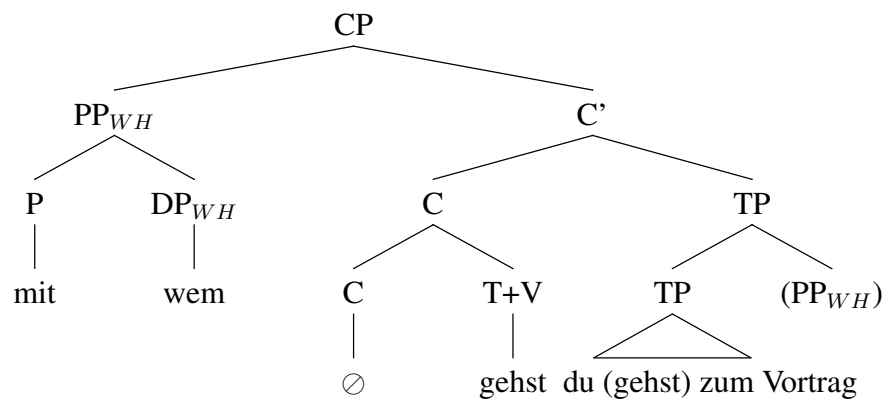


FIGURE 45: PIED PIPING

If we apply the same process of feature inheritance to Givenness, we get the following structure for the PP *in der Tankstelle*.

⁴I leave aside the details of why pied piping exists, or how exactly it should be encoded in a Minimalist framework. More research is needed to evaluate the current claims against the space of existing theories of pied piping, and vice versa.

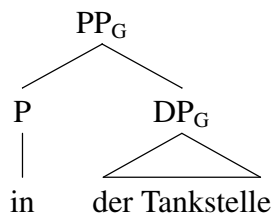


FIGURE 46: G-FEATURE PROJECTION TO PP

Any feature of the DP must be a feature of the dominating PP—there is, as we’ve seen before in other syntactic contexts, an “all-or-nothing” effect with respect to G-marking on a DP within a PP. Having posited a formal feature for de-accenting salient material, there is now a link between wh-movement and Givenness-marking that appears to be instantiated in examples like (22). But the analysis in Fig.46 raises an important question: why must a G-feature be present on the DP? Couldn’t the accent pattern IN der Tankstelle be derived via G-marking only on the NP *Tankstelle*, since determiners resist accent *a priori*? And wouldn’t this configuration prevent projection to the DP node, and therefore prevent inheritance by the PP?

To answer this question, we must first answer a more basic question: why does the preposition receive accent at all? Don’t prepositions, like determiners, resist accent *a priori*? In order to address these issues, we must dive a bit deeper into how prosodic accent assignment interacts with syntactic Givenness-marking.⁵

To further illustrate the problem, consider the default pronunciation of the English version of the sentence in question.

(23) I didn’t KNOW there was an ATM in the GAS station.

There are three accents above the word level: *know*, *ATM* and *gas station*. Now if we situate the sentence in the context given above, where both ATMs and gas stations are contextually salient, it is possible to derive a structure like the following.

(24) I didn’t know there was an [_G ATM] in [_G the gas station]

What we want to explain is why the structure in (24) would have the intonation in (25-a), with stress on the preposition *in*, as opposed to the intonation in (25-b), where there is only stress on *know*.⁶

⁵The casual reader can skip to 4.3.2 without losing the overall thread of this chapter.

⁶It is also possible, indeed natural, to place the rightmost accent on *was*. If we assume that *an ATM* is in

- (25) a. I didn't KNOW there was an atm IN the gas station
 b. I didn't KNOW there was an atm in the gas station

Bear in mind that the same intonational contour in (25-b) is derivable if we G-mark the entire embedded CP, but what we want to know is why the prosodic structure represented in (25-b) is *not* derivable from (24), as we might expect if we assume that prepositions such as *in* resist accent *a priori*.

The following acceptability contrasts suggest an explanation.

- (26) a. Speaking of resignation, I didn't know until today that the POPE had resigned
 / #... I didn't know until today that the pope HAD resigned
 b. Q: What do you think of the pope's resignation?
 A: I'm not sure; I didn't know until today that the pope HAD resigned
 c. A: #I didn't know until today about the pope's HAVING resigned

We see in (26-a) the typical prohibition on a strongly accented tense head without a contrastive interpretation. In (26-b) we see the effect of de-accenting the Given NP *pope* as well as the Given VP *resigned*: there must be an accent on the tense head, *had*. Finally, in (26-c) we find that this requirement does not hold for the equivalent DP *the pope's having resigned*. I propose that a CP (but not a DP) must contain some sentence-level stress. The effect of the double G-marking in (26-b) is to remove the possibility of accenting one of the content words in the CP which requires accent on some element. This results in accent on the rightmost non-deaccented element, which is *had*.

This is not too surprising given well-known alignments between prosodic structure and syntactic structure. Until now, I have largely ignored the layers of prosodic structure which determine accent placement, but these layers become relevant now. Under standard treatments of prosodic structure (see Halle and Vergnaud 1987 and Truckenbrodt 2007 for a summary), each sentence-level stress occurs at the right edge of a *prosodic phrase*. Prosodic phrases tend to align with syntactic XPs, except when such an alignment is prevented by other phonological constraints. Assuming that G-marked elements are invisible to accent assignment, we obtain the following structures for the felicitous pronunciations of the sentences in (26). (Prosodic phrases are contained in parentheses, and (27-a) represents the default pronunciation.)

Spec,PP then this is the result of G-marking the entire PP *an ATM in the gas station*. Otherwise, it could be derived by G-marking *in der Tankstelle* and *an ATM* separately.

- (27) a. (I didn't KNOW) (until TODAY) (that the POPE) (had RESIGNED)
 b. (I didn't KNOW) (until TODAY) (that the POPE had resigned_G)
 c. (I didn't KNOW) (until TODAY) (that the pope_G HAD resigned_G)
 d. (I didn't KNOW) (until TODAY about the pope_G's having resigned_G)

I propose that CPs, including embedded ones, must align with a prosodic phrase boundary. Under this proposal, the ability to accent functional heads in Givenness contexts results from the fact that the following configuration is illegal.

- (28) *(I didn't KNOW) (until TODAY that the pope_G had resigned_G)

This prosodic structure requires accent on *had*. It is possible to derive the above intonation pattern (I didn't know until TODAY that the pope has resigned), but it requires a G-feature on the entire embedded CP. In that case, the entire CP is completely invisible to stress assignment, a requirement that must trump the constraint on alignment between CPs and prosodic phrases.⁷

- (29) (I didn't KNOW) (until TODAY ~~that the pope had resigned~~_G)

We can state this in the language of Optimality Theory (Prince and Smolensky, 1993) by positing two phonological constraints, where the first is ranked above the second.

1. GIVENNESS: A G-marked syntactic phrase cannot contain accent.
2. ALIGN(CP,PRP): A CP must contain at least one prosodic phrase.

These two constraints interact to prevent the configuration in (28). Therefore, when both *pope* and *resigned* are Given, it is necessary to accent something in the CP, and with only prosodically light functional heads available, prominence falls on the rightmost element by default.

We can now return to our original question: why is the following not possible?

- (30) *...dass da ein Geldautomat IN der Tankstelle_G ist.
 that there an ATM in the gas-station is
 '... (that) there was an ATM in the gas station'

⁷This raises the question: why would the double G-marking configuration in (27-c) ever be preferred over simply de-accenting the entire CP? I can only speculate that there exist preferences regarding how much material can be de-accented in an utterance.

Assume the same constraints for German as for English: Given-marked material is never accented, and CPs align with prosodic phrases.

- (31) a. *daß da ein [_G Geldautomat] in [_G der Tankstelle] ist
b. (daß da ein Geldautomat IN der Tankstelle ist)
- (32) a. daß da ein [_G Geldautomat] in der [_G Tankstelle] ist
b. (daß da ein Geldautomat in DER Tankstelle ist)
- (33) a. daß da ein Geldautomat in der [_G Tankstelle] ist
b. (daß da ein GELDAUTOMAT in der Tankstelle ist)

The only structure which correctly generates accent on the preposition is (31), and this is exactly the configuration which is ungrammatical under the assumption of feature inheritance by PP nodes. The only piece of the puzzle remaining is the question of why we don't find [_{PP} in DER Tankstelle] as a natural information-structural configuration, as in (32). This must be ruled out independently. Perhaps it is the case that the phonological system generates (32), but that speakers so strongly disprefer nuclear accent on determiners that the G-marking configuration in (33) is chosen instead, which generates a more “comfortable” intonation pattern. To this same end, one could assume a strong preference toward de-accenting DPs rather than NPs, in which case the pied-piping nature of PPs would yield the following.

- (34) a. daß da ein Geldautomat [_G in der Tankstelle] ist
b. (daß da ein GELDAUTOMAT in der Tankstelle ist)

As we will see in Chapter 5, it is possible in very limited circumstances to use Focus to place strong prominence on a determiner.

The difference between German and English with regard to de-accenting within PPs can be summarized as follows.

- Because CPs require an accent, a CP where only prosodically light functional elements lack a G-feature will create prominence on the rightmost functional element in that CP, contrary to typical prosody.
- The only way to place accent on a preposition in English is to de-accent its sister DP.
- In German, but not in English, PPs inherit features of the DPs they dominate.

- In German, it is impossible to de-accent a PP's sister DP without de-accenting the entire PP, due to feature inheritance.
- In German, accent on a preposition with a de-accented sister DP cannot be derived via Givenness.
- The intonation pattern in question is only possible in German when there is Focus on the preposition, creating a contrastive interpretation.

Before concluding this chapter, I turn briefly to a possible effect of V2 syntax on G-marking possibilities in German.

4.3.2 V2 and stress on lexical verbs

Below is another configuration predicted to be illegal under the current proposal.

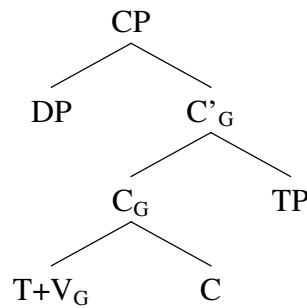


FIGURE 47: ILLEGAL V2 CONFIGURATION

This phrase structure instantiates the standard treatment of German's V2 syntax in main clauses (den Besten, 1983), where the verb undergoes head movement first to T, and then from T to C, carrying the tense head with it. Some element is then attracted (in this case a DP) to Spec,CP, resulting in a verb-second word order. The predicted illegality of Fig.47 results from the failure of the G-feature on C' to project to the CP. In this section I give some evidence that this prediction is borne out.

This section is somewhat speculative in that it is not fully clear that we should expect this configuration to be legal even without any syntactic restrictions on G-marking. This is because it is not clear whether or not the G-feature of the verbal head should have to be inherited by the entire C complex. The exact nature of head movement and its role in Minimalism has not yet been satisfactorily decided (for a summary, see Chomsky, 2001; Roberts, 2011b). However, assuming that head movement is involved in V2 phrase structure in German, and assuming that complex heads share the features of their parts, we can

test whether Fig.47 is indeed illegal by constructing a context that makes everything under the C' node Given, and attempting to de-accent everything except the subject. This is somewhat tricky, because verbs often lack accent *a priori*, especially tensed verbs which are often prosodically light auxiliary elements. The test needs to involve a tensed verb with some semantic and phonological weight. Consider the verb *übersetzen* 'to translate'. First, let's find a context where in English, which lacks V2 syntax, the verb *translate* has the option of being de-accented along with its object.

(35) A: I can't go to the talk because I won't understand it without translation. It's in French!

B: I don't understand French, either. GILLIAN's translating the talk

Here, the salience of the meaning 'translate the talk' allows the predicate VP to be de-accented in English. Because of V2 and the illegality of Fig.47, I predict the German equivalent of this to be infelicitous. Two native German-speaking informants had straightforward intuitions that this was the case.

(36) A: Ich kann nicht zum Vortrag gehen, weil ich ihn ohne Übersetzung
I can not to-the talk go, because I it without translation
nicht verstehen würde. Er ist in Französisch!
not understand will it is in French

B: Ich verstehe auch kein Französisch. ??GILLIAN übersetzt den Vortrag
I understand also no French Gillian translates the talk

The following variant was clearly preferred, where accent falls on the tensed verb.

(37) Ich verstehe auch kein Französisch. Gillian überSETZT den Vortrag

Florian Schwarz (p.c.) points out that the following context ameliorates the unacceptability of the de-accenting in (36).

(38) A: Der Vortrag ist in Französisch. Ich weiß nicht, ob eine Übersetzung
the talk is in French I know not whether a translation
angeboten wird.
provided will

'The talk is in French. I don't know if a translation will be provided.'

B: GILLIAN übersetzt den Vortrag

I posit that this context, which involves uncertainty about whether a translator will be provided, introduces an implicit Question Under Discussion whose alternatives are something like {‘Gillian is translating’, ‘Tony is translating’, . . . , ‘nobody is translating’}. Perhaps this QUD is best represented as a question ‘Will there be a translator, and if so, who?’ If this QUD can be accommodated by the hearer in discourse, then Focus on Gillian is licensed, and Givenness is not needed to derive the de-accenting of the predicate.

Schwarz (p.c.) further points out that any context in which translation is taken to be a likely event at a talk can serve to ameliorate the de-accenting in (36). This is consistent with the notion that implicit QUDs can be accommodated in cases where a question suggests itself. In a context where one is expecting translation, but is uncertain about whether a particular talk will provide that service, the question of *who* is translating can be accommodated, since knowing the answer to this question is an obvious route to knowing the answer to the broader question of whether translation will be provided. The point of (36) is to provide a context where the concept of translating is salient, but where the question of *who* might be translating does not suggest itself in any way. This same context optionally licenses de-accenting of the verb in English, and it is presumably due to G-marking. The questionable acceptability of this configuration in German suggests that perhaps the V2 syntax of German is preventing the Givenness feature from marking the tensed verb *übersetzt*, due to the inheritance of the G-feature by the complementizer whose position the verb occupies, forcing unwanted projection to CP.

4.4 Interim Summary

The purpose of this dissertation is to defend an account of information structure that is determined by Givenness and Focus as two separate phenomena, represented at two different levels of linguistic theory. These past two chapters have been dedicated to arguing for a syntactic feature which encodes Givenness. The evidence for this can be summarized by the following four points.

1. In English and German, it is possible to de-accent XPs whose meaning is salient in the current discourse.
2. Givenness-based de-accenting, unlike de-accenting due to (lack of) Focus, does *not* require any particular contrast or Question Under Discussion.

3. In English, Givenness-based de-accenting is syntactically limited in its distribution; for example, the lower half of an adjunct structure cannot be de-accented by Givenness alone.
4. The same restrictions apply in German, as well as additional restrictions imposed by the syntax of that language; for example, scrambled DPs cannot bear nuclear accent as a result of the lower remnant VP being Given.

In Chapter 3 I showed that in judgment tasks, subjects' preferences, though sometimes subtle, were consistent with points (1)-(3) above. I also argued in that chapter that point (3) is straightforward if Givenness is a syntactic feature: syntactic features, under standard assumptions, must project to maximal XPs. In this chapter I have provided additional evidence from German. Three informants had strong intuitions consistent with point (4). Again, the judgments are straightforward if Givenness is a formal syntactic feature.

The following questions suggest themselves at this point.

- Is Focus syntactically limited in its distribution? If not, can it be called a syntactic feature? If not, what exactly is Focus, and how should it be represented in linguistic theory?
- If Focus is not a syntactic feature, how can one account for apparent cases of Focus movement? Does Focus have any syntactic effects at all?

The following two chapters are dedicated to addressing these questions in detail.

Chapter 5

Focus

5.1 Distributional Properties of Focus

Chapters 3 and 4 were dedicated to arguing for the hypothesis that Givenness is a syntactic feature in English and German, which must coexist with some notion of (contrastive or QUD-based) Focus. The coexistence of Focus and Givenness has been proposed before by Féry and Samek-Lodovici (2006), Selkirk (2007) and others. The syntactic nature of Givenness is suggested by Selkirk (2007) and has been explored in Slavic (Kucerova, 2007). The main contribution of the preceding chapters is to present evidence based on intonation patterns in English and German that Givenness is syntactically determined in these languages. For the remainder of this work, I switch gears to examine the phenomenon of Focus in light of what has been said about Givenness. The current chapter examines data primarily from English, and a little from German; Chapter 6 further examines these languages and gives glimpses of Italian and other languages. We will see that Focus is quite different from Givenness in its behavior. Therefore, I argue, Focus cannot be given the same status in grammar as Givenness as with existing analyses à la Selkirk (2007). The central claim of the remainder of this work has four parts.

1. Unlike Givenness, which is syntactically constrained in its distribution, Focus is constrained only by pragmatic and phonological principles.
2. The reason for this difference in behavior is that Focus is not encoded in the syntactic derivation of a sentence; rather, the placement of prosodic accent is underspecified by grammar, and Focus is the result of strategic decisions about where to place accent given the current state of discourse.

3. Both contrastive and QUD-based instances of Focus can be seen as instantiations of a single generalization—Focus exploits the hearer’s expectations about the current discourse in order to facilitate communication.
4. Some purported instances of Focus movement, which suggest a syntactic Focus feature, are epiphenomena which do not require Focus to be encoded in syntax.

I utilize the game-theoretic pragmatic framework outlined at the end of Chapter 2 to build a model of how accent placement is determined by a combination of discourse expectations and a desire for redundancy in communication. This allows for an account of Focus without positing any place for it in syntax. Under this account, Focus is the result of a game-theoretic, domain-general reasoning mechanism applied to the problem of where to place prosodic prominence given the phonological parameters of a language. Independent phonological constraints are supplied by grammar, but they do not fully specify an algorithm for assigning prominence. Speakers are free to choose the domain of accent assignment, and these decisions are made in way that maximizes the link between prosodic prominence, on one hand, and information that is not predictable by the hearer, on the other. This is neither a principle of Universal Grammar nor an acquired syntactic parameter, I argue. Rather, it is best modeled as the interaction of other linguistic principles and parameters with general principles of pragmatic decision making. This has implications for theories of Focus movement, which are discussed in Chapter 6, as well as other predictions that are beyond the scope of what can be covered in this dissertation. Ultimately, the extensibility of this account to different languages and phenomena will be left as a goal for future research.

To begin, I examine the distribution of Focus placement in English. I show that Focus is not bound by the same syntactic constraints as Givenness. This is demonstrated by examining three phenomena: Focus on partial adjunct structures, Focus on remnant VPs under scrambling and Focus below the level of the phonological word.

5.1.1 Focus and adjuncts

To start, let’s consider whether the same generalization which led to the G-feature proposal in Chapter 3 holds for Focus-marking as well—must Focus on a head project to that head’s maximal XP? As it turns out, the generalization does not hold. Consider the following.

- (1) Q: Did you have pizza baked in the oven or a sandwich baked in the oven?
 A: I had [_F a SANDWICH] baked in the oven.

The Question Under Discussion sets up two possibilities: ‘I had *x* baked in the oven’ where $x \in \{\text{‘pizza’}, \text{‘a sandwich’}\}$. Under the standard Roberts (1996) treatment, we should place Focus narrowly on the DP *a sandwich* in the answer in (1). The resulting intonation pattern lacks any prominence on the modifier *baked in the oven*. This shows *prima facie* that Focus does not project from *sandwich* to the entire DP *a sandwich baked in the oven*. However, the test is not straightforward, because we have claimed that Givenness marking exists as an independent factor in determining accent. Perhaps Focus does indeed project, and we use G-marking to obtain a structure like the following.

- (2) Q: Did you have pizza baked in the oven or a sandwich baked in the oven?
 A: I had [_F a SANDWICH baked in the oven_G]

In order to refine our test, let’s consider a phenomenon that is closely related to Focus: ellipsis (Kim, 1997; Jayaseelan, 2001; Gengel, 2007). Typically ellipsis is licensed on any elements which are not in Focus, as in the following simple example.

- (3) Q: What did you eat for lunch?
 A: A sandwich.

It is possible for Focused elements to be partially Given-marked, but the Givenness-marking does not license ellipsis. In (4) we see that when the broadly Focused sentence contains a G-marked modifier, that element cannot be elided. There is a Gricean implicature which can, with some effort, derive the intended meaning if the modifier is not present, but the utterance is not as natural as the one containing the modifier. This suggests a strict information-structural constraint on ellipsis.¹

- (4) A: It’s so hot in this kitchen! Why are they running the oven on such a hot day?
 B: [_F That guy ordered a SANDWICH baked in the oven_G] /
 #That guy ordered a SANDWICH.

Contrast that with the following modification of (1), where being in all possible QUD answers, and thus not being in Focus, licenses ellipsis of the modifier.

¹The analysis set forth later in this chapter is consistent with this constraint—being salient is not a license for ellipsis, but being expected or highly probable is.

- (5) Q: Did you have pizza baked in the oven or a sandwich baked in the oven?
 A: A sandwich.

This is a robust difference between Focus and Givenness-marking—see (6) for additional examples—and it provides us with another tool to distinguish between the two. We can generalize from the examples in (3), (4) and (6) that stand-alone sub-clausal constituents that answer QUDs must comprise the entire largest Focus domain of the full, non-elided sentential counterpart to that utterance.

- (6) a. (i) Q: Who chastised Bob at the party?
 A: [_F Nancy Pelosi] ~~chastised Bob at the party~~ (Focus)
 (ii) Bob keeps getting chastised at this party. You won't believe this:
 #_F [_F Nancy Pelosi [_G ~~chastised Bob~~]] (Givenness)
- b. (i) Q: Where did Nancy Pelosi chastise the Senator?
 A: ~~Nancy Pelosi chastised the Senator~~ [_F At the State of the Union] (Focus)
 (ii) The Senator keeps getting chastised by Pelosi! You won't believe this:
 #_F [_G ~~Nancy Pelosi chastised the Senator~~] At the State of the Union] (Givenness)

Taking it to be true that constituents in Focus cannot be elided, given example (5), a structure like the one in (1) must be possible. If Focus behaved exactly the same as Givenness, i.e. if it were a syntactic feature subject to feature projection, then the minimal answer to the question in (1), *Did you have pizza baked in the oven or a sandwich baked in the oven?*, would have to be *a sandwich baked in the oven*, and not the further elided DP *a sandwich*. This is because the F-feature would project to the entire DP including the modifier *baked in the oven*, and that full DP would thus be unable to undergo ellipsis. In other words, a syntactic account of Focus predicts that *a sandwich baked in the oven* should be subject to constraints on F-marking that are analogous to the constraints imposed on G-marking within a DP like *blue convertible* in the examples in Chapter 3. This prediction is not borne out: it is perfectly fine to elide a modifier. There does not appear to be any requirement that Focus on a head project to create Focus on that head's maximal projection.

As we will see, the most extreme example of the freedom of Focus from feature projection is found in cases where Focus applies to syllables, metrical feet and bound morphemes below the word level. But before examining those cases, let's first check to see if the failure

of the adjunct generalization extends to the analogous scrambling configurations in German discussed in Chapter 4.

5.1.2 Focus and scrambling

Recall that the projection of Givenness to an XP limits scrambling possibilities, such that the following example requires an MEC antecedent for the VP.

- (7) Ich habe gehört, dass Arthur den Heiligen GRAL [_{VP} einem Ritter gegeben] hat.
 I have heard that Arthur the holy grail a.dat knight gave has
 ‘I heard that Arthur gave the Holy Grail to a knight.’

We should look for the Focus-marking analog to this projection behavior. If Focus behaved the same as Givenness, we would expect a prohibition on the following configuration.

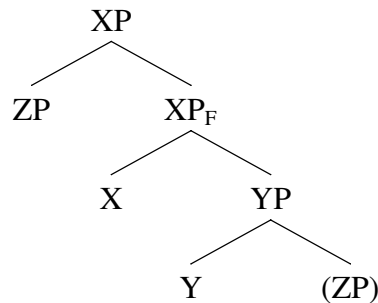


FIGURE 48: AN ILLEGAL CONFIGURATION IF FOCUS REQUIRES PROJECTION

Such structures, where we have a recursive structure $XP \rightarrow ZP XP$, are involved in scrambling, and thus provide a test case. For example, we should not be able to construct the following.

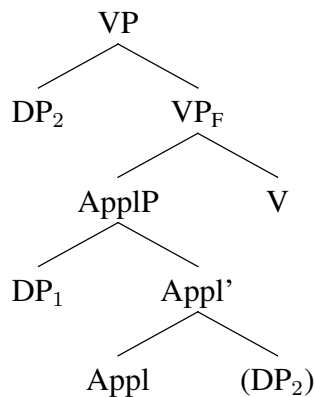


FIGURE 49: ILLEGAL SCRAMBLING IF FOCUS REQUIRES PROJECTION

This is the structure I assume for the VP in the following sentence.

- (8) Er hat [_{VP} den Brief [_F einem Kind geschickt]]
he has the.acc letter a.dat child sent
'He sent the letter to a child.'

Again we can use ellipsis to construct a test of this prediction. If Focused elements cannot be elided, then a syntactic F-feature account of Focus wrongly predicts that the following will be illegal.

- (9) Q: Was hat er mit dem Brief getan?
what has he with the letter done
'What did he do with the letter?'
- A: Einem Kind geschickt.
a.dat child sent
'Sent it to a child.'

That this is acceptable contradicts the notion of an F-feature which must project to the maximal projection of the verb, which is *den Brief einem Kind geschickt*. Again, ellipsis is not licensed by Givenness—the fact that the referent of *den Brief* 'the letter' is salient cannot be sufficient to license that DP's ellipsis. Rather, it must be the case that *den Brief* is outside of the domain of Focus based on the Question Under Discussion. This is straightforwardly true as a matter of pragmatics, but again, a syntactic account of Focus predicts an unwanted consequence, the projection of Focus to *den Brief*, which we crucially do not find.

This is consistent with the intuition that the full sentential answer to the question in (9) places no prosodic prominence on *den Brief*, and from the ellipsis test we know that it is not due to G-marking; rather, it has the structure below.

- (10) Er hat den Brief [_F einem KIND geschickt]
he has the letter a child sent
'He sent the letter to a child.'

One should note that though the verb *geschickt* 'sent' is pragmatically in Focus, it does not bear strong accent. This is a fact about default stress assignment in German—though German shares the general pattern of right-edge prosodic prominence of English, there is typically no strong pitch accent on sentence-final verbs. This may be part of an overall

cross-linguistic pattern for accent to fall on arguments rather than on verbs. Reflexes of this can be seen with intransitive verbs in English, as in (11-a) from Schmerling (1974).²

- (11) a. (Out of the blue, obvious that some interesting news has been heard:)
Q: What happened?
A: JOHNSON died.
- b. (After Harry S Truman's ill health having been in the news recently:)
Q: What happened?
A: Truman DIED.
- (After Schmerling 1974)

I now turn to another phenomenon which illustrates the syntactically unconstrained nature of Focus: Focus below the word level.

5.1.3 Focus within words

We begin by noticing that it is possible to place contrastive Focus on a bound morpheme.

- (12) My mother thinks I'm out of work, but actually I'm UNDERemployed

If we construct an analogous example where the verbal morpheme *employed* is Given, but where there is no contrastive interpretation (i.e. no MEC antecedent) for *unemployed*, we see that Givenness marking below the word level fails. (13-a) shows that it is possible to de-accent a semantically analogous stand-alone word, *work*, while (13-b) shows that it is impossible in the same context to de-accent *employed* when it is part of a larger word.

- (13) a. The issue of job creation is particularly important to those who can't FIND work
- b. The issue of job creation is particularly important to the unEMPLOYED. / #... the UNemployed

²It is commonly taken to be true following Selkirk (1995) and others that unaccusatives differ from unergatives in whether they prefer subject stress or verbal stress by default. On the basis of experimental results, Hirsch and Wagner (2011, 2013) claim instead that intransitives always exhibit subject stress as in (11-a) as their default behavior. Under this account, in (11-b), the accent is shifting rightward onto the verb due to the "topicality" of the subject. That unergatives often instantiate verbal stress is said to be a byproduct of the meaning of unergatives, which typically have animate or human subjects which are more likely to be topical. I leave it open whether this is true, but I note that this account is fully consistent with the claims made about Givenness marking in Chapters 3 and 4, under which the subject *Truman* in (11-b) is G-marked, suppressing the accent and forcing prominence on *died*.

This mirrors the “blue convertible” examples from Chapter 3—to de-accent part of a word requires an MEC antecedent. The impossibility of de-accenting in (13-b) is straightforward under the assumption that Givenness is a syntactic feature which much project to an XP. But it is perhaps surprising that Focus can be freely placed on parts of words. This includes not only contrastive instances, but also cases of QUD-Focus as well.

- (14) Q: What’s your employment status?
A: I’m UNDERemployed

As pointed out by Artstein (2004), we also find examples of “metalinguistic”³ Focus, as in (15), (16) and (17).

- (15) I said she was EMPloyed by the army, not DEployed.
(16) Q: This is a stalag-what?
A: It’s a stalagMITE.
(Artstein 2004, p.7)
(17) I said I like Thai FOOD, not tyPHOONS!

In these cases, the speaker is addressing some part of what has previously been said: in (15) and (17) the speaker is correcting a misheard morpheme and phonological syllable, respectively, and in (16) the speaker is addressing a particular kind of QUD where the possible answers all share some phonological material. These instances license Focus on the contrasting/question-answering word parts *em-*, *de-*, *-mite* and *...phoons*. This metalinguistic license does not exist for Givenness. In other words, the mere salience of some morpheme, syllable or metrical foot does not license one to shift accent within a word. This is illustrated below.

- (18) There are lots of restaurants in town to choose from. We only have two restrictions:
I don’t want to go anywhere that requires a shirt and TIE, and #my father doesn’t
LIKE Thai

Example (19) illustrates quite clearly the contrast between Focus and Givenness—it is perfectly natural to de-accent the metrical foot /soDa/ when two words containing that foot are being contrasted, as in (19-a), but it is impossible to do so merely in virtue of /soDa/ being “Given”, as in (19-b).

³See Horn (1985).

- (19) a. We drove from MINnesota to SARsota
b. # We drove through MinneSota and we drank a LOTta soda

I end this section with another illustration of just how free Focus is in its distribution. This example was heard on a TV show singing competition entitled “The Voice”. One of the judges, Cee-Lo Green, was describing the competition’s high standard for vocal prowess, and he summed up his thoughts on the matter with the following utterance.

- (20) We’re looking for THEE voice, not THUH voice.

Here, Cee-Lo is contrasting two possible vowel qualities for the English definite determiner *the*, emphasizing that the most appropriate vowel quality for his utterance is the unreduced long vowel (i:) rather than the reduced schwa, due to his intent to convey the implicatures that go along with stressing the definite determiner in a way that yields the long vowel. When one stresses *the* in this way it has the effect of widening the domain restriction of the definiteness presupposition, implying some sort of global uniqueness. The implicature here is that Cee-Lo and company are looking for the best singer of all, not just a big fish in a small pond.

This glaring asymmetry in the behavior of Focus and Givenness suggests that these two concepts are not represented in the same way in language. Chapters 3 and 4 made the case that what might have seemed like unexpected restrictions of G-marking were in fact straightforward entailments of the way syntax is usually taken to work. What is surprising is that Focus is unencumbered by these considerations. The most obvious suggestion is that Focus is not encoded in syntax at all. The remainder of this dissertation is devoted to exploring this possibility and to answering the question which immediately arises from it: what exactly is Focus?

5.2 From Syntax to Discourse

This section incorporates the phenomena outlined above into a sketch of an analysis of Focus, whose purpose is to illustrate where Focus fits into the larger linguistic system. A fully formalized analysis is given in the next section. I argue that Focus should be viewed as a constraint on the interaction between prosodic phonology and a structured representation of discourse. Borrowing from Roberts (1996), Farkas and Bruce (2010) and others, I hold that discourse should be represented independently from grammar, although as we will see

the two interact. Under this conception, “discourse” is taken to be a structured model of how grammatical competence is used for purposes of communication.

The goal of speakers and hearers in discourse is to avoid misunderstanding. Of course, this goal is not always achieved—as is pointed out by Labov (1994, 2010), humans misunderstand each other more often than we’d like to think. Therefore, the models developed in the remainder of this chapter should be seen as *normative*: I aim to show why Focus is *optimal* for communication, with no assumption that optimal communication is always achieved. This idealization is not too different in spirit from models of grammatical competence which abstract away from performance errors. The goal is not to explain every single utterance that is observed in the real world, but rather to give a general account of several phenomena, leaving room for unintentional breakdowns in communication.

On a similar note, I remain agnostic about the degree to which these models are “psychologically real”. That is, I do not go as far as to claim that interlocutors are capable of calculating optimal strategies for communication on the fly. More likely, the optimality of various communicative strategies becomes evident such that speakers can develop simple rules as “short cuts” for optimal communication. These rules are distinct from the rules underlying generative grammar—these are rules for *selecting* from among possible utterances, each of which is generated by the rules of grammar. Allow me to illustrate with a simple example.

- (21) a. Can you hand me the pen on the table?
- b. (Pointing to a pen on the table) Can you hand me that pen there?

The referential content of (21-a) and (21-b) is more or less the same, the difference being that in (21-b) the speaker has chosen to use deixis to convey the intended propositional content, whereas in (21-a) the speaker has instead opted for an additional bit of description, the PP *on the table*, to guide her communicative goal. The speaker always has a choice between using deixis or not using deixis: both possibilities are equally valid under the grammatical rules of English. And yet there are clear reasons for preferring one to the other based on context. It is not difficult to imagine both optimal and sub-optimal contexts for using deixis as in (21-a). For example, if the speaker and hearer have not established eye contact immediately prior to the utterance, then deixis may lead to a delay in the achievement of the speaker’s goal: what if the hearer is not looking in the direction of the speaker? The pointing gesture will not be seen. On the other side of the coin, if the hearer is reasonably sure that the speaker will see the gesture, then the deixis will likely

facilitate the achievement of the speaker's goal by making it more immediately obvious what is intended. Must the speaker weigh the pros and cons of (21-a) and (21-b) every time she wants a pen handed to her? It is more likely that a communicative rule is developed, either by learning through experience, by learning a norm that has been developed in her speech community, or by applying other learned behaviors, whereby deixis is only used in instances where the speaker and hearer are engaged visually as well as auditorily. There is nothing specifically linguistic about this rule: it is simply the only sensible way to use deixis given the communicative goals of the interlocutors.

Decisions arise whenever we are engaged in discourse. To briefly consider another case, one always has a choice with regard to the overall volume or intensity of one's utterance. Some of the rules that govern this are obvious, e.g. if grandma has difficulty hearing, then increase the overall intensity of your utterance. Perhaps this rule is learned from experience (grandma kept mishearing), perhaps it was explicitly taught, or perhaps it was figured out. Regardless of the exact nature of the rule, we know two things for sure regarding the question of *why* this rule exists.

- It would be perverse to posit a grammatical explanation. Surely, the theory of syntax cannot sustain an account where utterance intensity is correlated with some abstract grammatical feature which introduces the presupposition that I am speaking to someone who has difficulty hearing.⁴
- The easiest explanation is that rules of communication arise which approximate optimal strategies for achieving communicative goals. Speaking louder to someone with hearing difficulties is self-evidently optimal from this perspective.

Going forward, we are interested in situating Focus within linguistic theory by considering the possibility that the answer to the question 'why does Focus exist?' is analogous to (although more complex than) the answer to the question, 'why talk louder to grandma than to others?' More specifically, we will explore the idea that Focus is encoded only in the phonological system, and that the semantic effects of Focus are the byproduct of pragmatic decisions about which possible intonation patterns should be used in which kinds of contexts. This section begins that project by first considering the implications of the data in 5.1 for the role of Focus in grammatical theory.

⁴Not that the technical apparatus doesn't allow for it: one could posit such a feature, we could call it [GRANDMA], which marks a matrix complementizer head and determines the intensity of the entire speech act correlated with the matrix CP.

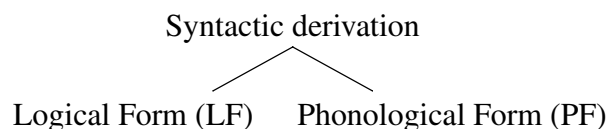
5.2.1 Focus and Vocabulary Insertion

In 5.1 we saw some strong differences in the distribution of Focus vs. Givenness. While Givenness, as argued in Chapters 3 and 4, can only mark syntactic phrases which are maximal projections of some head, Focus can mark partial adjunction structures (as evidenced by ellipsis possibilities) as well as parts of words. In this section, I show that this latter property, the ability of Focus to mark phonological and morphological material, is particularly telling with regard to where Focus is encoded in the linguistic system.

If we accept the premise that Givenness is a syntactic feature, and if the truth of this premise is established by examining the distributional properties of Givenness marking, then the notion of a syntactic Focus feature is incompatible with the fact that Focus shares none of the interesting distributional properties of Givenness. What are the possible explanations for this incompatibility? The two most obvious possibilities are as follows.

- Focus is not represented anywhere in the syntactic derivation of a sentence.
- Focus and Givenness instantiate two different “flavors” of feature: one which projects to phrases, and one which does not.

If a non-syntactic explanation of Focus exists, and much of this chapter is devoted to arguing that one does, then the former is more parsimonious. But beyond that, there is an independent empirical reason to prefer this explanation. The phenomenon of Focus within words is incompatible with the “two flavor” approach if we assume the standard generative architecture illustrated in Chapter 2 Fig.7, repeated below.



In the framework of Distributed Morphology (Halle and Marantz, 1993; Embick, 2010), this architecture is expanded to cover the morphological structure of words as well. The following quote from Embick and Halle (2005, p.38) sums up the general idea.

Roots and abstract morphemes are combined into larger syntactic objects, which are moved when necessary (Merge, Move). In the simplest case, PF rules linearize the hierarchical structure generated by the syntax, and add phonological material to the abstract morphemes in a process called *Vocabulary Insertion*.

Within the Minimalist framework, syntactic competence cannot be directly influenced by phonology—there is a unidirectional process of “Spell-out” or “Vocabulary Insertion”, where abstract units of structure are interpreted by the phonological system (PF). If the Minimalist framework is to provide a useful model of syntactic competence, then we must square this architecture with the data given in 5.1. Let’s begin by looking at Focus on bound morphemes.

(22) My mother thinks I’m out of work, but actually I’m UNDERemployed

This example is not problematic for the “two flavor” account of Focus. The theoretical assumptions of Distributed Morphology allow us to posit the following structure for the word *underemployed*, so long as there is no requirement that the Focus feature on *under-* project to the morphologically complex verbal head.

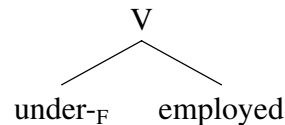


FIGURE 50: A POSSIBLE MORPHOLOGICAL STRUCTURE?

In fact, at first glance, this account, where Focus is encoded in morphosyntax but does not project, appears quite attractive. It provides an explanation of how the correct alternative sets in the sense of Rooth (1992) are generated in cases of structural ambiguity. Consider the following.

(23) Q: Are you able to the lock the door or not?
 A: The door is UNlockable

The correct alternative set based on the context is {‘the door can be locked’, ‘the door cannot be locked’}. But the Focus structure in the answer in (23) is only licensed if the word *unlockable* is parsed as [un + [lock-able]], meaning ‘cannot be locked’, rather than as [[un-lock] + able], meaning ‘can be unlocked’.

Phrases pose a similar problem. The following example is due to Anthony Kroch (p.c.).

(24) Q: What kind of history does he teach?
 A: He’s an AMERICAN history teacher

The NP *American history teacher* is structurally ambiguous as shown in Fig.51, and Focus on *American* is only licensed in (24) under the parse on the left.

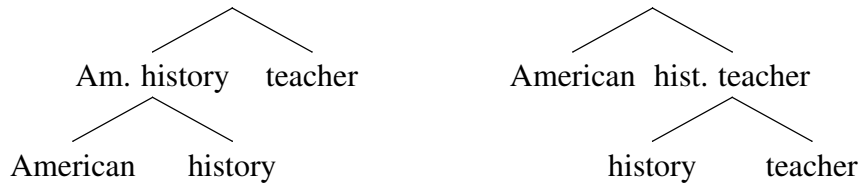


FIGURE 51: STRUCTURAL AMBIGUITY

Is this proof that Focus is indeed a feature of syntactic derivation (though without any projection requirements)? I argue that it is not. In fact, I argue that other cases of Focus within words prove that the standard grammatical architecture of Minimalism *cannot* accommodate Focus. But first, I want to show that there is a way in which Focus can be *sensitive* to structure in a way that allows for (23) and (24) without being present in the syntactic derivation.

There is precedent for representing Questions Under Discussion as syntactic objects in a model of discourse. Farkas and Bruce (2010) re-imagine the QUD stack of Roberts (1996) (see 2.1.1) as *the Table*, so-named because the authors argue that it is not only questions but also tentative propositions that are integral to the structure of discourse. Under their model, a question or tentative proposition is placed “on the Table” (i.e. on the QUD stack) as a *syntactic* object. This idea, briefly discussed in 2.1.1, is a simple yet powerful one: discourse is structured into “moves”, i.e. speech acts that are offered forth by interlocutors. These speech acts come in the form of syntactic objects. The model of discourse is completely separate from the generative system that generates these structures. In other words, moves in discourse come as “pre-packaged” syntactic structures, and nothing in the discourse model itself prevents ungrammatical utterances. That work is done by the grammatical system. The space of possible speech acts in discourse is constrained *a priori* by the rules of grammar.

This is a crucial distinction: just because syntactic objects comprise the input to discourse, this does not mean that every interaction between discourse and linguistic form is encoded in the syntactic rules which determine what those objects can look like. Consider a simple example of what has been called “syntactic alignment” (Pickering and Garrod, 2004; Branigan et al., 2007), the phenomenon whereby interlocutors tend to converge on similar syntactic structures in language use.

- (25) A: Can you believe that David gave his father another tie for Father’s Day?
 B: Tell me about it!...

- (i) ... And he gave his mother a book about numerology for Mother's Day!
- (ii) ... And he gave a book about numerology to his mother on Mother's Day!

It is argued that (25–i) is a more likely utterance than (25–ii) because its structure aligns more closely with the prior speaker's utterance. There is experimental evidence (see Branigan et al., 2007) that being an active participant in discourse, as opposed to a third-party observer, strengthens these effects, perhaps suggesting an effect beyond mere priming. It would thus be sensible to follow Farkas and Bruce (2010) and posit that the syntactic structure of A's utterance in (25) is represented in the discourse model, influencing B's next "move". But crucially, what is at issue here is not whether (25–i) or (25–ii) is grammatical. Rather, the issue is the speaker's *choice* from among grammatical alternatives based on the syntactic structure of the previous contribution to the discourse. By analogy: it is possible that Focus placement is an issue of *choice* from among phonologically valid alternatives, with the hearer's reaction to that choice being sensitive to syntactic structure. So when the speaker utters "UN_Flockable", the hearer infers a particular communicative strategy, and that inference is contingent on a particular parse for the word.⁵

While there is a case to be made that the interaction between Focus and structural ambiguity does not require a "two flavors" syntactic approach, the more important question is whether that approach is empirically valid at all. I argue that it is not, based on the fact that Focus is constrained by phonology. These constraints are incompatible with the notion of a syntactic Focus feature under the standard model of grammar. Not wishing to throw the baby out with the bath water, the conclusion is simple: Focus is assigned at a level of representation at which Phonological Form (PF) has already been determined.

Consider (19-a) from 5.1, repeated below.

(26) We drove from MINnesota to SARasota

This is a case of contrastive Focus: there is not necessarily any Question Under Discussion of the form 'You drove from whattasota to whattasota?' (though such a question is possible meta-linguistically). More likely, the journey and destination in (26) are being offered forth as contrasting members of the set {Minnesota, Sarasota}, where both share something in

⁵And similarly for *American history teacher*; in order for Focus within this phrase to be felicitous, the hearer must be able to assign the correct parse. The result of that parse is a syntactic object, and it is the syntactic object which serves as input to the discourse model.

common: the phonological material /soDa/. Both *Minnesota* and *Sarasota* can be seen as MEC antecedents of each other: one can not simultaneously drive to Sarasota and Minnesota.⁶ This in conjunction with the common phonological material licenses the accent shift.

But how could this be encoded at the syntactic level? We cannot appeal to morphosyntax, because these words are monomorphemic—the abstract morphemes that underlie “Minnesota” and “Sarasota” are not decomposed into *Minne* + *sota*, etc. The only level of representation at which these words are decomposed into such constituents is at PF, a level which under standard assumptions is inaccessible at the stage in the derivation at which Focus is supposedly marked under a syntactic account.

Nor can we appeal to the existence of “meta-linguistic” objects. Meta-linguistic Focus, closely related to meta-linguistic negation (Horn, 1985), is the ability to use Focus to draw a contrast between pronunciations. This provides a plausible account for certain instances of Focus below the word level, which are addressed in Artstein (2004). Consider (17) from 5.1, repeated below.

(27) I said I like Thai FOOD, not tyPHOONS!

The syntactic account of Focus can be preserved in this particular case by positing the existence of meta-linguistic objects—“words” whose denotations are their own pronunciation. In other words, in (27) the phrase *Thai food* and the word *typhoon* do not refer to ‘Thai food’ or ‘typhoon’; they instead refer only to their pronunciations, /tay.fu:d/ and /tay.fu:n/, respectively. Under the standard architecture, these objects are characterized by having phonological denotations at LF. Thus, it seems sensible to follow Artstein (2004) in positing that these objects are decomposed in morphosyntax into distinct components with distinct phonological denotations.

However, it is evident that not every case of Focus within words is a case of meta-linguistic Focus. The utterance in (26) is possible even when *Minnesota* and *Sarasota* are being used “normally”, as opposed to meta-linguistically. For example, (26) could be uttered as a response to “What did you do over winter break?” In that case, *Minnesota* and *Sarasota* are not being used to refer to their own pronunciations. They refer straightforwardly to the places in the United States to which they usually refer. The bottom line

⁶Several assumptions have to be made about the semantics of these words in order for Wagner’s (2012) formal definition of what I call MEC to apply correctly. I will not digress into these assumptions, because the analysis of Focus proposed later in this chapter gets rid of MEC as a stipulation anyway, and accounts for this case quite straightforwardly.

is that whether meta-linguistic or not, Focus can always be used to contrast phonological material. And this is problematic for a theory which represents Focus in narrow syntax.

Moreover, consider the constraints imposed on Focus by metrical structure, noticed by Artstein (2004).

- (28) a. This is a MORPHological problem that gets a PHONological solution.
b. I have trouble with morphology, but he will only discuss phon(Ology) /
...#(PHONo)(logy) / ...??(PHON)(ology)
(Artstein 2004, p.12)

Here we see that Focus cannot be used to shift accent within the word *phonology* because the foot structure would not be preserved: *phonology* is analyzed as containing one whole metrical foot, (-ology), and although the prefix *phon-* can be analyzed as a morpheme, it is unfocussable because the resulting pronunciations, either (PHONo)(logy) or the slightly more acceptable (PHON)(ology), add an additional foot into the metrical structure of the sentence. Focus appears to be unable to fundamentally alter foot structure, suggesting that the metrical foot is the “unit” of Focus below the word level, i.e. it is feet and not syllables that are contrasted. Again, the problem for syntactic accounts arises when one considers that feet can be Focused independently of whether the use is meta-linguistic. The result is a range of data that under such an account requires PF to be constructed before Vocabulary Insertion. This would drastically alter well-established assumptions of grammatical theory.

A better account, I argue, treats Focus as purely phonological. That is to say, Focus structure is assigned to a PF and not an abstract syntactic representation. This allows for all of the distributional data presented so far in this chapter, but there is a glaring problem: purely phonological features should not be able to have an affect at the level of Logical Form (LF). In other words, we cannot appeal to any semantic representation at LF to explain the semantic-pragmatic effects of Focus placement. While this might seem to render the “Focus as pure phonology” idea a non-starter, there is no problem at all once we recognize that the whole of what most people call “language” does not consist simply of grammatical competence.⁷ Rather, we must consider the ability of human beings to make linguistic choices, independent of the rules of grammar, which maximally facilitate communication. To put it another way, two semantically identical structures, A and B, may be generated by grammar, but this does not mean that A and B must be felicitous in all of the same contexts.

⁷As discussed in Chapter 1, some Chomskyans consider this statement to be trivially false in virtue of the fact that they have redefined the word “language” to refer specifically to grammatical competence. I use the word “language” in the broader sense.

Rather, it is quite plausible that certain contexts favor A so strongly, and that other contexts favor B so strongly, that a sharp distinction in meaning arises purely pragmatically without being encoded at LF. In order for Focus to fall into this category, we must show that there is a non-arbitrary, domain-general explanation for the various behaviors exhibited by Focus. That is, the data regarding Focus must be explained using only general communicative reasoning behaviors and other grammatical parameters not directly related to Focus. I aim to show that such an explanation exists. The first step toward this goal is to develop a formal model of discourse within which to represent Focus.

5.2.2 Representing the state of discourse

I have argued that the standard architecture of grammar does not allow a narrow syntactic representation of Focus, since Focus is necessarily sensitive to post-Vocabulary-Insertion information such as pronunciation and metrical structure. If we wish to preserve the standard architecture, then Focus must be a PF phenomenon at its core. And yet, there are clear semantic effects of Focus placement. I have argued that these effects can potentially be accounted for by systematic pragmatic rules that map types of discourse contexts to particular choices of prosodic form. Given these considerations, an idealized formal model of discourse must represent three different pieces of information. First, the speaker and hearer must have access to a Common Ground (Stalnaker, 1974) which contains shared knowledge about the world and about the discourse itself, including information about the Question Under Discussion. Second, the speaker and hearer must have access to a shared LF representation for the most recent discourse move which encodes both the meaning of what has just been said as well as the hierarchical structure. Finally, the LF representation must be linked to a PF representation which includes information about prosodic form. These three factors all combine to determine the overall effect that a particular discourse move has on the Common Ground of the interlocutors. Under this model, Focus is assigned at the level of PF, and the placement of Foci at PF are chosen strategically in order to have a particular effect on the discourse.

Putting these ideas together, we can posit an architecture for *communicative competence*, distinct from the typical generative notion of linguistic competence. The notion of linguistic competence consists of the principles and parameters of sentence generation, e.g. rules that govern word order, or constraints on prosodic form. Communicative competence, on the other hand, combines linguistic competence with rules of utterance choice, e.g. norms determining how loudly to speak, or pragmatic generalizations about when to

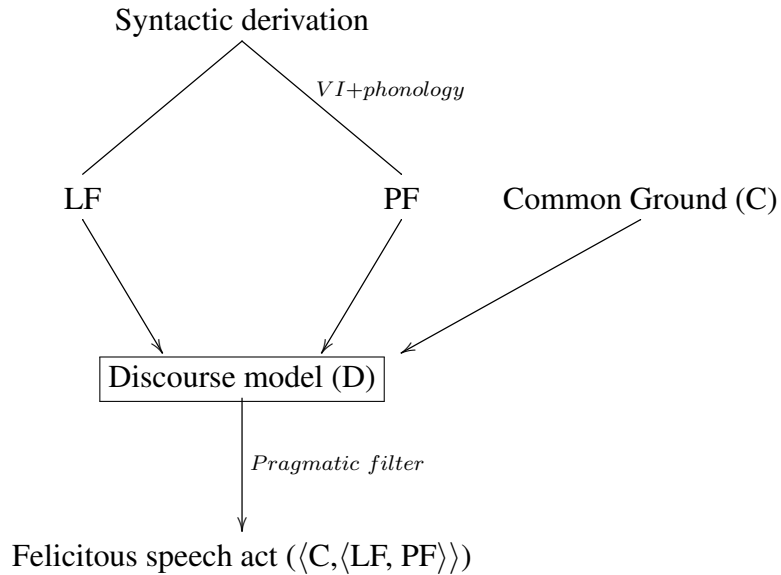


FIGURE 52: AN ARCHITECTURE FOR COMMUNICATIVE COMPETENCE

use a passive construction vs. an active construction. The output of linguistic competence is a countably infinite set of sentences, each encoded as a tuple $\langle LF, PF \rangle$ representing a core meaning and an instruction to either speech or signing systems. The output of communicative competence is a countably infinite set of discourse/utterance pairs, encoded as a more complex tuple $\langle C, \langle LF, PF \rangle \rangle$, where C is a Common Ground. The model of communicative competence is game-theoretic: a discourse-utterance pair $\langle C, \langle LF, PF \rangle \rangle$ is felicitous if and only if PF is an optimal signal to send in a game whose goal is to converge on the meaning LF given the context C . This approach differs from the treatment of linguistic competence in that it is not purely derivational: discourse is not modeled as a computational system, but rather as a filter. See Fig.52 for an illustration.

The two components of interest are the discourse model (D) and the “pragmatic filter”. It is the filter which adds the game-theoretic component, and a model thereof is presented in the next section. Let’s first consider the nature of D . The general idea is that the set of felicitous utterance/context pairs $\langle C, \langle LF, PF \rangle \rangle$ can be generated by an abstract mechanism that has the following steps.

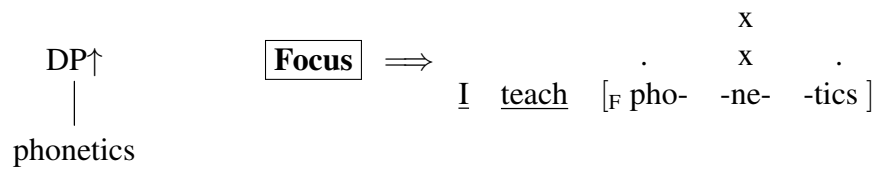
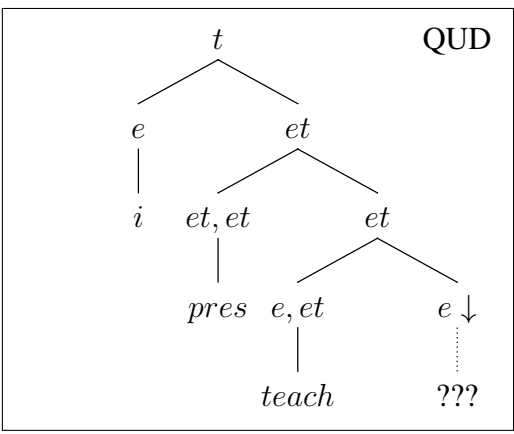
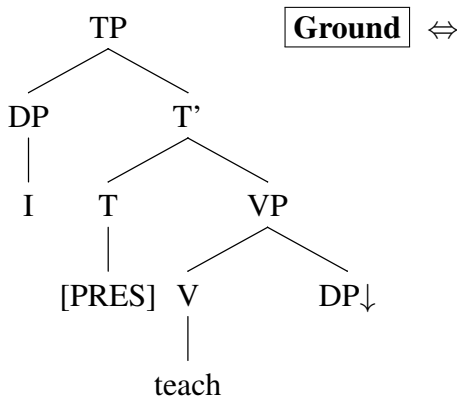
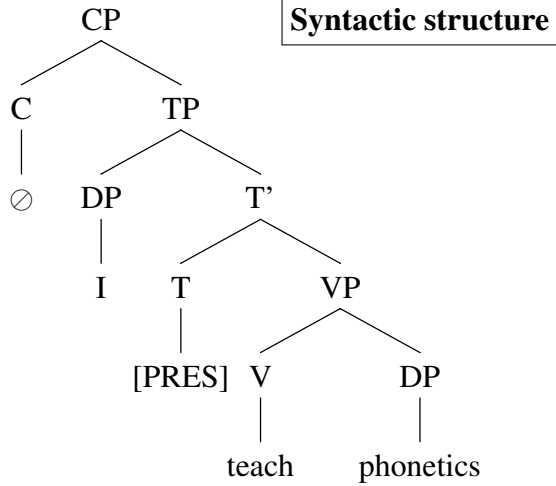
1. The set of grammatical utterances $\langle LF, PF \rangle$ is generated by the linguistic competence mechanism.

2. For each grammatical utterance, a discourse model D is generated by combining $\langle LF, PF \rangle$ with the Common Ground C .
3. $\langle LF, PF \rangle$ is taken to represent a felicitous move in discourse if and only if D survives a filter.
4. D survives the filter if and only if it corresponds to a particular kind of signaling game with an optimal outcome (more in 5.3).

Let's consider the structure and formalization of D . How should a particular state of discourse be represented? As stated above, the meaning, structure, phonetic form and discourse context all need to be included somehow. Let's consider how these notions map onto the notation used for representing Focus in Chapter 2. Consider Ch.2, Fig.9, repeated below. Under this notation, Focus and Ground correspond to two sub-trees of the main syntactic structure of a sentence, and using the formalism of Tree Adjoining Grammar (TAG), these trees can be combined together by replacing the down-arrow node (the "missing" part of the Ground) with the up-arrow node (the Focus).

We will need to refine this somewhat. The "syntactic structure" in Ch.2, Fig.9 encodes the abstract structure of the sentence prior to Vocabulary Insertion. The discourse model D contains the post-VI representation of this structure; because the hearer has access to both phonetic and semantic content, a more accurate representation would be a pair of trees $\langle LF, PF \rangle$. The representation of PF must also contain prosodic structure. This structure is recoverable from the way in which Ch.2, Fig.9 divides the representation into a "Ground" tree and a "Focus" tree. The Focus tree is the sub-tree of the larger syntactic structure on which prosodic accent is assigned. The separation of the syntactic structure into Focus and Ground must be an aspect of the way PF is represented in D —the prosodic structure can be read off of this TAG structure directly.

Moreover, the corresponding LF of each sub-tree must be recoverable—semantic information is necessary to determine whether the Focus structure is licensed. In Ch.2 it was stipulated that the Ground tree is isomorphic to a representation of the QUD, an LF representation whose denotation is a set of alternative propositions. The game-theoretic model constructed in this chapter aims to *derive* this isomorphism rather than stipulating it. Therefore, the identity of the QUD only needs to be represented as part of the Common Ground—the way in which the Common Ground constrains the felicity of the Focus structure is part of the game-theoretic filter developed in the next section. In order to develop this filter, however, the Focus tree must have a *meaning* as well as a pronunciation. This



CHAPTER 2, FIGURE 9

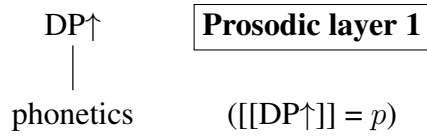
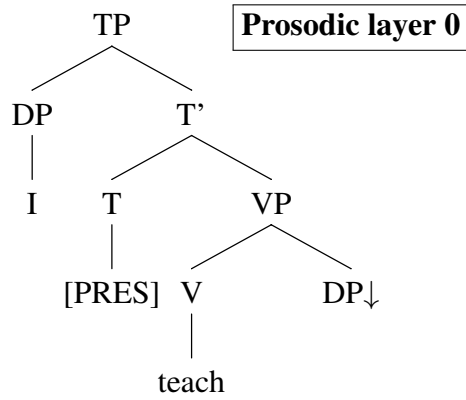
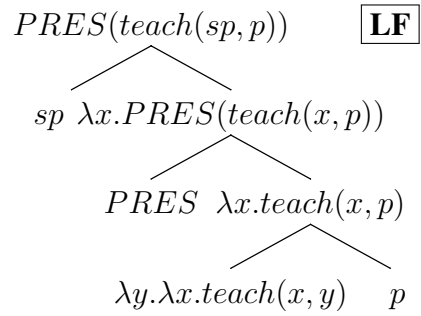
is not straightforward, because the division into Focus and Ground is taken to be a fact about the PF representation rather than the LF representation. If we are to maintain the separation between the two forms, then it must be the case that there is a mechanism for *recovering* a meaning for a PF constituent. In other words, this model requires a separate mechanism for linking nodes of the Focus tree with nodes on *LF*. This will become clearer in the next section when we consider in more depth the communicative function of Focus. Before moving on, let's synthesize the above-mentioned considerations into a more refined notation for our discourse model.

First, let's re-package Ch.2, Fig.9 to better fit the architecture in Fig.52. The speaker has just uttered the declarative, "I teach phonetics", and the Common Ground contains the proposition that the Question Under Discussion is 'what do you (the speaker) teach?' The LF representation for this discourse move is a structured semantic representation of the proposition $PRES(teach(sp, p))$, where *sp* is 'the speaker' and *p* is 'phonetics'. The PF is divided into two prosodic "layers": the Ground layer receives no accent, while default accent is assigned to the Focus layer. We can highlight this fact by calling the Ground layer "Prosodic layer 0" and calling the Focus layer "Prosodic layer 1". Layer 1 is linked to a meaning which must be represented as a node on the LF tree. Finally, the QUD is represented as a set of alternative propositions supplied by discourse. These alternatives are taken to be the set of *expected* discourse moves, i.e. the hearer was expecting the current discourse move to convey some proposition in this set. This updated representation is depicted in Fig.53. The speaker has made a move in discourse by offering the declaration "I teach phonetics." This corresponds to a proposition which is in the set of expected propositions supplied by the Common Ground. The speaker has placed prosodic prominence only on the word *phonetics*.

Now let's look at a more complex example. Recall that contrastive instances of Focus are said to have a nested structure like the following.

- (29) Q: Mary's uncle, who buys and sells expensive convertibles, came to her wedding. What did she get from him as a gift?
 A: She got [_F a [_F CHEAP] convertible]

It is assumed (see e.g. Rooth, 2009) that *convertible* in this case, though its relative prominence is lower than it is by default, is not Focus-free. Rather, there are two layers of Focus: the whole DP *a cheap convertible* receives some prominence as the answer to the QUD, but the degree of prominence on *convertible* is relatively low compared with the promi-



Expected LF $\in \{ \text{PRES}(\text{teach}(a, p)), \text{PRES}(\text{teach}(b, p)), \text{PRES}(\text{teach}(c, p)), \dots \}$

FIGURE 53: DISCOURSE REPRESENTATION

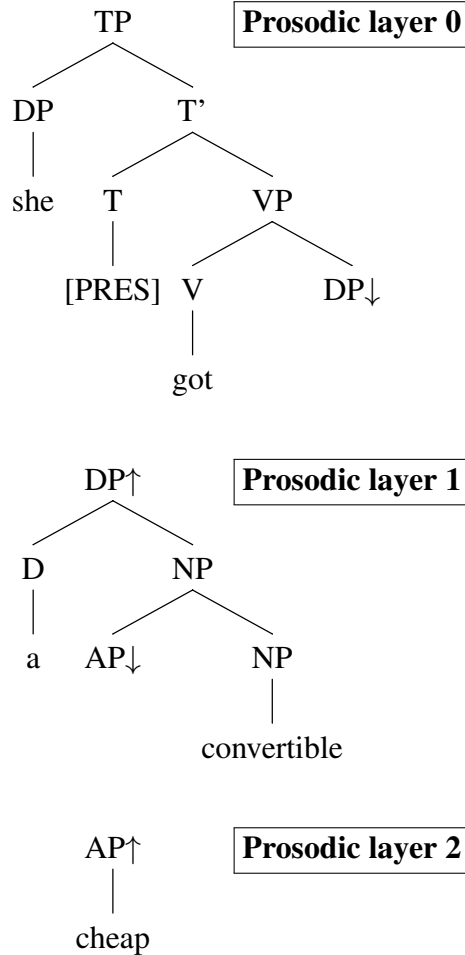


FIGURE 54: NESTED PROSODIC LAYERS

nence on *cheap* imposed by an additional layer of Focus which serves to contrast ‘cheap’ with ‘expensive’. Because this cannot be a product of syntactic F-features, we must treat it as a structuring on PF. Just as Fig.53 contains two prosodic layers, prosodic layer 0 and prosodic layer 1, we can posit an additional layer in cases like this, prosodic layer 2, which receives the highest level of accent. This is illustrated in Fig.54.

Finally, because these layers are PF representations and as such contain full phonological information, it is possible to represent metrical properties of lexical items on the same tree, as in Fig.55. This allows Focus below the word level to be represented.

I argue that any division of Phonological Form into prosodic sub-trees (including into morphological and sub-lexical metrical structures) *can* be made, but not every possible division *should* be made given the state of the discourse. To illustrate my point, consider

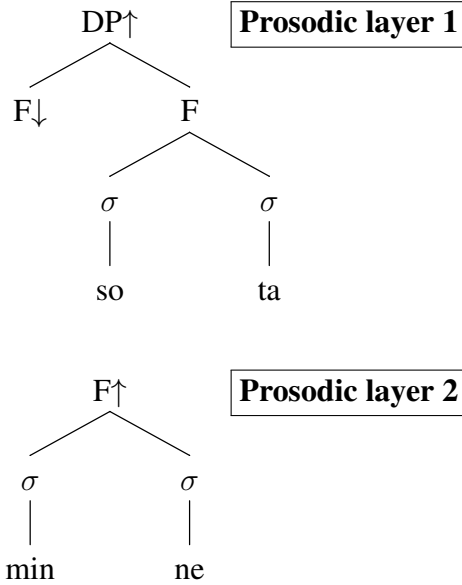


FIGURE 55: FOCUS BELOW THE WORD LEVEL

a “neutral” Common Ground, i.e. an out-of-the-blue context where no information about the discourse is supplied by context. The following structure is wildly infelicitous in such a context.

(30) Guess what? #I took [_F the [_F ARCHITECT’S] cousin] out for lunch.

It is not the case that the language faculty is incapable of generating (30). Under the current conception, which is motivated by Focus’s complete lack of syntactic constraints, the division of an utterance into layers of prosodic prominence is made after the Logical Form of the sentence has been spelled out. The logical meaning ‘I took the architect’s cousin out for lunch’ is paired with a particular structured sequence of phonemes, and neither prosody nor the state of discourse is represented anywhere. The role of syntax and phonology is to constrain the space of possible discourse moves, and the constraint is only partial. The correlation between pragmatics and prosody results from the fact that all possible prosodic layer structures are considered valid from the perspective of grammar, but that different choices from among these configurations can have different communicative effects.

Example (30) is unacceptable not because it is ungrammatical or nonsensical, but rather because it leaves the hearer wondering *why* this particular prosodic configuration was chosen instead of a simpler one. A theory of Focus, then, must show that there is a reason to

choose the Focus structures we see in the contexts in which we see them, and no reason to choose the ones we don't see. And this reason cannot simply be that speakers have learned a particular arbitrary mapping between prosody and pragmatics. If that were the case, we would expect Focus to be part of the syntactic system, which by definition mediates the arbitrary correspondences between sound and meaning in natural language. The observed behavior of Focus must somehow create a *better* system for accomplishing communicative goals given the language-specific constraints imposed by grammar.

To finish out this section, I argue that Focus does indeed facilitate communication. I argue that each prosodic layer in a well-formed discourse model *D* adds a layer of redundancy to the most recent discourse move. This is optimal given the existence of noise in communication. A move in *D* is chosen strategically so that the elimination of the lowest prosodic layers from the representation of the move would nevertheless allow a perfectly rational hearer to figure out the intended meaning. The amount of structure that could be eliminated relies on what the hearer is already expecting the speaker to do.

5.2.3 Focus as redundancy

So far I have defended the following premises: (1) Focus (unlike Givenness) does *not* exhibit the key characteristics of a syntactic feature, (2) the only grammatical constraints on Focus are phonological, (3) the most likely role for Focus in the architecture of grammar is as a structure on Phonological Form which determines prosody, and which is included as part of a structured representation of the speaker's contribution to the discourse, (4) semantic effects of Focus must arise from a language-external filter on which Focus structures are chosen in which kinds of contexts, and (5) this position is only tenable if the behavior of Focus (*modulo* interactions with other independent aspects of a language's grammar) has some universal communicative advantage. I now turn attention to the conditional clause in the fifth premise: the question of whether generalizations about Focus placement reflect some universal communicative strategy. I argue the affirmative—Focus imposes a layer of redundancy on language, and choices about Focus placement reflect an optimization between creating useful redundancy and minimizing overall prominence. This optimization problem is solved by taking into account interlocutors' expectations in discourse.

To begin this argument, let's return to the phenomenon of ellipsis. A single narrowly Focused constituent can stand alone as the answer to an explicit Question Under Discussion.

- (31) Q: Who chastised Bob at the party?
A: Nancy Pelosi.

Non-Focused material is left out of the answer altogether. Recall that Focus is special in this behavior. Example (6), repeated below as (32), illustrates that Given material is not left out unless it is completely outside of the Focus domain. In other words, only constituents that would be on prosodic layer 0, without considering any prosodic effects of Givenness, can be elided.

- (32) a. (i) Q: Who chastised Bob at the party?
A: [_F Nancy Pelosi] ~~chastised Bob at the party~~ (Focus)
(ii) Bob keeps getting chastised at this party. You won't believe this:
#[_F Nancy Pelosi [_G ~~chastised Bob~~]] (Givenness)
- b. (i) Q: Where did Nancy Pelosi chastise the Senator?
A: ~~Nancy Pelosi chastised the Senator~~ [_F At the State of the Union]
(Focus)
(ii) The Senator keeps getting chastised by Pelosi! You won't believe this:
#[_F [_G ~~Nancy Pelosi chastised the Senator~~] At the State of the Union]
(Givenness)

The same phenomenon is found in other languages as well, e.g. German.

- (33) Q: Was hat er mit dem Brief getan?
what has he with the letter done
'What did he do with the letter?'
A: Einem Kind geschickt.
a.dat child sent
'Sent it to a child.'

The availability of these sub-clausal answers suggests that the inclusion of non-Focused material is unnecessary. But it is not the case that there is a one-to-one mapping between Focus and ability to stand alone as the answer to a question. For example, one cannot elide the material between two different Foci.

- (34) Q: Who ordered what at the Tofu Palace?
A: #Mary, grilled tofu. I, a salad.

We may say that an answer to a question must consist of a single constituent, at least in typical contexts. In cases of multiple Foci, a full clausal answer is required.

Moreover, even in cases where one has a choice, as between (35–i) and (35–ii), there may be reasons to prefer one over the other.

- (35) Q: Who ordered the Banh Mi?
A: (i) BOB ordered the Banh Mi
(ii) Bob.

I leave it to the reader to imagine reasons why one could prefer (35–i) in certain cases. The nature of those reasons is not important for the present discussion. What is important is the undeniable fact that both (35–i) and (35–ii) are possible, and that (35–i) instantiates the only felicitous accent pattern for the sentence in this context. In other words, if the speaker decides, for whatever reason, to utter the entire clause instead of the single-word answer, that utterance must have a prosodic structure that results in the intonational contour shown in (35–i). And it is surely no coincidence that the higher layer of prominence corresponds to the only material that could *not* be elided. This echoes Halliday’s (1967) original analysis of information structure where Focus is taken to be the “informative” contribution to a sentence. In a sense I am merely arguing for a return to this simple idea, at least for the canonical case, but coupled with a formal analysis of what makes something “informative” and a way of extending that analysis to less obvious uses of Focus (e.g. contrastive Focus in “farmer” sentences). In highlighting what is “informative”, as if the hearer could not herself evaluate what is and isn’t crucial to her own interpretation of an utterance, Focus can itself be seen as redundant.⁸ We may think of linguistic communication as a behavior whose goal is the transmission of information from speaker to hearer. It is a staple of information theory that redundancy is valuable for the transmission of information. Consider Claude Shannon on the ideal encoding of a message in the presence of noise.

An approximation to the ideal would have the property that if the signal is altered in a reasonable way by the noise, the original can still be recovered. In other words the alteration will not in general bring it closer to another reasonable signal than the original. This is accomplished at the cost of a certain amount of redundancy in the coding. (Shannon, 1948, p.414).

⁸Roberts (1996) addresses this idea as well. The marking of Focus in natural language is not necessary for conveying truth conditions. One possible exception (see the end of this chapter for a brief discussion) is the association of Focus with operators like *only*.

In (35–i) the speaker has chosen a redundant encoding of their message: they included the entire sentence when a single phrase could have sufficed. We may view Focus as a further layer of redundancy. The speaker did not only choose an entire sentence, but they put an extra layer of prominence on the material that is crucial for the hearer’s interpretation of the utterance. More specifically, the speaker has placed extra prominence on a constituent such that *if the utterance consisted only of that constituent, it could still allow the hearer to arrive at the speaker’s intended meaning*. This makes the speaker’s “signal”, i.e. utterance, more robust to noise. To mangle Shannon’s words with my own:

An approximation to the ideal prosodic pattern would have the property that if the speaker’s signal is altered in a way that obscures the least prominent material (i.e. the lowest prosodic layers), the original intended meaning can still be recovered. In other words the alteration will not make some other intended meaning more likely given the current discourse context. This is accomplished at the cost of (redundantly) elevating certain elements to prominence over other elements.

What does it mean to make one meaning “more likely” than another? The answer is simple: meaning A is more likely than meaning B iff the hearer *believes* that a discourse move conveying meaning A is more probable than a discourse move conveying meaning B. And what mediates these beliefs? We are already familiar with one such mechanism: Questions Under Discussion. Consider a model of the world where three individuals exist: Al, Barry and Chelsea. This model is part of a discourse with two interlocutors and a QUD on the table, ‘Who arrived first to the party?’, which is represented by a set of possible answers {‘Al arrived first to the party’, ‘Barry arrived first to the party’, ‘Chelsea arrived first to the party’}. The QUD by its very nature introduces a belief: the hearer *expects* the speaker’s next discourse move to convey a proposition that is part of the QUD set. This is, in essence, what it means to be “under discussion”. Given this expected set of propositions, the transmission of the signal “Barry” makes the meaning ‘Barry arrived first to the party’ maximally probable in virtue of the fact that (1) given the hearer’s beliefs, the meanings of the form ‘x arrived first to the party’ are *a priori* more probable than all other possible meanings at the time of transmission, and (2) only one of these probable meanings involves Barry. One goal of the formalization of this idea is to specify precisely what it means for a proposition to “involve” some semantic object. But it is hopefully intuitively clear that QUDs delimit expectations in discourse and allow hearers to calculate intended meanings even when the entire intended proposition is not encoded in the speaker’s utterance. If

the speaker chooses, perhaps redundantly, to encode the entire intended proposition, the presence of noise during signal transmission makes it communicatively optimal to assign additional prominence to the part of the signal which could have stood alone as a signal under ideal conditions. This makes the most crucial component of the signal less likely to be lost, maximizing the probability of successful coordination around the intended meaning. Moreover, it allows the speaker to minimize the overall level of prominence, which could be seen as an instantiation of the kind of economy principle which permeates Gricean pragmatics.⁹

At the end of this chapter I show that some contrastive uses of Focus can be straightforwardly accounted for by considering discourse expectations. These cases are ones like in (36) where nested Focus is being used to correct some prior belief on the part of the hearer. I take these to be the canonical instances of contrastive Focus.

- (36) Q: Mary’s uncle, who buys and sells expensive convertibles, came to her wedding. What did she get from him as a gift?
A: She got [_F a [_F CHEAP] convertible]

Here the context makes it clear that the questioner finds it highly probable that Mary’s uncle bought her an expensive convertible. (If the questioner did not have this belief, the setup to the question would violate the Maxim of Relevance.) Given this context, we can ask: what would the hearer consider to be the most likely intended meaning for the signal “cheap”? A cheap convertible, or something else that is cheap? If we grant that the hearer was expecting something of the form ‘a P convertible’ more so than, say, ‘a P food processor’, the hearer would be more likely to reconstruct ‘a cheap convertible’ if the signal were merely “cheap”—this is the same game, but played at prosodic layer 2 instead of prosodic layer 1. Of course, this alone does not explain MEC effects: why couldn’t the speaker have said “she got a BLUE convertible”? In the next section I show that MEC effects can be reduced to framing effects in the sense of Bacharach (1993, 2006), which are part of the architecture of cooperative signalling games. This same game-theoretic framework allows us to derive non-canonical uses of contrastive Focus, e.g. in former sentences, via Gricean implicature.

⁹In ASL and other signed languages, Focus is encoded by doubling a sign, i.e. repeating a Focused lexical item in a lower position in the sentence (Petronio, 1993; Petronio and Lillo-Martin, 1997). By analogy, one could imagine intonational Focus in spoken language as a way of “doubling” the signal. Loosely speaking, placing an additional layer of prominence on a certain constituent could be seen as a prosodic analog to repeating that constituent. Repetition is the simplest form of redundancy: in case part of the signal is lost, simply repeat the most crucial information to minimize the risk of misunderstanding.

(37) An AMERICAN farmer was talking to a CANADIAN farmer. . .

To finish the discussion about the role of Focus in the language faculty, before moving on to the game-theoretic analysis, I take stock of the arguments made thus far and briefly consider some of their wider implications.

5.2.4 Implications

To distort Putnam's (1975) famous quip: Focus just ain't in the syntax.¹⁰ It is a phonological property, and I hold that its distribution is largely determined by strategic rules of choice which minimize the risk of miscommunicating in the presence of noise, while still holding to basic economy principles (e.g. minimize overall prominence). Under this conception, Focus placement is a byproduct of basic communicative considerations, and as such we should expect direct analogs to it in non-linguistic communication systems. I dare not speculate as to whether this prediction is borne out generally, but a piece of anecdotal evidence might be useful as a suggestion of what such analogs can look like. Consider the map in Fig.56, taken from the cartography textbook *Making Maps* (Krygier and Wood, 2011, p.144). This map is presented as an instance of one of the British Cartographic Society's "five principles of cartographic design", the principle they call "Hierarchy with Harmony". The main point is to draw the user's attention to the important information on the map and de-emphasize (but not exclude altogether) the less important information. In Fig.56 the states on the map in which significant events occurred are shaded darker and labeled, while the other states, largely irrelevant for the purposes of the map, are lightly colored and less prominent, with no labels. One could imagine the same map but with only the relevant states included, with irrelevant states like Oregon not appearing on the map at all. The presence of all 48 contiguous states serves to situate the user geographically—the relevant states are easier to identify when part of a geographic whole, as opposed to being disembodied outlines floating on a white background. Even so, the relevant states are labeled, i.e. the cartographer *could* have communicated all relevant information without including all 48 contiguous states. This instantiates the kind of basic communicative principle suggested above, which could be summarized as follows: "include enough information to make the intended meaning obvious, but don't emphasize information which is not crucial to understanding."

¹⁰The original quote is, "'meanings' just ain't in the head!" Putnam is arguing about what it means to mean something, concluding that meaning is external to the human mind, since the 'meaning' of an utterance can depend on facts which are unknown to the users of that utterance.

Geo-Smiley Terror Spree

Luke Helder, a university student from Minnesota, went on a two-week spree of bombings throughout the Midwestern U.S. in an attempt to create a giant smiley face across the nation.

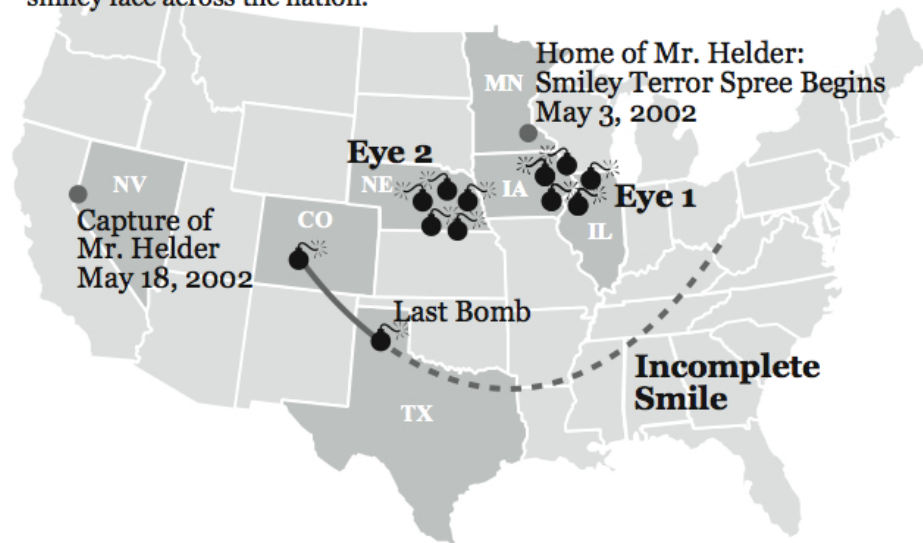


FIGURE 56: CHOICES ABOUT PROMINENCE IN A NON-LINGUISTIC DOMAIN

This kind of communicative principle is quite different from the grammatical principles of the “principles and parameters” approach to language acquisition. The typical generative conception of acquisition is that grammatical parameters are part of an innate structured hypothesis space, i.e. they determine a set of possible grammars, and that these parameters are “set” from experience. That is to say, certain grammatical constructions “come online” at a certain point during acquisition once enough experience has been gained to set the right parameters.¹¹ Applied to the analysis developed in Chapters 3 and 4, this means that Givenness-marking should be learned as part of a domain-specific process of setting grammatical parameters, just like the placement of tensed verbs or the formation of questions, etc. The developmental trajectory of one’s ability to de-accent Given XPs should be independent from the developmental trajectory of more general principles of communication. In fact, there need not be any correlation between the patterns exhibited during syntactic acquisition and the patterns exhibited during the acquisition of Focus. And to the extent that we can test a child’s general communicative abilities apart from her grammatical abilities, we expect the trajectory of Focus acquisition to correlate only with the general abilities.¹²

It is far beyond the scope of this work to further probe the two implications discussed here—that Focus should have analogs in non-linguistic communication, and that the acquisition of Focus by a child should therefore not be expected to follow a trajectory similar to that of the acquisition of strictly linguistic parameters. But there is another implication of the arguments made thus far that will be at least partially tested in Chapter 6. This is an implication suggested by previous work on information structure (Kucerova, 2007; Selkirk, 2007; Kratzer and Selkirk, 2009): any IS category which is not marked in narrow syntax cannot directly motivate movement. Therefore, Focus should not directly motivate movement. This is not to say that certain movement constructions cannot be correlated with certain Focus structures for indirect reasons. But it would be problematic for the current conception of IS if one could find examples of syntactic movement in a language being

¹¹See (Yang, 2002) for a fully formalized model of this.

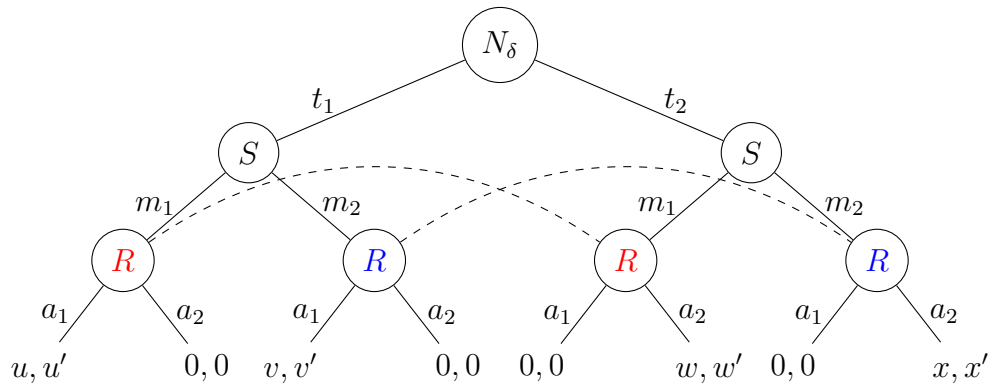
¹²A note for future research: experimental studies in various languages (see Gussenhoven, 1983; Braun, 2006; Clopper and Tonhauser, 2013) have shown that there are phonetic correlates of prosodic prominence, e.g. f0 slope and changes in syllable duration, which are reliably found in speech production, but which are often imperceptible by hearers in certain experimental tasks. This asymmetry poses a challenge for language acquisition: if some of the acoustic correlates of accent are imperceptible, how do people learn to produce them? Perhaps they are not learned at all, i.e. they could be byproducts of innate or mechanical phonetic processes. But if the child goes through an early phase in which these correlates are not found, it implies a stage where the child “learns” the phonetics of prominence without any perceptible evidence in the linguistic input data. If such a phenomenon were found, it could be explained if the acoustic correlates in question are the result of applying domain-general principles of communication and prominence to language production.

100% correlated with Focus of the exact nature discussed in this work. I leave the discussion of this rather strong prediction for Chapter 6. For now I briefly foreshadow the conclusion of that chapter: a number of purported cases of Focus-driven movement do not have the same semantic/pragmatic effect as Focus as it is discussed in this work. Rather, many movement constructions are indirectly correlated with Focus in virtue of having independent semantic or phonological motivations which partially overlap with the function Focus.

Having argued for a particular place for Focus in the language faculty, a place which is quite different from that of Givenness, I now turn to the heart of the analysis of this phenomenon: a game-theoretic model of Focus placement.

5.3 Game-theoretic Analysis

Focus can be modeled as a coordination game with signaling. Recall the structure of these games from Chapter 2, Fig.18, repeated below.



This game consists of three sequential moves.

1. A **type** for the Sender (t_1 or t_2) is chosen by Nature, where Nature chooses by flipping a weighted coin with probability distribution δ .
2. The Sender chooses a **message** (m_1 or m_2) to send to the Receiver.
3. The Receiver takes an **action** (a_1 or a_2). This results in payouts to both the Sender and Receiver which are determined by Utility functions $U_S(t, m, a)$ and $U_R(t, m, a)$, respectively, where t is the Sender's type, m is the message, and a is the Receiver's action. (The payoffs are represented on the game tree as an ordered pair $\langle U_S, U_R \rangle$.)

Because the above game is a coordination game, the Utility functions assign a zero payout to both the Sender and Receiver when there is a mismatch between type and action, i.e. when $t = t_i, a = a_j$ and $i \neq j$.

This structure maps onto the conception of Focus developed in the previous section. Under that conception, Focus corresponds to layers of prosodic prominence on a PF representation of a discourse move. I argue that the prosodic layering configuration for a discourse move is chosen so that if one of the lower layers were to be eliminated from the representation, the meaning associated with that layer could be calculated using only the higher layers. This is formalized within a signaling game framework by constructing a game like the one above where the message consists only of the higher-layer material. If a particular linguistic object is an optimal strategy in this game, then it necessarily corresponds to an optimal Focus structure given the considerations discussed in 5.2. The goal of the game is to use Focused material to coordinate around an intended meaning. The basic ontology of this game is outlined below.

- The Sender is the speaker, and the Receiver is the hearer.
- The set of possible types T and the set of possible actions A are both identical to a set of meanings E , a representation of the hearer's expectations regarding the speaker's upcoming discourse move. The speaker's type represents their intended meaning, and the hearer's action represents their interpretation of the speaker's message.
- The message m is a representation of the material on prosodic layer n of the PF representation of the speaker's discourse move, where m is associated with an appropriate meaning on the LF tree for that move, and where the material on layers $\geq n - 1$ is associated with the speaker's intended meaning (i.e. the speaker's type).

In this section I develop some simple Utility functions for this game using well-established assumptions from game theory. This framework yields correct predictions about the placement of Focus in various kinds of contexts. An example is found in Fig.57. By developing a model which yields the Utilities in Fig.57, we correctly predict that (38-a) is a better Focus structure than (38-b). Before motivating these Utilities, let's walk through the mechanics of how we obtain the prediction from the structure of the game.

- (38) a. Q: Who is teaching phonetics?
 A: [F BILL] is teaching phonetics
- b. A: #Bill is teaching [F PHONETICS]

t_1	‘Bill is teaching phonetics’
t_2	‘Sue is teaching phonetics’
m_1	[_F Bill]
m_2	[_F phonetics]
a_1	‘Bill is teaching phonetics’
a_2	‘Sue is teaching phonetics’

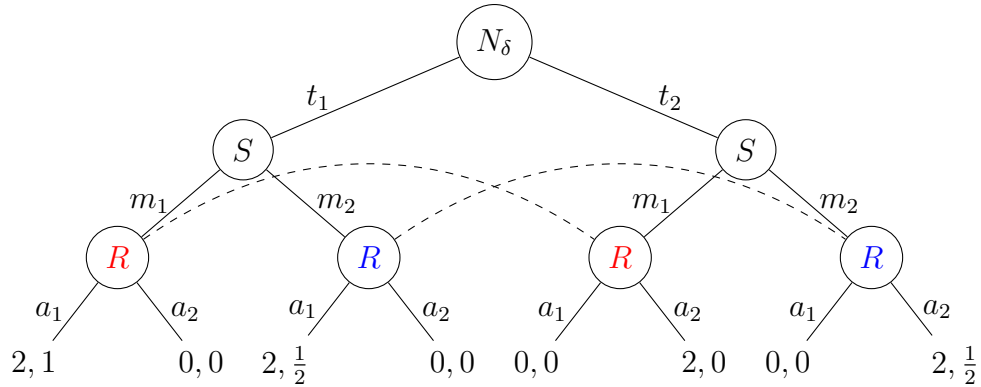


FIGURE 57: A FOCUS GAME

In the example in Fig.57, we are considering a context where the Question Under Discussion is ‘who is teaching phonetics?’ Furthermore, we are considering a model of the world where there are only two possible answers to this question: either Bill or Sue is teaching phonetics. Thus, the QUD is identified as a set containing two propositions, {‘Bill is teaching phonetics’, ‘Sue is teaching phonetics’}. This QUD gives us our possible types: because the hearer is expecting one of these two propositions, only these two propositions are considered as possible types/actions in this game.

In Fig.57 we compare two possible messages (from among many others). We consider an utterance with narrow Focus on *Bill* and an utterance with narrow Focus on *phonetics*. The message needs to be construed in a particular way to avoid false predictions. Importantly, it is not the case that this game predicts just any utterance with narrow Focus on the DP *Bill* to be an acceptable answer in (38). In other words, we should not expect on the basis of this game’s structure that the utterance “BILL is teaching biology” will be just as felicitous as (38-a). This is because the goal of the game is not to choose an utterance, but rather *to choose a prosodic structure for an utterance that has already been chosen*. There are two separate decisions to be made, which sentence to utter and how to utter that sentence, and the game-theoretic analysis here is concerned only with the latter. It is self-evident that there is independent reason not to choose an utterance whose

truth conditions do not match your intended meaning. This could itself be modeled game-theoretically, though I will not venture down that path here. The Sender in these games is making choices about prosody, and nothing else.

Given the Utilities in Fig.57, which we will derive shortly, there is an optimal message. As we did in Chapter 2, we can solve this sequential game using a *rollback* method: we start with the last move in the game (the Receiver’s move), determining for each message what the best action is for the Receiver by maximizing the Receiver’s Expected Utility (the weighted average, weighted by δ , of the Utilities of the different possible outcomes associated with the action). Then, knowing which action the Receiver will take for each message, we choose a message for each possible type for the Sender which results in the best outcome for the Sender of that type, again by maximizing Expected Utility. This results in a unique equilibrium strategy for each possible type: we know which message a rational Sender of each type would send, and which action a rational Receiver would take.

Of course, to find this equilibrium point we need to consider δ —this gives us the prior probabilities for the types which determine Expected Utility for the Receiver. Let the Receiver’s estimate of the probability of t_1 in Fig.57 be p . The probability of t_2 is $1 - p$. The Receiver, not knowing which type she is dealing with, relies on the Expected Utility (EU_R) for an action a to evaluate whether a is a wise action. The Expected Utility of an action given some message, $EU_R(m, a)$, for a signaling game with two types is given below.

$$EU_R(m, a) = p * U_R(t_1, m, a) + (1 - p) * U_R(t_2, m, a) \quad (5.1)$$

For Fig.57, this gives us the values shown in Table 15.

$$\begin{aligned} EU_R(m_1, a_1) &= p * (1) + (1 - p) * (0) \\ EU_R(m_1, a_2) &= p * (0) + (1 - p) * (0) \\ EU_R(m_2, a_1) &= p * \left(\frac{1}{2}\right) + (1 - p) * (0) \\ EU_R(m_2, a_2) &= p * (0) + (1 - p) * \left(\frac{1}{2}\right) \end{aligned} \quad (5.2)$$

	a_1	a_2
m_1	p	0
m_2	$\frac{1}{2}p$	$\frac{1}{2}(1 - p)$

TABLE 15: EXPECTED UTILITIES FOR THE RECEIVER

Two things become clear about the game in Fig.57. First, if the Sender sends m_1 , the Receiver should always take action a_1 , regardless of δ , since $EU_R(m_1, a_2)$ is zero. Second, if the Sender sends m_2 , the Receiver should take action a_1 only if $p > 0.5$. If $p < 0.5$, then a_2 is better, and if $p = 0.5$, the Receiver should have no preference.

We are now in a position to ask: what would a rational Sender do in the face of uncertainty about the Receiver's beliefs? In other words, what is the equilibrium outcome if the Sender does not know which values the Receiver possesses for δ ? We know with certainty that m_1 will result in a_1 . But what about m_2 ? Let q be the Sender's estimate of the probability of the Receiver playing a_1 given m_1 . The probability of a_2 is $1 - q$. We obtain the following Expected Utilities.

$$EU_S(t, m) = q * U_S(t, m, a_1) + (1 - q) * U_S(t, m, a_2) \quad (5.3)$$

	m_1	m_2
t_1	1	q
t_2	0	1-q

TABLE 16: EXPECTED UTILITIES FOR THE SENDER

If the Sender is of type t_1 , then it is better to send the message m_1 , as long as we assume that $q < 1$.¹³ If the Sender is of type t_2 , then m_2 is better. This latter statement may seem like a false prediction, but we are only seeing one part of the game. Under the generalized form of the game, it will become clear that m_2 is sub-optimal because there is another message m_3 (which corresponds to narrow Focus on *Sue*) which beats it.

Now that we have walked through an example of how to use a signaling game to make a prediction about Focus structure, we need to develop systematic functions for assigning Utilities. These functions will rely only on simple, motivated assumptions, and will ultimately derive a range of phenomena. Let's briefly consider the range of phenomena to be covered before developing the final analysis.

¹³This amounts to assuming that the Sender does not believe that the Receiver is certain that the Sender is of type t_1 .

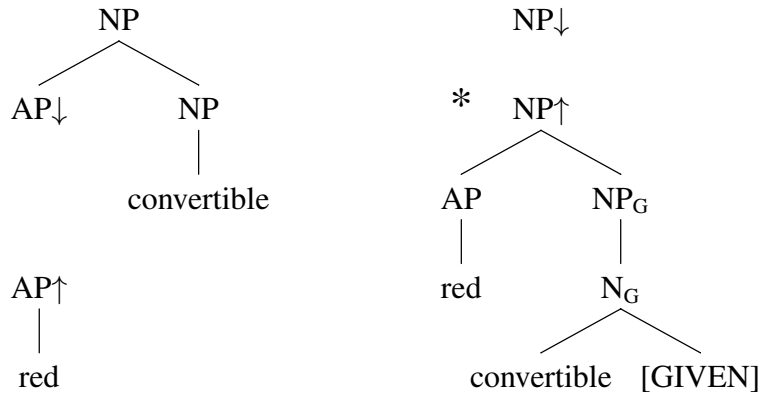


FIGURE 58: LEGAL/ILLEGAL DERIVATIONS FOR AN ACCENT PATTERN

5.3.1 Empirical desiderata

QUD Focus

The current analysis is only explanatory if it accounts for both QUD-based and contrastive instances of Focus, since they both pattern together in their distribution, and therefore are both taken to be phenomena that lie outside the domain of narrow syntax. Recall that a structure like the one on the left in Fig.58 must be responsible for both (39-a) and (39-b), since the structure on the right is illegal as per Chapter 3.

- (39) a. It's not a blue convertible; it's a RED convertible
 b. Q: What color convertible did you buy?
 A: I bought a RED convertible

I take wh-Focus as in (38) and (39-b) to be the simplest case. We will begin with a model that correctly predicts that (38-a) is better than (38-b), etc., and we will extend it to account for more interesting uses.

Multiple wh-questions

As discussed in 2.1 and 2.4, multiple Foci are required when answering multiple wh-questions.

- (40) Q: Who ordered what at the Tofu Palace?
 A: BILL ordered TOFU, and SUE ordered a SALAD.

This was explained by the fact that in (40) the context sets up a QUD with two open variables: every proposition in the QUD set is of the form ‘x ordered y’, and only the verb *ordered* represents information associated with every possible answer. But the mapping between discourse and prosody is not quite that simple. There are independent effects of a question’s form on the well-formedness of its possible answers which need to be explained. For example, the following questions have the same set of possible answers, but one is more restrictive than the other in terms of what form the answer must take.

- (41) Context: two linguists are having a conversation about their friends Bill and Sue. Both interlocutors know that Bill and Sue teach linguistics courses at a nearby university, and that Bill and Sue are teaching exactly one course each this semester.
- a. Q: What are Bill and Sue teaching?
 A: ?They’re BOTH teaching PHONETICS. / They’re teaching PHONETICS.
- b. Q: Speaking of Bill and Sue, who’s teaching what?
 A: They’re BOTH teaching PHONETICS. / #They’re teaching PHONETICS.

Assume for simplicity that the only courses being offered are phonetics and morphology. Both questions have the same possible answers in terms of propositional content; for the questions in both (a) and (b), given the context, the answer’s meaning will be some member of {‘Bill teaches morphology & Sue teaches morphology’, ‘Bill teaches morphology & Sue teaches phonetics’, ‘Bill teaches phonetics & Sue teaches morphology’, ‘Bill teaches phonetics & Sue teaches phonetics’}. Why, then, is it necessary to have two Foci in (b) but not in (a)? A full pragmatic model of Focus should explain this fact.

Contrastive Focus

One of the major goals of the current analysis is to unify contrastive Focus and wh-Focus under a single set of related pragmatic generalizations.¹⁴ I address three phenomena which must be accounted for in order to achieve this goal: MEC, farmer sentences, and association with *only*.

As it stands, MEC is a stipulation of the analysis of Focus: (42) is possible, but (43) is not, because ‘cheap convertible’ is mutually exclusive with an antecedent ‘expensive

¹⁴As discussed in Chapter 2, the seminal analysis of Rooth (1992) unifies both kinds of Focus under a single semantic description—alternative semantics—but it does not attempt to explain in purely pragmatic terms *why* the system looks this way. Pragmatic explanation is the goal of Roberts (1996), and I take the current work to be an extension of that program.

convertible’, whereas ‘blue convertible’ has no such antecedent.

(42) Q: Mary’s uncle, who buys and sells expensive convertibles, came to her wedding. What did she get from him as a gift?

A: She got [_F a [_F CHEAP] convertible]

(43) Q: Mary’s uncle, who buys and sells expensive convertibles, came to her wedding. What did she get from him as a gift?

A: #She got [_F a [_F BLUE] convertible]

One special case of this is so-called farmer sentences. Where the Focus in (42) seems to correct some expectation on the part of the hearer, the Foci in (44) seem to be purely structural—the pragmatic function is not easy to discern. These cases pose a special challenge to unifying all the different uses of Focus placement.

(44) An AMERICAN_F farmer was talking to a CANADIAN_F farmer. . .

These and similar examples have analogs below the word level as well.

(45) a. It’s not a stalactite; it’s a stalagMITE.

b. Q: This is a stalag-what?

A: It’s a stalagMITE.

(Artstein 2004, p.7)

(46) We drove from MINnesota to SARasota

Finally, we will need to address the association of Focus with words like *only*, where the Focus structure affects scope, and therefore truth conditions, as in the following from Selkirk (2007).

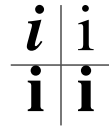
(47) a. Wittgenstein only brought a glass of WINE over to ANSCOMBE_F

b. Wittgenstein only brought a glass of WINE_F over to ANSCOMBE

The initial test for the current analysis will be its ability to make correct predictions about all these cases: QUDs, multiple wh-Foci, contrastive Foci, farmer sentences, Focus below the word level, and the behavior of *only*. There are other testing grounds surely, and some of them will be tentatively addressed in Chapter 6, but these provide a good start.

5.3.2 Utility assignment: salience vs. economy

Recall the discussion of framing at the end of Chapter 2. A *frame* is a set of attributes which serve to label moves in a coordination game. In Ch.2, Fig.19, repeated below, there are different possible frames for a coordination game where players are asked to pick one of the letters. For example, one could label the four actions as $\langle italic, regular, regular, regular \rangle$ or as $\langle bold, nonbold, bold, bold \rangle$. Depending on which frame is used, a different action may suggest itself. Consider a scenario where players are asked to pick a letter from Ch.2, Fig.19 and given some reward if they pick the same one, and zero otherwise. The reward is not dependent on which action the players take, only on whether they take the same action. The raw payoff structure is shown in Ch.2, Fig.20 below.



CH.2, FIG.19: MULTIPLE POSSIBLE FRAMES

	a_1	a_2	a_3	a_4
a_1	1,1	0,0	0,0	0,0
a_2	0,0	1,1	0,0	0,0
a_3	0,0	0,0	1,1	0,0
a_4	0,0	0,0	0,0	1,1

CH.2, FIG.20: COORDINATION GAME WITH NO LABELS

This structure predicts that players will choose their actions more or less at random, but Schelling (1960) and others (see 2.3) have shown that people are actually quite good at coordination games like this—much better than chance. This is because players tend to coordinate around whichever action is more *salient*. Typically this is formalized within game theory by adding extra Utility to the salient action, making that action a *Schelling point*, or an equilibrium point with elevated payoffs which serves as an obvious strategy for the players.

After Bacharach (1993), Sugden (1995) and Bacharach (2006), salience can be seen as a measure of how distinctive a label is given a certain frame. This is illustrated in Ch.2, Fig.21, repeated below, which takes the game in Ch.2, Fig.20 and adds labels from the family of attributes $\{italic, regular\}$. This transforms the Utilities such that the Utility for each labeled action is inversely proportional to the number of actions with that label.

	<i>italic</i>	<i>regular</i> ₁	<i>regular</i> ₂	<i>regular</i> ₃
<i>italic</i>	1,1	0,0	0,0	0,0
<i>regular</i> ₁	0,0	$\frac{1}{3}, \frac{1}{3}$	0,0	0,0
<i>regular</i> ₂	0,0	0,0	$\frac{1}{3}, \frac{1}{3}$	0,0
<i>regular</i> ₃	0,0	0,0	0,0	$\frac{1}{3}, \frac{1}{3}$

CH.2, FIG.21: COORDINATION GAME WITH LABELS SUPPLIED BY A FRAME

We may think of this intuitively as an extension of Schelling’s idea that salient actions are actions which “suggest themselves” to the players. The intuition is that there is a set “amount” of salience assigned to each attribute, e.g. *italic* or *regular*. Thus if there are three actions labeled as *regular*, the players’ attention paid to that attribute is divided among those three actions. And if there is only one action labeled as *italic*, that action enjoys a higher degree of salience, and thus “suggests itself” to the players, which is reflected in the transformed Utility structure for the game. Mathematically, the transformed Utility for an action a which has some label $\mathcal{L}(a)$ is equivalent to the conditional probability $P(a|\mathcal{L}(a))$, which is the probability of choosing a at random from among all actions with the same label, $\mathcal{L}(a)$. Let’s follow Schelling and call this simple method of Utility assignment *salience*.

$$salience(a) = P(a|\mathcal{L}(a)) \quad (5.4)$$

This is somewhat different from the Schwarzschild (1999) use of the word, which is discussed in Ch.3—there, salience is taken to be a binary property. However, the basic definition is the same. Something is “salient” iff it is present in the interlocutors’ consciousness at the time of utterance. When applied to the Focus game, we speak of a continuum of salience, where actions which stand out from the crowd, so to speak, are more salient than other actions.

In the simple game in Ch.2, Fig.19, if the players have taken the same action, then their payoffs are equal to the salience of that action, and otherwise the payoffs are zero. Within the framework of signaling games, it works a bit differently. There is an asymmetry to coordination games with signaling—the Receiver is trying to coordinate their action with the Sender’s type, but the Sender does not get to choose the type. Rather, the Sender is constrained by Nature and only gets to choose the message, which acts as a signal of the type which Nature has chosen. Under the current analysis, messages themselves have labels, which serve to (1) highlight a particular frame with which to label the Receiver’s possible actions, and (2) highlight a particular attribute within that frame, such that the coordinat-

ing action becomes more salient than its competitors. That is, the message supplies both a family of attributes to label the actions, as well as the identity of the label $\mathcal{L}(a)$ of the coordinating action. I reformulate 5.4 as follows, where salience is taken to be the conditional probability of choosing a particular action under the assumption that the action has the same label as the message.

$$salience(a|m) = P(a|\mathcal{L}(a) = \mathcal{L}(m)) \quad (5.5)$$

The label of the Sender’s message is determined by its semantic content. For example the message [F Bill] is associated with the meaning ‘Bill’, and it is that meaning which serves as its label. This labels every proposition in the set of possible types/actions as either a ‘Bill’ sentence or a ‘Sue’ sentence, the mechanics of which I return to momentarily. The salience of the Receiver’s action, then, is the probability of choosing that action from among all the actions *suggested by the message*, i.e. all the actions which are labeled as ‘Bill’ actions. Crucially, the Sender in this game is *manipulating* salience for the Receiver, rather than using it to choose an action. Therefore, the Sender’s Utilities are not based on salience. But there is a different notion that is used to transform the Sender’s Utilities: economy.¹⁵

Simply put, the Sender prefers a brief message over a lengthy one, all things being equal. This is a re-packaging of a sub-maxim of Grice’s Maxim of Manner, “be brief; avoid unnecessary prolixity”¹⁶ and a cousin to general economy principles evoked e.g. by Rooth (1992) and Schwarzschild (1999): avoid unnecessary prominence. For our purposes this notion can be formalized in terms of the number of words contained within the message. A more sophisticated formulation may be needed as more complex cases arise, but this will do for now. This gives us the following formalization, where a message m is a PF representation, and where $W(m)$ is an unstructured set consisting of all and only the phonological words present in m .

$$economy(m) = \frac{1}{||W(m)||} \quad (5.6)$$

Both the Sender and Receiver receive zero Utility if there is a mismatch between type and action. If coordination occurs, the Sender receives a Utility proportional to the economy of the message, and the Receiver receives a Utility proportional to the salience of the action.

¹⁵This is a crucial notion in game-theoretic treatments of a variety of pragmatic phenomena. For more, see Parikh (2010) and Clark (2011), and references therein.

¹⁶This sub-maxim, so formulated, is a violation of itself.

The final piece of this puzzle is how labels are assigned to actions in our Focus game. To begin, the set of possible types/actions is delimited by a set of discourse expectations, a special case of which is the Question Under Discussion. When attempting to signal propositional content, the space of possibilities is delimited by the QUD in virtue of the fact that the hearer is assuming the speaker’s intended meaning to be some member of the QUD set. We may say that the unlabeled types and actions are simply propositions in this case. Just as the label *italic* in Ch.2, Fig.20 corresponds to an *attribute* of that action, action labels in the Focus game must correspond to attributes. But what does it mean to be an “attribute” of a proposition? Informally, we may say that some meaning \mathcal{M} is an attribute of a proposition if that proposition “involves” \mathcal{M} . For example, the referent ‘Bill’ is an attribute of ‘Bill teaches phonetics’ because we can say that that proposition involves Bill. We need to operationalize this more formally. To do so, I use the notion of ExClo originally introduced in our discussion of Givenness, adapted from Schwarzschild (1999).

- $\text{ExClo}(\lambda x.[\dots x \dots]) \stackrel{def}{=} \exists x.[\dots x \dots]$
- $\text{ExClo}(x_e) \stackrel{def}{=} \exists y.y = x$
- $\text{ExClo}(\phi_t) \stackrel{def}{=} \phi.$

As a first pass at formalizing a semantic notion of attribute, I propose that \mathcal{M} is an attribute of ϕ if the salience (in Schwarzschild’s sense, where there is a binary distinction between a proposition being salient and not) of $\text{ExClo}(\phi)$ logically entails the salience of $\text{ExClo}(\mathcal{M})$. For example, if ‘Bill teaches phonetics’ were a salient proposition in the Common Ground, it would necessarily hold that ‘Bill exists’ is also a salient proposition, and therefore ‘Bill’ is an attribute of ‘Bill teaches phonetics.’

Actions represent propositional content, and as such, any action will have many distinct attributes. But crucially, the actions in a Focus game are *framed* by the message. As mentioned above, messages have labels which are determined by their conventional semantics, and because these labels correspond to semantic meanings, they are potential attributes of actions. In the game in Fig.57 in the previous section, the message [F Bill] carries the label ‘Bill’. This label is part of a *family of attributes*, to use Bacharach’s (2006) terminology. Recall the game in Ch.2, Fig.19. There were two possible frames discussed, corresponding to two different families of attributes. The first family was $\{italic, regular\}$, and the second was $\{bold, nonbold\}$. The core claim here, discussed at the end of Chapter 2, is that there are dimensions along which different properties lie, such that one property along a

particular dimension necessarily brings to mind all properties on that dimension. For example, the property ‘red’ is part of the family of attributes we might call “color”, and as such evokes ‘blue’, ‘yellow’, etc.—each individual member of the family supplies a single value along a particular semantic dimension.

Which family of attributes does ‘Bill’ belong to? We may ask, what relation does ‘Bill’ have to the action which has the attribute ‘Bill’? We can consider thematic relations. The set of actions is {‘Bill is teaching phonetics’, ‘Sue is teaching phonetics’}, and ‘Bill’ supplies an *agent* attribute for the action, ‘Bill is teaching phonetics’. Therefore, the family of attributes F for the label \mathcal{L} of the message m , or $F(\mathcal{L}(m))$, is AGENT, which in our simple model of the world where only Bill and Sue exist is the set {‘Bill’, ‘Sue’}. By making a particular frame salient, the message constrains the labeling of the Receiver’s actions such that for any action a , $F(\mathcal{L}(m)) = F(\mathcal{L}(a))$. For example, if the Sender sends the message “red” in a game whose goal is to pick a concrete object, the Receiver will label all objects based on color. And if the Sender sends the message “Bill” in a Focus game where ‘Bill’ is the agent of one of the possible actions, the Receiver will label all actions based on agenthood.

Putting it all together, the Receiver’s Utility function in the Focus game is as follows.

$$U_R(a_j, t_i, m) = \begin{array}{l} \textit{salience}(a_j|m) \text{ if } i = j \text{ (see Eq.5.5),} \\ \text{and 0 otherwise,} \\ \text{where } F(\mathcal{L}(m)) = F(\mathcal{L}(a_j)) \end{array}$$

BOX 7: RECEIVER’S UTILITY FUNCTION

Again considering the game in Fig.57, the message [F Bill] is better than the other message [F phonetics] because the latter frames the game in terms of what is being taught, and the Receiver’s Utility is divided among both actions whose label is ‘phonetics’. The message [F Bill], on the other hand, frames the game in terms of the agent of the teaching, and the only action with positive Utility is the intended meaning, as it is the only action whose label is the same as the label of the message, ‘Bill’.

The Sender’s Utility function is somewhat simpler. The Sender’s Utilities are not affected by labeling. The outcome for the Sender depends only on whether successful coordination has occurred and how economical the message is.

$$U_S(a_j, t_i, m) = \begin{array}{l} 1 + \textit{economy}(m) \text{ if } i = j \text{ (see Eq.5.6),} \\ \text{and 0 otherwise} \end{array}$$

BOX 8: SENDER’S UTILITY FUNCTION

These functions derive the payoffs in Fig.57, and provide a model that can account for more complex cases as well.

That the Receiver’s Utilities depend on framing—the assignment of labels to actions from a given family of attributes—provides a natural explanation for the idea of Mutually Exclusive Contrast (MEC) discussed in Chapters 2, 3 and 4. I briefly address the mechanics of this before applying the Focus game to a number of phenomena.

5.3.3 Deriving MEC

Recall the notion of Mutually Exclusive Contrast (MEC) derived from Wagner (2012). A constituent [ab] has an MEC antecedent [ab’] iff $\text{UniClo}([ab])$ entails the negation of $\text{ExClo}([ab’])$, where UniClo is closure under universal quantification. The distinction is illustrated below: Focus on *cheap* in (48) is licensed because the NP *cheap convertible* has an MEC antecedent containing *convertible*, whereas Focus on *blue* in (49) is not licensed because no such antecedent exists.

(48) Q: Mary’s uncle, who buys and sells expensive convertibles, came to her wedding. What did she get from him as a gift?

A: She got [_F a [_F CHEAP] convertible]

$\forall x. \text{cheap}(x) \ \& \ \text{convertible}(x) \rightarrow \neg \exists x. \text{expensive}(x) \ \& \ \text{convertible}(x)$
(MEC)

(49) Q: Mary’s uncle, who buys and sells expensive convertibles, came to her wedding. What did she get from him as a gift?

A: #She got [_F a [_F BLUE] convertible]

$\forall x. \text{blue}(x) \ \& \ \text{convertible}(x) \not\rightarrow \neg \exists x. \text{expensive}(x) \ \& \ \text{convertible}(x)$
(no MEC)

This special semantic relationship is directly derivable from our assumptions about framing in coordination games. As Bacharach and Bernasconi (1997, p.6) note, with respect to framing, “when attributes do come to mind they come in clusters. . . it is nearly impossible to notice that ‘U’ is a vowel without noticing that other objects are consonants.” As mentioned above, the core claim is that a label supplied by a frame represents a unique attribute value along some meaningful dimension. This gives us the following axioms.

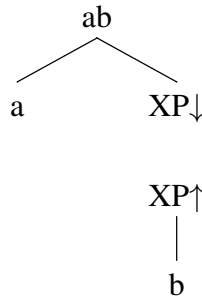
1. For a Game G with possible actions $A_G = \langle a_1, a_2, \dots, a_n \rangle$, the players must choose a frame, where a frame is a labeling function L such that $L(A_G) = \langle \mathcal{A}_1, \mathcal{A}_2, \dots, \mathcal{A}_n \rangle$.

2. There must exist some family of attributes F such that for any attribute \mathcal{A}_i in $L(A_G)$ (the set of framed actions), $\mathcal{A}_i \in F$.
3. It is impossible for two or more attributes in F to appropriately describe a single action. Formally, where \mathcal{L} is a function returning the unique label for a given action under $L(A_G)$:

$$\forall a \in A_G : \exists \mathcal{A}. \mathcal{L}(a) = \mathcal{A} \ \& \ \forall \mathcal{A}' \neq \mathcal{A} : [\exists F. \{\mathcal{A}, \mathcal{A}'\} \subset F] \rightarrow \neg \exists \mathcal{L}'. \mathcal{L}'(a) = \mathcal{A}'$$

This last formal statement can be read as a constraint on the well-formedness of families of attributes: “For any labeled action in a game, no other attribute in the same family of attributes as that action’s label can be applied to that action under any valid labeling function.” For example, $\{red, blue\}$ supplies a valid frame for labeling objects only if each object has a unique color attribute, such that it would not be possible to label a red object “blue”, and vice versa. Here we must assume that a “valid labeling function” is one which assigns meaningful attributes to actions such that the statement ‘action a has attribute \mathcal{A} ’ is true. In the previous section we defined this in logical terms: ϕ has attribute \mathcal{M} if $\text{ExClo}(\phi)$ entails $\text{ExClo}(\mathcal{M})$. In 5.3.5 we will extend this a bit to account for the role of morphological and phonological attributes in determining Focus below the word level. For now, we derive MEC using only the semantic notion of attribute.

Assume that Focus structure $[\text{ab}_F]$ maps onto the following prosodic layering.



The structure of the signaling game developed in this chapter (see 5.3.4 and 5.3.5 below for more details) derives the descriptive generalization of Rooth (1992): $[\text{ab}_F]$ necessarily evokes some set of alternatives of the form $[\text{ab}']$. MEC is the additional stipulation that $[\text{ab}']$ must have a particular contrastive semantic relationship to $[\text{ab}]$, discussed above. The game-theoretic analysis needs no such stipulation: this constraint is derived via the three axioms given above.

- I. The set of alternatives $\{[\text{ab}']\}$ corresponds to the set of possible actions in the Focus game, and each action must have a label. (Axiom 1)

II. The labels for all actions in $\{[ab']\}$ must belong to the same family of attributes F .
(Axiom 2)

III. If an action is a meaning representation, then the possible attributes are the semantic objects whose ExClo is made salient by the ExClo of that action. (Definition)

IV. F cannot contain two semantic objects whose ExClo is made salient by the ExClo of the same action. (Axiom 3 + (III))

V. Let $\Rightarrow(A,B)$ stand for ‘A makes B salient in the Common Ground’.

For every action a in A_G , for every possible label \mathcal{A} in F :

$$[\text{ExClo}(a) \Rightarrow \text{ExClo}(\mathcal{A})] \rightarrow \forall \mathcal{A}' \neq \mathcal{A} : \neg[\text{ExClo}(a) \Rightarrow \text{ExClo}(\mathcal{A}')]]$$

(Restatement of (IV))

VI. For two distinct possible labels \mathcal{A}_1 and \mathcal{A}_2 :

$$[\forall a \in A_G. \text{ExClo}(a) \Rightarrow \text{ExClo}(\mathcal{A}_1)] \rightarrow [\neg \exists a \in A_G. \text{ExClo}(a) \Rightarrow \text{ExClo}(\mathcal{A}_2)]$$

(Follows from (V))

VII. For any two members $[ab]$ and $[ab']$ of the alternative set $\{[ab']\}$ with distinct labels:

$$[\forall a \in A_G. \exists \mathcal{L}. \mathcal{L}(a) = \mathcal{L}([ab])] \rightarrow [\neg \exists a \in A_G. \exists \mathcal{L}. \mathcal{L}(a) = \mathcal{L}([ab'])]$$

(Special case of (VI))

VIII. Let \mathcal{L}_x be the function $\lambda a. \exists \mathcal{L}. \mathcal{L}(a) = \mathcal{L}(x)$, where $\mathcal{L}_x(a)$ can be paraphrased, ‘action a could be labeled with the label of x ’:

$$\text{UniClo}(\mathcal{L}_{[ab]}) \Rightarrow \neg \text{ExClo}(\mathcal{L}_{[ab']})$$

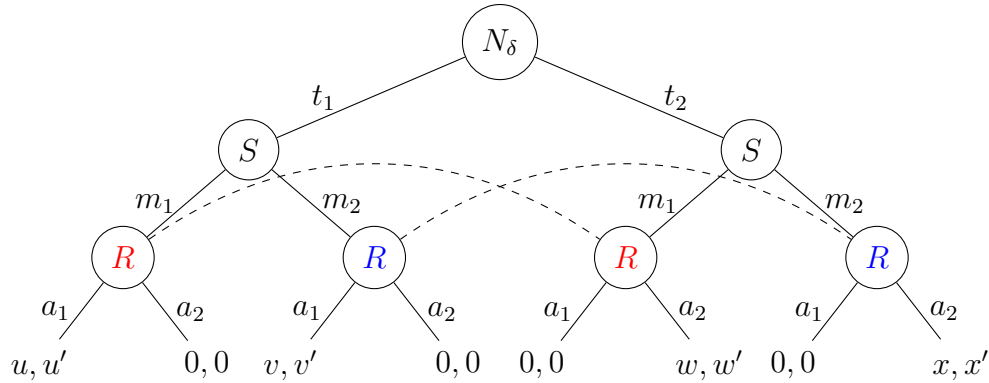
We have ended with a game-theoretic counterpart to the original MEC formulation: labeling is constrained such that the UniClo of a labeling function for $[ab]$ excludes the ExClo of the corresponding labeling function for $[ab']$. In other words, if all actions could be labeled ‘cheap convertible’, then no actions could be labeled ‘expensive convertible’. The constraint holds because it is impossible for ‘cheap’ and ‘expensive’ to be attributes of the same action. That is, there is no predicate P such that the salience of $\exists x. P(x)$, in the Schwarzschildian sense, logically entails the salience of both cheap convertibles and expensive convertibles. On the other hand, the choice of possible actions cannot be framed as a choice between actions labeled ‘cheap’ or ‘blue’, because it is possible to be both cheap

and blue, and therefore the constraint in (VIII) fails. In other words, $\{cheap, blue\}$ is an illegal frame for the same reason that $\{bold, italic\}$ was in our earlier example of framing.

These consequences of framing, together with the Utility assignments proposed in 5.3.2, are sufficient to explain the empirical desiderata presented in 5.3.1. We now turn to the analysis of these phenomena, including cases relating to Focus in wh-questions as well as contrastive Focus. The next section concentrates on the former, deriving the correspondence between Focus and Question Under Discussion in single and multiple wh-question contexts.

5.3.4 Wh-Focus as a signaling game

A Focus structure is optimal iff it is an equilibrium strategy in the Focus game. The Focus game is a signalling game with the following structure, where the messages are taken to be representations of the Focused material, with non-Focused material left out entirely. The types and actions are intended meanings and interpreted meanings, respectively. The goal is for these two meanings to be the same.



The Sender chooses a message that will frame the game in a particular way so as to maximize the Receiver’s Expected Utility for the action that corresponds to the Sender’s type. Expected Utility for the Receiver is the weighted average of the possible payoffs for an action given the probability distribution δ over types.

$$EU_R(a, m) = \sum_{\forall t \in T} prob(t) * U_R(a, t, m)$$

The Receiver’s Utility function depends on how the game is framed by the message. Each message has a label corresponding to the semantic content of that message, and that label serves to make some actions more salient than others, which boosts the Utility for coordinating around those actions. This is formalized as follows, where the “salience” of an

action in this case is taken to be the probability of choosing that action at random from among all actions with the same label (i.e. semantic content) as the message.

$$saliency(a|m) = P(a|\mathcal{L}(a) = \mathcal{L}(m)) \quad (5.7)$$

$$U_R(a_j, t_i, m) = \begin{aligned} & saliency(a_j|m) \text{ if } i = j, \\ & \text{and 0 otherwise,} \\ & \text{where } F(\mathcal{L}(m)) = F(\mathcal{L}(a_j)) \end{aligned}$$

The hearer's Utilities are higher for more economical messages, where economy is formalized simply as the inverse of the number of words contained in the message.

$$economy(m) = \frac{1}{||W(m)||} \quad (5.8)$$

$$U_S(a_j, t_i, m) = \begin{aligned} & 1 + economy(m) \text{ if } i = j, \\ & \text{and 0 otherwise} \end{aligned}$$

This Utility function feeds an Expected Utility function for the Sender. The Sender is not certain about the Receiver's beliefs about the Sender's type, i.e. the Sender does not know δ . Therefore, the Sender behaves so as to maximize the weighted average of the different outcomes given a probability distribution over actions, which is determined by considering the Receiver's Expected Utility. In other words, the Sender considers how likely the Receiver is to choose the intended meaning given a particular message and the Utilities it creates for the Receiver, and takes this into account when deciding whether that message is optimal.

$$EU_S(t, m) = \sum_{\forall a \in A} prob(a) * U_S(a, t, m)$$

BOX 9: EXPECTED UTILITY FOR THE SENDER

Finally we introduce two constraints on the structure of the game: one constraint on the set of possible types and actions, and one constraint on the set of possible labels for actions.

1. The set of possible types/actions is equivalent to a representation of the hearer's (Receiver's) discourse expectations. Expectations are represented as a set of meanings E , such that the hearer is assuming that the speaker (Sender) will convey some meaning in E . When the meanings under consideration are propositions, E is equivalent to the QUD set.

2. Every action has a label which is introduced by the message. Each label is a member of a family of attributes F where every member of F is in a Mutually Exclusive Contrast (MEC) relationship to every other member of F .

The first constraint is motivated by the model of pragmatics formulated in Roberts (1996) and its successors, and the second constraint is motivated by the general game-theoretic principles discussed in 5.3.3.

To derive the simplest case, consider again the following question-answer exchange.

- (50) Q: Who is teaching phonetics?
 A: [_F Bill] is teaching phonetics.

We want to derive the fact that [_F Bill] is a better message in the Focus game than all competing messages. To do this, let's consider some possible messages and actions, given in Table 17, and calculate the Receiver's Expected Utilities for each message/action combination, given in Table 18. Again, consider a simplified world where the only two individuals are Bill and Sue.

t_1	'Bill is teaching phonetics'
t_2	'Sue is teaching phonetics'
m_1	[_F Bill]
m_2	[_F phonetics]
m_3	[_F Sue]
m_4	[_F Bill's teaching phonetics]
m_5	[_F teaching]
a_1	'Bill is teaching phonetics'
a_2	'Sue is teaching phonetics'

TABLE 17: TYPES/MESSAGES/ACTIONS

	a_1	a_2
m_1	p	0
m_2	$\frac{1}{2}p$	$\frac{1}{2}(1 - p)$
m_3	0	1-p
m_4	p	0
m_5	$\frac{1}{2}p$	$\frac{1}{2}(1 - p)$

TABLE 18: RECEIVER EXPECTED UTILITY ($p = \text{PROBABILITY OF } t_1$)

We can use Table 18 to calculate the Sender’s Expected Utility for each message given the Sender’s type. We know that if the Sender sends message m_1 or m_4 , the Receiver is certain to play a_1 because its Expected Utility is higher regardless of the Receiver’s beliefs. Similarly, m_3 will always prompt an a_2 response. But for m_2 and m_5 , the outcome is contingent on the Receiver’s probability distribution δ . If the probability of t_1 is higher than the probability of t_2 , the Receiver will play a_1 . If t_2 is more probable, a_2 will be played. If the two types are equiprobable under δ , the Receiver will have no preference, and will therefore choose at random. Let q be the probability of the Receiver playing a_1 after m_2 or m_5 , with no assumptions about δ , such that the following holds.

$$q = \text{prob}(p > \frac{1}{2}) + \frac{1}{2}(\text{prob}(p = \frac{1}{2})) \tag{5.9}$$

The probability term q should be taken as a belief about the Receiver’s beliefs. This allows us to calculate Expected Utilities for each message/type combination for the Sender.

	m_1	m_2	m_3	m_4	m_5
t_1	2	$2q$	0	$1\frac{1}{3}$	$2q$
t_2	0	$2(1 - q)$	2	0	$2(1 - q)$

TABLE 19: SENDER EXPECTED UTILITY

If the Sender is of type t_1 (wishes to convey ‘Bill is teaching phonetics’), both m_1 and m_4 guarantee successful coordination, but m_1 yields higher Utility for economy reasons. In this case, if we assume that q is strictly between 0 and 1, i.e. that the Sender believes that the Receiver does not already know with certainty the answer to the QUD, then m_1 *dominates* all other strategies in that m_1 yields a better outcome for a t_1 Sender regardless of anybody’s beliefs. Similarly, for a t_2 Sender, m_3 dominates all other strategies.

This gives us two clear equilibrium points for this game: (1) if Bill teaches phonetics, the Sender will send the message [F Bill], which will compel the Receiver to assign the interpretation ‘Bill is teaching phonetics’, and (2) if Sue teaches phonetics, the Sender will send the message [F Sue], which will compel the Receiver to assign the interpretation ‘Sue is teaching phonetics’.

Multiple wh-questions

I now move on to more interesting examples, beginning with the following.

- (51) a. Q: What are Bill and Sue teaching?
 A: ?They're BOTH teaching PHONETICS. / They're teaching PHONETICS.
- b. Q: Speaking of Bill and Sue, who's teaching what?
 A: They're BOTH teaching PHONETICS. / #They're teaching PHONETICS.

Two issues need to be accounted for: (1) why are two Foci always necessary to answer the question in (51-b)?, and (2) why is a single Focus available to answer the question in (51-a)? Let's begin by constructing some types/actions and messages. Assume a model of the world where Bill and Sue are the only individuals, phonetics and morphology are the only classes being taught, and it is part of the Common Ground that neither Bill nor Sue ever teach more than one class per semester, though it is possible that they are both teaching the same course.

t_1	'Bill is teaching phonetics, and Sue is teaching morphology'
t_2	'Bill is teaching morphology, and Sue is teaching phonetics'
t_3	'Bill is teaching phonetics, and Sue is teaching phonetics'
t_4	'Bill is teaching morphology, and Sue is teaching morphology'
m_1	$\langle\langle [F \text{ Bill }], [F \text{ phonetics }] \rangle, \langle [F \text{ Sue }], [F \text{ morphology }] \rangle\rangle$
m_2	$\langle\langle [F \text{ Bill }], [F \text{ morphology }] \rangle, \langle [F \text{ Sue }], [F \text{ phonetics }] \rangle\rangle$
m_3	$\langle\langle [F \text{ Bill }], [F \text{ phonetics }] \rangle, \langle [F \text{ Sue }], [F \text{ phonetics }] \rangle\rangle$
m_4	$\langle\langle [F \text{ Bill }], [F \text{ morphology }] \rangle, \langle [F \text{ Sue }], [F \text{ morphology }] \rangle\rangle$
m_5	$\langle [F \text{ both }], [F \text{ phonetics }] \rangle$
m_6	$\langle [F \text{ both }], [F \text{ morphology }] \rangle$
m_7	$[F \text{ phonetics }]$
m_8	$[F \text{ morphology }]$
a_1	'Bill is teaching phonetics, and Sue is teaching morphology'
a_2	'Bill is teaching morphology, and Sue is teaching phonetics'
a_3	'Bill is teaching phonetics, and Sue is teaching phonetics'
a_4	'Bill is teaching morphology, and Sue is teaching morphology'

TABLE 20: A MULTIPLE WH-QUESTION GAME

Recall from our discussion in 2.1.3 that multiple wh-questions can be interpreted in multiple ways. Following Roberts (1996) and Büring (2003), the question 'who is teaching what?' can be interpreted either as (1) an answer to the question 'who is teaching phonetics?' followed by an answer to the question 'who is teaching morphology?', or (2) an answer to the question 'what is Bill teaching?' followed by an answer to the question 'what

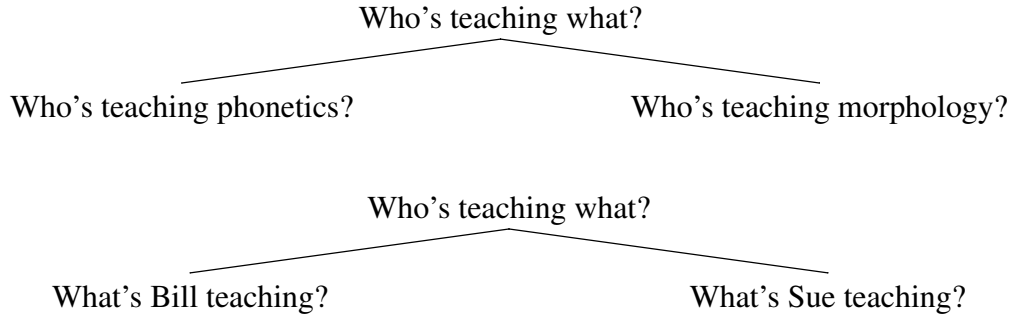


FIGURE 59: TWO POSSIBLE STRUCTURES FOR A MULTIPLE WH-QUESTION

is Sue teaching?'. These two possible structures for answering this multiple wh-question are illustrated in Fig.59. Fig.60 applies this ambiguity in semantic structure to the structure of the Focus game. An action in the Focus game corresponding to Table 20 consists of two different components, corresponding to the two components of the semantics of the QUD. Each component can be represented as (1) either a PHONETICS-TEACHER proposition or a MORPHOLOGY-TEACHER proposition, or (2) either a BILL-SUBJECT proposition or a SUE-SUBJECT proposition. In case of the former, the component corresponding to the proposition 'Bill is teaching phonetics' could be represented $\langle \text{PHONETICS-TEACHER, 'Bill'} \rangle$.

Note that if we translate this into typed lambda calculus, the representation would be the tuple $\langle \lambda x. \text{teaches}(x, \text{phonetics}), \text{bill} \rangle$. This is identical to the "structured meaning" analysis of Krifka (2001, 2007). Under Krifka, answers to questions are added to the Common Ground in a structured way, such that $\langle \lambda x. \text{teaches}(x, \text{phonetics}), \text{bill} \rangle$ is a representation of an answer to the question 'who teaches phonetics?'. I have imported this idea into the current framework to model differences in the way action components are represented: in a multiple wh-context, given the structural ambiguity in Fig.59, one may view the proposition 'Bill teaches phonetics' as an answer to 'who teaching phonetics?' or as an answer to 'what does Bill teach?'. One crucial difference between the two game structures in Fig.60 is that in S_1 , but not in S_2 , there is an option for 'both'. That is to say, the answer to the question 'Who teaches phonetics?' can be 'both Bill and Sue', which we can represent in the structured meaning framework as the mereological sum of both those individuals, yielding $\langle \lambda x. \text{teaches}(x, \text{phonetics}), \text{bill} + \text{sue} \rangle$. In this case, the answer to the question 'who teaches morphology?' is null, or $\langle \lambda x. \text{teaches}(x, \text{morphology}), \emptyset \rangle$. In S_2 there is no such option because Bill and Sue are considered individually, and we know from the context that no one teaches both phonetics and morphology.

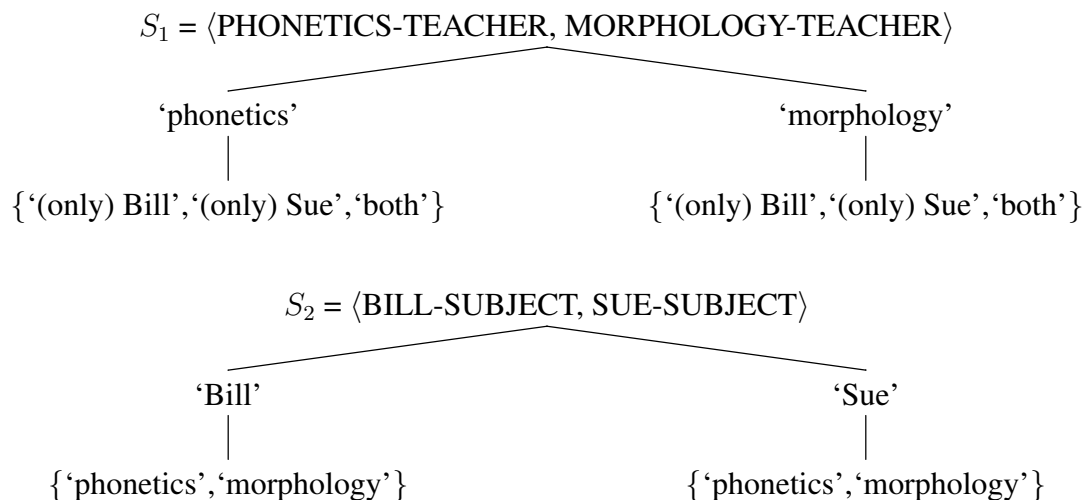


FIGURE 60: TWO POSSIBLE FOCUS GAME STRUCTURES

We can use the availability of both S_1 and S_2 in multiple wh-questions to explain the facts in (51) within the current framework. We will do this by considering Utilities for both structures individually, and then considering the consequences of both structures being available. First, some simple mathematical assumptions are needed to deal with the increased complexity of the representations in this game compared to the one in Table 17.

1. Propositions of the form $\langle P, x \rangle$, i.e. propositions represented by structured meaning tuples like $\langle \lambda x. \textit{teaches}(x, \textit{phonetics}), \textit{bill} \rangle$, have two labels—both P and x must be labeled. The label for such a structure is a set, taken to be the union of $\{\mathcal{L}(P)\}$ and $\{\mathcal{L}(x)\}$.
2. Similarly, for utterances with two Foci $\langle FOC_1, FOC_2 \rangle$, e.g. “BILL_F is teaching PHONETICS_F”, both FOC_1 and FOC_2 are labeled according to their semantic meanings. For example, the label of $\langle \text{BILL}_F, \text{PHONETICS}_F \rangle$ is the set $\{\textit{bill}, \textit{phonetics}\}$. Salience must therefore be reformulated to depend on **sets** of labels.
3. In completely answering a multiple wh-question, two distinct propositions are conveyed. For example, we can decompose a_1 into an ordered pair of **component propositions** $\langle \phi'_1, \phi''_1 \rangle$, where component proposition $\phi'_1 = \langle \lambda x. \textit{teaches}(x, \textit{phonetics}), \textit{bill} \rangle$ and component proposition $\phi''_1 = \langle \lambda x. \textit{teaches}(x, \textit{morphology}), \textit{sue} \rangle$. The salience of a pair of component propositions given a single message is the probability of that pair being chosen at random given the constraint that the chosen propositions must *both* have the same label as the message.

4. If a Sender’s message consists of two distinct utterances, it is similarly decomposed into an ordered pair of **component utterances** $\langle u', u'' \rangle$, each component utterance denoting one or more attributes of the corresponding component proposition in $\langle \phi', \phi'' \rangle$. Saliency then is taken to be the probability of choosing that set of propositions given the constraint that the first proposition has the same label as the first utterance, and the second proposition the same label as the second utterance.

These four principles yield the following three equations.

$$\begin{aligned}
 \text{saliency}(\langle P, x \rangle | \langle FOC_1, FOC_2 \rangle) &= P(\langle P, x \rangle | [\mathcal{L}(P) \cup \mathcal{L}(x) \subset \mathcal{L}(FOC_1) \cup \mathcal{L}(FOC_2)]) \\
 \text{saliency}(\langle \phi', \phi'' \rangle | m) &= P(\langle \phi', \phi'' \rangle | [\mathcal{L}(\phi') \cup \mathcal{L}(\phi'') \subset \mathcal{L}(m)]) \\
 \text{saliency}(\langle \phi', \phi'' \rangle | \langle u', u'' \rangle) &= P(\langle \phi', \phi'' \rangle | [\mathcal{L}(\phi') \subset \mathcal{L}(u') \ \& \ \mathcal{L}(\phi'') \subset \mathcal{L}(u'')]) \\
 &= \text{saliency}(\phi' | u') * \text{saliency}(\phi'' | u'')
 \end{aligned}
 \tag{5.10}$$

The first equation merely states that it is possible for messages/actions to have multiple attributes as labels, and that in that case saliency is redefined to operate on sets rather than individual attributes.

To illustrate the intuitive motivations for the second two equations in 5.10, imagine a simple coordination game where players are asked to choose two shapes from among a set of four shapes. Two of the shapes are red, and the other two are blue. Now imagine that one player can send a one-word message to the other player. If the Sender chooses the message “red”, it is clear that the intended set is the set of both red shapes. A rational player will never choose one red shape and one blue shape, for example. Why not? Intuitively, the message “red” makes salient the pairs such that the attribute ‘red’ holds for *both* members of the pair. There is only one such pair in this setup, and thus coordination is guaranteed if the players are perfectly rational. In other words, the selection rule being suggested is not ‘choose red’, but rather ‘choose all red’.

Now, imagine the same game but with the message “red blue”. This should change the outcome. It seems clear that the intended set is a set with one red member and one blue member. Since both colors have been made salient, the saliency of the available pairings is dependent on both colors being represented by the message. The set with both blue members, for example, is not made salient, because does not represent a “red blue” set. That is to say, for an action that is decomposed into multiple components, saliency is calculated relative to attributes of the action as a whole, and is not merely composed from the saliency

scores of the complex action's component parts. The equations in 5.10 are simple ways of cashing out this intuition.

Finally, turning to Sender Utilities, economy for complex messages is calculated by simply taking the inverse of the number of words contained in both component utterances combined.

$$economy(\langle u', u'' \rangle) = \frac{1}{\|W(u')\| + \|W(u'')\|} \quad (5.11)$$

We are ready to calculate the Expected Utilities for the Receiver in the game in Table 20, under both QUD structures in Fig.60. The following notational shorthand will allow for a clearer picture: let p and p' be the independent probabilities of the propositions 'Bill teaches phonetics' and 'Sue teaches phonetics', respectively, and let P and P' represent $1 - p$ and $1 - p'$. Under this notation, the prior probability of t_1 ('Bill teaches phonetics and Sue teaches morphology') is pP' .

$$\begin{aligned} p &= prob(\text{Bill teaches phonetics}) \\ p' &= prob(\text{Sue teaches phonetics}) \\ P &= prob(\text{Bill teaches morphology}) = 1 - p \\ P' &= prob(\text{Sue teaches morphology}) = 1 - p' \end{aligned} \quad (5.12)$$

Let's begin with Receiver's EUs for each message/action combination under S_1 . Under this structure, the possible teachers of each course are 'Bill', 'Sue', and 'both'. Under the constraints on framing discussed in 5.3.3, 'Bill' and 'Sue' can only be labeled as 'only Bill' and 'only Sue' under this QUD structure. Taking these to be valid interpretations of the two Foci $[_F \text{ Bill}]$ and $[_F \text{ Sue}]$, respectively, we can calculate salience scores for various message/action combinations. We calculate a salience score of 1 for a_1 given m_1 . This is derived as follows, where ϕ'_1 is 'Bill is teaching phonetics', ϕ''_1 is 'Sue is teaching morphology', u'_1 is the first pair of Foci, and u''_1 the second.

$$\begin{aligned} salience(a_1|m_1) &= salience(\phi'_1|u'_1) * salience(\phi''_1|u''_1) \\ &= P(\phi'_1|\mathcal{L}(\phi'_1) \subset \{\text{'only Bill', 'phonetics'}\}) \\ &\quad * P(\phi''_1|\mathcal{L}(\phi''_1) \subset \{\text{'only Sue', 'morphology'}\}) \\ &= 1 * 1 \\ &= 1 \end{aligned} \quad (5.13)$$

Applying 5.12, the Expected Utility for a_1 given m_1 is pP' . EUs for all message/action

combinations for QUD structure S_1 are in Table 21. Notice that the expected Utility for many combinations is zero. This is partly because under this QUD structure, the two Foci [F Bill] and [F Sue] must be taken to mean ‘only Bill’ and ‘only Sue’ (otherwise, the frame is illegal). Consider a_3 . This is represented as $\phi'_3 = \langle \lambda x.teaches(x, phonetics), bill + sue \rangle$ and $\phi''_3 = \langle \lambda x.teaches(x, morphology), \emptyset \rangle$. The message m_3 frames both these actions such that they would only be salient if (1) both ‘only Bill’ and ‘phonetics’ were attributes of ϕ'_3 , and (2) if both ‘only Sue’ and ‘phonetics’ were attributes of ϕ''_3 . Neither criterion is met, and thus neither action has any salience to the Receiver under this QUD structure.

$$\begin{aligned}
 salience(a_3|m_3) &= salience(\phi'_3|u'_3) * salience(\phi''_3|u''_3) \\
 &= P(\phi'_3|\mathcal{L}(\phi'_3) \subset \{ \text{‘only Bill’, ‘phonetics’} \}) \\
 &\quad * P(\phi''_3|\mathcal{L}(\phi''_3) \subset \{ \text{‘only Sue’, ‘phonetics’} \}) \quad (5.14) \\
 &= 0 * 0 \\
 &= 0
 \end{aligned}$$

Also note that m_7 and m_8 create zero Expected Utility for all four actions. Consider m_7 . The only Focus contained in m_7 is [F phonetics]. The probability of a pair of propositions given a single message is the probability of picking that pair given the constraint that both propositions have the same label as the message. In this case, that label is *phonetics*. The problem arises from the QUD structure—the first component proposition is always a proposition about phonetics, and the second component proposition is always a proposition about morphology (though it may be the proposition ‘no one teaches morphology’). Thus it is impossible for both components to have the label *phonetics*. Similarly for m_8 and the label *morphology*.

And finally, a word must be said about the treatment of *both* in m_5 and m_6 . I take *both* to be ambiguous between a quantifier and a mereological sum, as illustrated by availability of both collective and distributive readings. In (52-a) below, the distributed reading is favored, and *both* is most naturally interpreted as a quantifier: for each individual x in the set {John, Mary}, x took the test. But in (52-b), a collective reading is preferred, in which case *both* cannot be interpreted as a quantifier—under that reading (where John and Mary carried the piano together), it is not the case that John carried the piano and Mary carried the piano. Rather, the agent of the carrying event must be taken to be the mereological sum of John and Mary. That is, the set containing John and Mary must be seen as an unified entity responsible for the carrying.

- (52) a. Q: Who took the test, John or Mary?
 A: They both did.
- b. Q: Who carried the piano, John or Mary?
 A: They both did.

Assume that the mereological sum reading is preferred for QUD structure S_1 , and that the quantifier reading is preferred for S_2 . This means that under S_1 , ‘both’ is taken as a shorthand for ‘Bill+Sue’, and can straightforwardly serve as the answer to a question like ‘who is teaching phonetics?’ In that case, the implicit full answer to the question is ‘the phonetics teacher is Bill+Sue, and the morphology teacher is nobody.’

Under S_2 on the other hand, *both* quantifies over Bill and Sue, yielding the meaning ‘Bill is teaching phonetics and Sue is teaching phonetics.’ In both cases, *both* implicitly introduces a complex message. Instead of $\langle u', u'' \rangle$, which I use to denote complex messages that consist of multiple externalized utterances, I use $\langle \nu', \nu'' \rangle$ to denote a single-utterance message whose label is complex due to the presence of a quantifier or mereological sum. The mechanisms whereby these complex messages are constructed are as follows. Let $both_{MS}$ denote the mereological sum denotation, let $both_Q$ denote the quantifier denotation, let FOC_2 be the Focused constituent that is not the word *both*, and let F be the family of attributes to which the label of FOC_2 belongs (in this case, the set containing ‘phonetics’ and ‘morphology’). $F - \mathcal{L}(FOC_2)$ is taken to be the set difference between F and the label of FOC_2 .

$$\begin{aligned} \mathcal{L}(\langle both_{MS}(x, y), FOC_2 \rangle) &= \langle \{x + y, FOC_2\}, F - \mathcal{L}(FOC_2) \rangle \\ \mathcal{L}(\langle both_Q(x, y), FOC_2 \rangle) &= \langle \{x, FOC_2\}, \{y, FOC_2\} \rangle \end{aligned} \quad (5.15)$$

The quantifier interpretation of *both* generates a complex message where (1) the first component is labeled with one of the members of the set associated with ‘both’ and with the meaning of the second Focused constituent, and (2) the second component is labeled with the other member of the ‘both’ set and with the meaning of the second Focused constituent.

The mereological interpretation of *both* generates a complex message where (1) the first component is labeled with the mereological sum denoted by ‘both’ and with the meaning of the second Focused constituent, and (2) the second component is labeled with the set of all other attributes in the same family of attributes as the second Focused constituent (F). This captures the intuition that in this context, any component proposition that is labeled as a ‘both’ action will serve as a complete answer to the Question Under Discussion, and

	a_1	a_2	a_3	a_4
m_1	pP'	0	0	0
m_2	0	Pp'	0	0
m_3	0	0	0	0
m_4	0	0	0	0
m_5	0	0	pp'	0
m_6	0	0	0	PP'
m_7	0	0	0	0
m_8	0	0	0	0

TABLE 21: RECEIVER EU, QUD STRUCTURE 1

therefore that all other attributes in F will fail to label any proposition that could be labeled using the family of attributes to which $both_{MS}$ belongs. That is to say, if any proposition involves both Bill and Sue, no other proposition congruent with the QUD will be about Bill or Sue. This is the interpretation favored under the first QUD structure. This yields the following salience for a_3 given m_5 , and similarly for a_4/m_6

$$\begin{aligned}
salience(a_3|m_5) &= salience(\phi'_3|\nu'_5) + salience(\phi''_3|\nu''_5) \\
&= P(\phi'_3|\mathcal{L}(\phi'_3) \subset \{\text{'Bill+Sue'}, \text{'phonetics'}\}) \\
&\quad + P(\phi''_3|\mathcal{L}(\phi''_3) \subset \{\text{'morphology'}\}) \\
&= 1 * 1 \\
&= 1
\end{aligned} \tag{5.16}$$

Putting it all together, we end up with the Expected Utilities in Table 21.

The second QUD structure, S_2 , yields different Expected Utilities for the Receiver, which are shown in Table 22. Under this structure, all actions are taken to be answers to ‘what is Bill teaching?’ and ‘what is Sue teaching?’

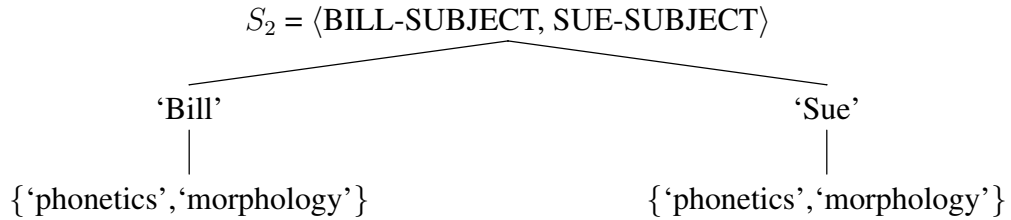


FIGURE 61: S_2

Here, the differences in how the actions are represented result in a different outcome. For example, m_3 creates non-zero salience for a_3 , because ϕ'_3 and ϕ''_3 now correspond to ‘Bill is teaching phonetics’ and ‘Sue is teaching phonetics’, respectively, rather than to ‘Bill and Sue are teaching phonetics’ and ‘no one is teaching morphology’.

$$\begin{aligned}
\text{salience}(a_3|m_3) &= \text{salience}(\phi'_3|u'_3) * \text{salience}(\phi''_3|u''_3) \\
&= P(\phi'_3|\mathcal{L}(\phi'_3) \subset \{\text{‘Bill’, ‘phonetics’}\}) \\
&\quad * P(\phi''_3|\mathcal{L}(\phi''_3) \subset \{\text{‘Sue’, ‘phonetics’}\}) \quad (5.17) \\
&= 1 * 1 \\
&= 1
\end{aligned}$$

Also, the message $[_F \text{ phonetics }]$ now creates salience for a_3 in accordance with 5.10, because *phonetics* is a semantic attribute of both ‘Bill teaches phonetics’ and ‘Sue teaches phonetics’. Finally, the ‘both’ messages are equivalent in their salience to their two-utterance counterparts due to 5.15. The end result is given in Table 22.

	a_1	a_2	a_3	a_4
m_1	pP'	0	0	0
m_2	0	Pp'	0	0
m_3	0	0	pp'	0
m_4	0	0	0	PP'
m_5	0	0	pp'	0
m_6	0	0	0	PP'
m_7	0	0	pp'	0
m_8	0	0	0	PP'

TABLE 22: RECEIVER EU, QUD STRUCTURE 2

This allows us to calculate numeric Expected Utilities for the Sender for both QUD structures, which are given in Tables 23 and 24.

	m_1	m_2	m_3	m_4	m_5	m_6	m_7	m_8
t_1	$\mathbf{1\frac{1}{4}}$	0	$\frac{5}{16}$	$\frac{5}{16}$	0	0	$\frac{1}{2}$	$\frac{1}{2}$
t_2	0	$\mathbf{1\frac{1}{4}}$	$\frac{5}{16}$	$\frac{5}{16}$	0	0	$\frac{1}{2}$	$\frac{1}{2}$
t_3	0	0	$\frac{5}{16}$	$\frac{5}{16}$	$\mathbf{1\frac{1}{2}}$	0	$\frac{1}{2}$	$\frac{1}{2}$
t_4	0	0	$\frac{5}{16}$	$\frac{5}{16}$	0	$\mathbf{1\frac{1}{2}}$	$\frac{1}{2}$	$\frac{1}{2}$

TABLE 23: SENDER EU, QUD STRUCTURE 1

	m_1	m_2	m_3	m_4	m_5	m_6	m_7	m_8
t_1	$1\frac{1}{4}$	0	0	0	0	0	0	0
t_2	0	$1\frac{1}{4}$	0	0	0	0	0	0
t_3	0	0	$1\frac{1}{4}$	0	$1\frac{1}{2}$	0	2	0
t_4	0	0	0	$1\frac{1}{4}$	0	$1\frac{1}{2}$	0	2

TABLE 24: SENDER EU, QUD STRUCTURE 2

We see that for a t_3 Sender, m_5 is best under S_1 , but m_7 is best under S_2 . Because the Sender cannot know how the Receiver will conceive of the Question Under Discussion in the case of the multiple wh-question ‘who’s teaching what?’, the Sender must consider both possible structures. Table 25 shows the result of averaging the Sender’s EUs for both structures. As predicted, the Sender will not send the message [F phonetics] for a_3 or the message [F morphology] for a_4 . Differences in how the multiple wh-question can be semantically encoded lead to differences in how salience is calculated, which ultimately limits the Sender’s options with regard to the economy of their message.

	m_1	m_2	m_3	m_4	m_5	m_6	m_7	m_8
t_1	$1\frac{1}{4}$	0	$\frac{5}{32}$	$\frac{5}{32}$	0	0	$\frac{1}{4}$	$\frac{1}{4}$
t_2	0	$1\frac{1}{4}$	$\frac{5}{32}$	$\frac{5}{32}$	0	0	$\frac{1}{4}$	$\frac{1}{4}$
t_3	0	0	$\frac{25}{32}$	$\frac{5}{32}$	$1\frac{1}{2}$	0	$1\frac{1}{4}$	$\frac{1}{4}$
t_4	0	0	$\frac{5}{32}$	$\frac{25}{32}$	0	$1\frac{1}{2}$	$\frac{1}{4}$	$1\frac{1}{4}$

TABLE 25: BOTH QUD STRUCTURES AVERAGED

And finally, we are ready to ask: what is the difference in (51) between ‘who is teaching what?’ and ‘what are Bill and Sue teaching?’ The answer is simple: the multiple wh-question is ambiguous between S_1 and S_2 , resulting in the EUs given in Table 25, whereas the single wh-question ‘what are Bill and Sue teaching?’ necessarily evokes S_2 , which results in the EUs given in Table 24. The fact that the single wh-question is necessarily a question about what Bill and Sue are teaching, and not a question about who is teaching phonetics and morphology, forces S_2 and changes the optimal message. Instead of m_5 for a_3 and m_6 for a_4 , we get m_7 and m_8 , respectively.

Having addressed different kinds of wh-question contexts, I now turn to contrastive Focus. I show that the same mechanics outlined in this subsection can be applied to those cases as well.

5.3.5 Extension to Contrastive Focus

I now move on to examples (53) and (54), repeated below, the former being what I take to be a canonical example of contrastive Focus.

- (53) Q: Mary's uncle, who buys and sells expensive convertibles, came to her wedding. What did she get from him as a gift?
 A: She got [_F a [_F CHEAP] convertible]
- (54) Q: Mary's uncle, who buys and sells expensive convertibles, came to her wedding. What did she get from him as a gift?
 A: #She got [_F a [_F BLUE] convertible]

The answer in (53) contains three prosodic layers: the first is layer 0, which contains the Ground of the sentence, then there is layer 1 which is the QUD Focus of the sentence (the direct object), and finally there is layer 2 which represents contrastive stress on the adjective *cheap*. Fig.62 illustrates the prosodic structure of the direct object DP only.

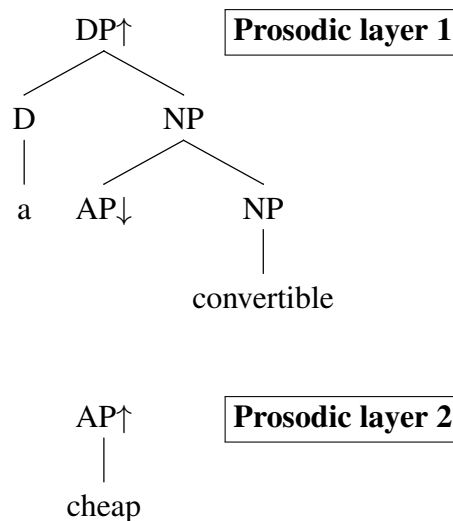


FIGURE 62: PROSODIC STRUCTURE

The same Focus game will operate on layers 1 and 2 as operated on layers 0 and 1 for our wh-Focus examples in 5.3.4. But this time, the set of types is not delimited by the QUD, but by a different aspect of discourse. The QUD set for the question in (53) is something like {‘she got a cheap convertible’, ‘she got a blue SUV’, ‘she got a toaster’, etc.}—the nature of the question creates the expectation on the part of the Receiver that the proposition being conveyed is of the form ‘she got x.’ That represents a set of expectations at the level of the

entire clause. We can now ask: are there expectations at the level of the object DP in (53)? In other words, if the hearer is interpreting the DP on prosodic layer 1, do they begin with prior expectations about that DP's meaning? In the context given in (53), the obvious answer is yes. There is no reason for the questioner to have mentioned the fact that Mary's uncle sells expensive convertibles other than to suggest that an expensive convertible is a likely gift for Mary from her uncle. The questioner has made it known, albeit indirectly, that she expects the referent of the DP in question to be 'a cheap convertible'.

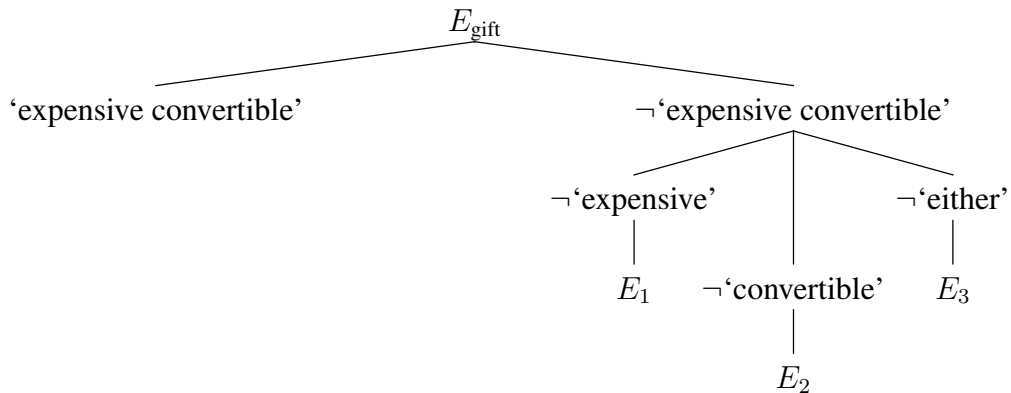
If these expectations can be spelled out, then we can apply the same mechanisms from 5.3.5: the prosodic configuration is chosen so that if only the information on prosodic layer 2 were transmitted, a perfectly rational hearer could recover the meaning for the DP on prosodic layer 1. This in turn allows the entire intended proposition to be calculated, since layer 1 was chosen to allow the recovery of material on layer 0. Intuitively, the answer in (53) places the strongest prominence on 'cheap' because if the entirety of the message were simply the word *cheap*, it would be possible in principle for the hearer to use her expectations given the current state of discourse to figure out that speaker intended 'she got a cheap convertible (not an expensive one).'¹⁷

So now we must address the question of how the hearer's expectations are represented in a context like this one. Again, we cannot use the QUD to delimit the set of possible types/actions at this layer. Rather, the Sender and Receiver must be playing a kind of meta-game where types correspond to meanings for wh-Foci, i.e. objects at prosodic layer 1. In (53) the questioner, who is the Receiver in this game, is under the misconception that the wh-Focus will be 'an expensive convertible'. For this case I propose a structured expectation set, shown in Fig.63, whereby the Receiver first expects the Sender to address whether her assumption is correct, and if not, expects the Sender to offer the meaning which makes the assumption false. This structuring of expectations is imposed by the nature of the speech act itself. The following examples motivate this.

¹⁷I tested this informally against another speaker's intuitions: I proposed a game where one player asks a question, and the second player gets to write down a sequence of words on a cue card to show the first player. The catch is, the second player is severely penalized for each word he writes beyond the first. I then gave the context and question in (53), and then asked the informant to imagine that the second player's message was just the word CHEAP. When asked what the answer to the question was, the informant quickly suggested that Mary received a cheap convertible instead of an expensive one.

- (55) A: Did Mary's uncle buy her an expensive convertible?
 B: No.
 A: Oh. Was it some other kind of car?
 B: No, it was a convertible.
 A: But it wasn't expensive?
 B: Not at all.
 A: That cheapskate!
- (56) A: Did Mary's uncle buy her an expensive convertible?
 B: He got her a CHEAP convertible
 A: That cheapskate!

The series of discourse moves in (55) has exactly the same effect on the Common Ground as the much shorter exchange in (56). B's speech act in (56) is, I argue, an implicit sequence of speech acts consisting of (1) a denial of A's assumption about Mary's gift (that it's an expensive convertible), (2) an elaboration of which assumed properties of Mary's gift fail to hold (that it's expensive), and (3) an assertion of what the gift really was (a cheap convertible). This yields the structure in Fig.63, where the corrective speech act structures a set of expected wh-Foci, E_{gift} , in this particular way.



E_1	=	{ 'cheap convertible', 'medium-priced convertible', etc. }
E_2	=	{ 'expensive SUV', 'expensive sedan', etc. }
E_3	=	{ 'cheap SUV', 'cheap sedan', etc. }

FIGURE 63: STRUCTURED EXPECTATION SET

We could paraphrase questioner's speech act in (53) as follows: 'Am I right in my assumption? And if not, is it because the gift wasn't expensive, because it wasn't a convertible, or

because it wasn't either?' The Receiver thinks the gift is an expensive convertible, and considers both an expensive gift and a convertible gift to be likely in their own right, even the if the combination of the two properties is erroneous. That is to say, the Receiver considers a cheap convertible or an expensive SUV a more likely gift than, say, a toaster. This intuition serves as the basis for Fig.63, which represents this structured set of expectations as a tree which dominates smaller subsets, each subset containing the expected set of meanings relative to the type of correction that the Sender is intending. Of course, the Receiver does not know in advance the nature of the Sender's correction. But we will see that this does not matter—as long as the Receiver's expectations are structured so that 'expensive' and 'convertible' are both taken to be likely properties of Mary's gift, it is possible to find a unique equilibrium for a reasonable set of possible messages.

Begin by assuming expectation set E_1 . That is, assume the expectation set that results from knowing that the convertible is not expensive. For simplicity, assume that convertibles can be cheap, expensive or medium-priced. Table 26 gives the resulting Focus game for three different messages, each of which corresponds to a different prosodic pronunciation of the DP *cheap convertible*.

t_1	'cheap convertible'
t_2	'medium-priced convertible'
m_1	[_F cheap]
m_2	[_F convertible]
m_3	[_F cheap convertible]
a_1	'cheap convertible'
a_2	'medium-priced convertible'

TABLE 26: E_1

Using the same methods from 5.3.4, we obtain the following Expected Utilities for the Receiver.

	a_1	a_2
m_1	p	0
m_2	$\frac{1}{2}p$	$\frac{1}{2}(1 - p)$
m_3	p	0

TABLE 27: RECEIVER EUS FOR E_1

Using these, we calculate the following EUs for the Sender.

	m_1	m_2	m_3
t_1	2	$2q$	$1\frac{1}{2}$
t_2	0	$2(1 - q)$	0

TABLE 28: SENDER EUS FOR E_1

We see that if the Receiver is of type t_1 , there is a unique equilibrium strategy: m_1 , which is [F cheap].

Now consider different variations of the DP *expensive SUV* under expectation set E_2 (where the Receiver knows the gift is not a convertible).

t'_1	'expensive SUV'
t'_2	'expensive sedan'
m'_1	[F expensive]
m'_2	[F SUV]
m'_3	[F expensive SUV]
a'_1	'expensive SUV'
a'_2	'expensive sedan'

TABLE 29: E_2

Tables 30 and 31 give the Expected Utilities for the Receiver and Sender, respectively.

	a'_1	a'_2
m'_1	$\frac{1}{2}p'$	$\frac{1}{2}(1 - p')$
m'_2	p'	0
m'_3	p'	0

TABLE 30: RECEIVER EUS FOR E_2

	m'_1	m'_2	m'_3
t'_1	$2q'$	2	$1\frac{1}{2}$
t'_2	$2(1 - q')$	0	0

TABLE 31: SENDER EUS FOR E_2

In this game, a type t'_1 Sender, wishing to convey 'expensive SUV' does best by sending the message [F SUV].

Finally, consider a game for E_3 , where the possible types are neither expensive nor convertibles, and the message corresponds to *cheap SUV* or *cheap sedan*.

t''_1	'cheap SUV'
t''_2	'cheap sedan'
t''_3	'medium-priced SUV'
t''_4	'medium-priced sedan'
m_1	[_F cheap]
m'_2	[_F SUV]
m''_3	[_F cheap SUV]
m''_4	[_F sedan]
m''_5	[_F cheap sedan]
a''_1	'cheap SUV'
a''_2	'cheap sedan'
a''_3	'medium-priced SUV'
a''_4	'medium-priced sedan'

TABLE 32: E_3

Let r be the probability of an SUV, and let r' be the probability of a cheap gift. Let R be $1 - r$, and let R' be $1 - r'$

	a''_1	a''_2	a''_3	a''_4
m_1	$\frac{1}{2}rr'$	$\frac{1}{2}Rr'$	0	0
m'_2	$\frac{1}{2}rr'$	0	$\frac{1}{2}rR'$	0
m''_3	rr'	0	0	0
m''_4	0	$\frac{1}{2}Rr'$	0	$\frac{1}{2}RR'$
m''_5	0	Rr'	0	0

TABLE 33: RECEIVER EUS FOR E_3

For simplicity, let's assume that the Sender believes that the Receiver considers all possibilities in E_3 equally *a priori*. We obtain the following Sender EUs.

	m_1	m'_2	m''_3	m''_4	m''_5
t''_1	1	1	$1\frac{1}{2}$	0	0
t''_2	1	0	0	1	$1\frac{1}{2}$
t''_3	0	1	0	0	0
t''_4	0	0	0	1	0

TABLE 34: SENDER EUS FOR E_3

If the Sender wishes to convey either ‘cheap SUV’ or ‘cheap sedan’, it is better to Focus the whole NP, because otherwise the salience of ‘cheap’ is divided among those two options, making coordination less likely.

What we have shown here is that the the message $[_F \text{ ‘cheap’}]$ is only optimal under expectation set E_1 . If either E_2 or E_3 are operable, the Sender should never send that message—there is always a better one. Assuming a perfectly rational Sender and Receiver, as we have been, the Receiver knows that the Sender would not send $[_F \text{ ‘cheap’}]$ under any expectation set other than E_1 , and therefore the Receiver reasons that the Sender must be signaling that E_1 is the expectation set which is consistent with the proposition being conveyed. That is, the Receiver can reason as follows.

1. I expect the Sender either to confirm my assumption that Mary got an expensive convertible, or to correct it. I do not know which.
2. The Sender has sent a message that would fail to result in an equilibrium state unless the Sender’s speech act were a correction about the price of Mary’s convertible.
3. I assume that the Sender wishes to reach an equilibrium state, and I assume that the Sender assumes the same about me.
4. The Sender must be signaling that his speech act is a correction about the price of Mary’s convertible.
5. In that case, the Sender must be of type t_1 —the intended proposition for the message $[_F \text{ cheap}]$ is ‘Mary got a cheap convertible.’

Players assume that past moves by other players are rational—that the player did what they did for good reason. In game theory this principle is well-established and is called *forward induction*. (See Kohlberg and Mertens 1986 for a treatment of forward induction within formal game theory; see Sally 2002 for an application to pragmatics.) This general principle of behavior has reflexes in pragmatics: Gricean implicatures are calculated from the assumption that the speaker did not intend an infelicitous meaning. Similarly, the Receiver in this game assumes that the Sender did not send a sub-optimal message, thereby accommodating the corrective nature of the message (the convertible was cheap, not expensive). Therefore, in the context of (53), $[_F \text{ cheap}]$ allows the hearer to calculate ‘a cheap convertible’ as the meaning of the wh-Focused DP, which in turn (via the wh-Focus game) allows the hearer to calculate the meaning ‘Mary’s uncle got her a cheap convertible for her

wedding.’ The contrastively Focused adjective would be a sufficient transmission between a perfectly rational speaker and hearer in this context, and thus, due to the informational considerations discussed in 5.2, the highest degree of prosodic prominence falls on that adjective.

Why is (54) infelicitous? Why can’t the QUD Focus be [_F [_F blue] convertible]? The answer lies in the constraints on framing discussed in 5.3.3. In that section we derived a form of MEC which states that for any given expectation set containing [ab] and [ab’], where [ab] and [ab’] have distinct labels from a single family of attributes, the two labels must be in an MEC relationship. This constrains the expectation sets such that there is no set containing ‘blue convertible’ and ‘expensive convertible’—if there were such a set, then Focus on the adjective would frame the game in a way that violates the derived MEC constraint. Intuitively, it is not possible to correct a misconception about price with a color term. The only expectation set that would generate the message [_F blue] is one like {‘blue convertible’, ‘red convertible’, etc.}, but this is not congruent with the context as it is represented in Fig.63.

I take examples like the one covered here to be canonical uses of contrastive Focus. I now turn to what I take to be non-canonical uses, farmer sentences, and show that they are derivable via Gricean implicature

Farmer sentences

Thus far I have used the Focus game as a formal model of a particular intuition, which is really just an extension of the intuition behind Roberts (1996) and related work: the role of Focus in language is to highlight the information in an utterance which is sufficient for a rational hearer to calculate the speaker’s intended meaning. This has been presented in two forms. First, following Roberts (1996), Questions Under Discussion create expectations about what form the next utterance will take, and these expectations can be exploited to calculate the intended proposition using only the Focused material. Second, extending that work into the domain of contrastive Focus, other speech acts similarly delimit discourse expectations, but in different ways. The example given in the section above was that of a corrective speech act—when the hearer has asked the speaker to verify an assumption, the hearer assumes that the speaker will either verify, or else correct the false assumption along a particular semantic dimension. This allows the speaker to use contrastive Focus within the QUD Focus, such that the contrastive Focus would by itself make the meaning of the QUD Focus recoverable (in turn allowing the hearer to calculate the meaning of the entire

intended proposition).¹⁸ The main idea is that each layer of prosodic prominence highlights information that is particularly important for the interpretation of the layer below, so that the material on prosodic layer 0 (the Ground layer) is largely unnecessary from an information-theoretic perspective (though it may be necessarily pronounced for grammatical reasons). This analysis seems, *prima facie*, to stumble in the face of farmer sentences, originally discussed by Rooth (1992). The following rather famous example is taken to be an out-of-the-blue utterance (e.g. the beginning of a joke).

(57) [F An [F AMERICAN] farmer was talking to a [F CANADIAN] farmer...]

The QUD is something like ‘what happened?’ or ‘what is your joke?’ There is no Ground layer; the entire sentence is on either layer 1 or layer 2. The question is why layer 2 exists at all in examples like this. Sending the message [F AMERICAN] does not seem to in anyway make the rest of the intended meaning obvious or recoverable. In fact, in this context, the set of discourse expectations is almost completely open-ended. Under Rooth (1992), the Focus structure here is licensed because the two farmers belong to the same alternative set {‘American farmer’, ‘Canadian farmer’, ‘Mongolian farmer’, etc.}, and that Focus is licensed whenever there is an antecedent which evokes that alternative set. (The two Foci license each other.) Under a re-formulated Wagnerian approach, the two Foci are licensed because the NPs within which they are contained are in Mutually Exclusive Contrast, i.e. UniClo(‘American farmer’) entails the negation of ExClo(‘Canadian farmer’), and vice versa.

These descriptive generalizations certainly hold, but in this chapter I have attempted not to describe these phenomena formally, but to explain *why* the system works this way using general principles of communication and reasoning. Such an explanation is important, I argue, because Focus is almost certainly not a feature in narrow syntax, and if such an explanation is not possible, then it remains a troubling mystery how the pragmatic meaning of an utterance can determine its linguistic form without syntax mediating the two. To this end, I propose that farmer sentences can indeed be analyzed within the current framework. The key insight is that a seemingly sub-optimal Focus structure can have the effect of changing the hearer’s expectations via Gricean implicature. Keeping our attention on the first half of (57), repeated below as (58), the implicature goes as follows.

¹⁸The idea that Focus represents information that is not “recoverable” is not a new one. In a sense, the current conception represents a return to the “predictability” analysis of Focus (Halliday, 1967; Kuno, 1972; Prince, 1981b). Under the game-theoretic analysis, this intuition about Focus arises from how the space of possible types/actions is structured.

(58) An AMERICAN farmer was talking to . . .

0. *Assume that the hearer has perceived and interpreted both prosodic layers*

1. The message on layer 1, [_F American], does not by itself yield a consistent equilibrium given the current state of the discourse.
2. Therefore, the message seems irrational. However, the message would be rational if there had been an expectation set of the form {‘American farmer’, ‘Canadian farmer’, ‘Mongolian farmer’, etc.}.
3. I cannot accommodate an expectation set that didn’t exist, but I can alter my current expectation set to include it.
4. I assume that the Sender is rational, and therefore there must have been a reason for sending [_F American].
5. The Sender, if rational, has intentionally evoked the set {‘American farmer’, ‘Canadian farmer’, ‘Mongolian farmer’, etc.} in order to include it in my current expectation set.
6. The remainder of the Sender’s utterance will contain an NP of the form ‘P farmer’, where P is some nationality.

The reasoning is straightforwardly Gricean¹⁹, save for step 0: “Assume that the hearer has perceived and interpreted both prosodic layers.” This would seem to go against the motivation for the Focus game—that prosodic prominence is assigned so that less prominent elements could be lost to noise without preventing successful communication. I argue otherwise for two reasons: (1) I have never claimed this motivation to be anything other than a heuristic—after all, most of what is said is *not* lost to noise—but rather that minimizing the effect of noise during communication is one factor that is considered when forced to choose from among otherwise equal prosodic alternatives, and (2) using apparently sub-optimal messages to convey implicit meanings is not only attested, but is a core mechanism of nearly all pragmatic reasoning. In that regard, the reasoning used to justify (58) is no different from the reasoning that allows any conversational implicature. The Sender has sacrificed one kind of optimality to achieve a different communicative goal, namely to

¹⁹This reasoning could itself be re-stated in game-theoretic terms, using the principle of forward induction. I will not endeavor to do so here.

evoke an alternative set which had not previously been part of the discourse. This has the effect of signaling to the hearer what will come next. It is known that contrastive Focus has such effects on hearers' expectations. Ito and Speer (2008) give convincing evidence from eye-tracking experiments that anticipatory processing is facilitated by the use of contrastive Focus as in (57). In a review of several experiments in that paradigm, Sedivy (2003) concludes:

(T)he emerging data suggest a prominent role for pragmatic communicative principles in guiding commitments made on the fly in the course of linguistic interpretation. (p.20)

This explains why (57) is perfectly acceptable, but (59) is not—if *American farmer* has created an expectation set containing all farmers of a certain nationality, then the message [F Canadian] becomes optimal, and that message is incongruent with (59).

(59) #An AMERICAN farmer was talking to a Canadian FARMER. . .

This is not to say that speakers explicitly reason about such effects on interpretation. As discussed at length in 5.2, these “motivations” for choosing one prosodic structure over another are to be taken as principles followed by idealized, perfectly rational interlocutors. It is likely that interlocutors in the real world reason from a somewhat simpler system of rules based on systematic correspondences between semantics, pragmatics and prosody. That system may look an awful lot like the analysis of Rooth (1992), but with no encoding of Focus in syntactic competence. Again, the goal here is to explain why, for English and other languages with similar phonological parameters, the system developed to be the way it is and not some other way, given that we cannot appeal to syntactic universals.

Beyond expanding the explanation of Rooth's system beyond Questions Under Discussion, the current analysis explains Wagner's constraint which I have called Mutually Exclusive Contrast (MEC). As argued in 5.3.3, MEC is a direct consequence of Bacharach's (2006) principles of framing. These principles explain, for example, why the following is so insulting.

(60) An AMERICAN farmer was talking to an INTELLIGENT farmer.

Recall Bacharach's constraint on frames: attributes come to mind in clusters. If the family of attributes *nationality* is evoked, then any pair of nationalities, e.g. 'American', 'Canadian', should be evoked. The following implicature ensues.

1. Focus on *American* implies that the nationality of some farmer will be an attribute upcoming linguistic material.
2. Focus on *intelligent* implies that the attribute of intelligence should have been expected.
3. Yet, the speaker has not supplied the nationality of the second farmer, or the intelligence of the first.
4. This would only be rational if *American* and *intelligent* were in the same family of attributes.
5. If the speaker is being cooperative, she must be intending to mean that in her mind they are.
6. Following 5.3.3, the speaker must be conveying that the attributes ‘American’ and ‘intelligent’ are in Mutually Exclusive Contrast.
7. Americans are unintelligent.

Having covered canonical cases of wh-Focus and contrastive Focus, and having extended that analysis to farmer sentences, I end this chapter with notes about Focus below the word level and association with *only*.

Morphological and phonological attributes

There is a minimal extension of the current analysis which allows us to account for Focus of word parts, as in the following.

- (61) a. It’s not a stalactite; it’s a stalagMITE.
 b. Q: This is a stalag-what?
 A: It’s a stalagMITE.
 (Artstein 2004, p.7)
- (62) A PROactive farmer was talking to a REactive farmer. . .
 (from Roberts 1996, p.43)
- (63) We drove from MINnesota to SARasota.

Until this point we have been operating with a notion of *semantic attribute*—the meaning ‘Bill’ is an attribute of the proposition ‘Bill is teaching phonetics’ because that proposition cannot be brought to mind without bringing Bill to mind. Formally, the salience of $\text{ExClo}(\text{‘Bill is teaching phonetics’})$ necessitates the salience of $\text{ExClo}(\text{‘Bill’})$. But as we acknowledged in 5.1 and 5.3.1, Focus can occur on elements with little or no meaning. We must extend the notion of attribute to account for morphemes and phonemes, independently of meaning.

1. X is a *semantic* attribute of Y iff X and Y are meanings represented as formulas in typed lambda calculus, and the salience of $\text{ExClo}(Y)$ in the Common Ground entails the salience of $\text{ExClo}(X)$ in the Common Ground.
2. X is a *morphological* attribute of Y iff X is a morpheme, Y is a morphologically complex word, and Y dominates X.
3. X is a *phonological* attribute of Y iff X is a sequence of phonemes comprising a metrical foot, Y is a phonological word, and Y contains X.

BOX 10: THREE WAYS TO BE AN ATTRIBUTE

Both morphological composition and phonological shape are salient attributes of a lexical item. This allows contrast between affixes as in (62) or between syllables as in (63) and (61). But crucially, standard models of grammar do not represent structurally complex phrases as strings of phonemes, but rather as strings of abstract words. This property of language, arising from its hierarchical nature, makes phonological representation less salient as a labeling property of a syntactic phrase than as a labeling property of an individual lexical item, and therefore suggests that one is less likely to frame a complex phrase as a sequence of phonological units. This rightly predicts the infelicity of the following.

(64) #We drove through MINnesota and drank a LOTta soda.

The difference between (63) and (64) is that in the case of the former, the two objects being contrasted correspond to single lexical items, and therefore it is natural to represent them both as sequences of metrical feet. But in the case of the latter the contrast is between DPs, one of which is syntactically complex. Here, “Minnesota” and “lotta soda” are conceived of as phrases rather than as lexical items, and therefore phonological structure is not an appropriate family of attributes. So while (63) suggests the game in Table 35, where the feet *minne* and *sara* can be used as differentiating attributes to refer to Minnesota and Sarasota, (64) can only suggest the game in Table 36, where the game is framed not as

a choice between different sequences of metrical feet, $\langle \text{minne}, \text{sota} \rangle$ or $\langle \text{sara}, \text{sota} \rangle$, but rather as a choice between different semantic symbols, *MN* or *soda*. In Table 36, the messages do not pick out an attribute for either action, and are therefore bad messages for the Sender.

	$\langle \text{minne}, \text{sota} \rangle$	$\langle \text{sara}, \text{sota} \rangle$
<i>minne</i>	<i>p</i>	0
<i>sara</i>	0	<i>p'</i>

TABLE 35: EXPECTED UTILITIES FOR THE RECEIVER, MINNESOTA/SARASOTA

	<i>MN</i>	<i>soda</i>
<i>minne</i>	0	0
<i>lotta</i>	0	0

TABLE 36: EXPECTED UTILITIES FOR THE RECEIVER, MINNESOTA/A LOTTA SODA

It is only in the case of (63) that the game may be framed in a way that allows Focus below the word level. Focus below the word level in (64) would suggest to the hearer a frame which is not legal under our assumptions about what counts as an attribute for different kinds of linguistic objects.

Association with only

I end with a note about association with *only*. Beaver and Clark (2008) lay out a convincing case that the known sensitivity of *only* to Focus placement is indirectly lexically encoded, and they give a pragmatic meaning for *only* that accounts for the sensitivity. Under their account, the function of *only* is to signal that the answer to the current Question Under Discussion that is being given is the most informative answer that could have been given, *contra* some expectation that a stronger proposition was true. For example, (65) and (66) mean roughly, ‘Of all possible answers to that question, ‘I gave a glass of wine to Anscombe’ is the most informative answer, even though you expected otherwise.’ The difference in meaning comes from the fact that the lexical meaning of *only* makes reference to the QUD, and therefore the set of propositions among which the given answer is the most informative is different given the different Focus structures. Example (65) ends up meaning, ‘contrary to expectation, I didn’t give anything more than a glass of wine to Anscombe’, while (66) ends up meaning, ‘contrary to expectation, I didn’t give a glass of wine to more people than Anscombe.’

- (65) Q: What did you give to Anscombe?
 A: I only gave [_F a glass of WINE] to Anscombe
- (66) Q: Who did you give a glass of wine to?
 A: I only gave a glass of wine to [_F ANSCOMBE]
 (Examples after Selkirk 2007)

For examples like this, the Beaver and Clark account is fully compatible with what has been said here. There is a slight hiccup, however, in accounting for cases of nested Foci like (67), which can be uttered with broad QUD Focus.

- (67) a. [_F Wittgenstein only brought a glass of WINE over to [_F ANSCOMBE]]
 b. [_F Wittgenstein only brought [_F a GLASS of WINE] over to ANSCOMBE]

These are taken to be answers to the question, ‘what happened?’ The nested Foci here are not congruent to QUDs, but rather to expectations more generally. Thus the difference between (a) and (b) is not accounted for if *only* makes reference only to QUDs. I will leave a more rigorous solution to this problem for future work, but for now I can propose that the lexical meaning of *only* must be able to signal information not only about QUDs but about any expectation set. We might take (67-a) to mean something like, ‘contrary to expectation, the set of entities who received wine from Wittgenstein is maximal.’ The expectations will differ based on which position is Focused, e.g. whether a beverage is Focused or whether a recipient is Focused. This would explain the pragmatic difference between the two utterances.

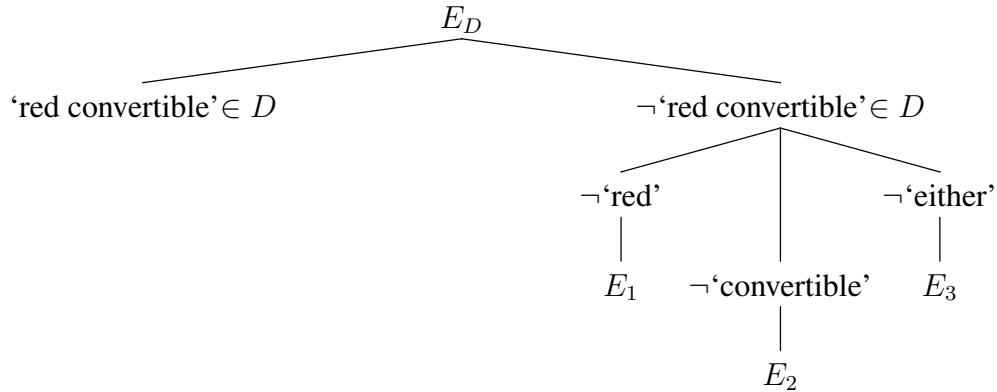
Under this account, the association of *only* with Focus is a byproduct of the fact that the semantics of *only* makes reference to expectations in discourse. This broader interpretation of Beaver and Clark (2008) allows us to account for the following example from Roberts (2006), which would otherwise be problematic.

- (68) A: John’s aunt Mary is wealthy and has lots of cars, so she often lets him drive one. Now that he’s turned 21, sometimes John drives Mary’s mini and other times he drives her red convertible.
 B: What did he drive before?
 A: He only drove her BLUE convertible.

I take this to have the following structure.

(69) He only drove [_F her [_F BLUE] convertible]

The meaning here is something like, ‘contrary to expectation, John was allowed to drive no more than a single convertible, and also contrary to expectation, that convertible is blue and not red.’ In terms of the Focus game, this nested Focus structure corresponds to the following structured set of expectations, where D represents the set of cars that John was allowed to drive before he was 21.



$E_1 =$	$\{D \exists x \in \{\text{'blue convertible'}, \text{'yellow convertible'}, \text{etc.}\}. x \in D\}$
$E_2 =$	$\{D \exists x \in \{\text{'red SUV'}, \text{'red sedan'}, \text{etc.}\}. x \in D\}$
$E_3 =$	$\{D \exists x \in \{\text{'blue SUV'}, \text{'blue sedan'}, \text{etc.}\}. x \in D\}$

FIGURE 64: WHAT JOHN WAS DRIVING

Very tentatively, I propose that the meaning of *only* is along the lines of the following.

[[only P]] = There exists a set of expectation sets \mathcal{E} such that for every expectation set E in \mathcal{E} , P is the most informative proposition consistent with E .

For simpler examples like (65) and (66), \mathcal{E} is the singleton set containing the QUD. For (68), \mathcal{E} is the set containing both the QUD and E_1 from Fig.64. The correlation with Focus arises from the close relationship between Focus placement and expectation sets. This is consistent with the prosody in (68), which in Roberts (2006) was analyzed in terms of Givenness, where the prosody results from the requirement that one de-accent *convertible* due to its salience in prior discourse. As argued in Chapters 3 and 4, this is untenable because Givenness, due to its syntactic nature, is never a feature of partial adjunct structures. The intonation in (68) must be due to Focus, and this is evidenced by a strict requirement of MEC.

- (70) A: John's aunt Mary is wealthy and has lots of cars, so she often lets him drive one. Now that he's turned 21, sometimes John drives Mary's mini and other times he drives her red convertible.
- B: What did he drive before?
- A: #He only drove that AMAZING convertible. / He only drove that amazing CONVERTIBLE.

In this chapter I have argued for a particular conception of Focus in light of comparing its distribution to that of Givenness-marking. Perhaps the most fundamental claim underlying this analysis is that Focus is not represented anywhere in the syntactic derivation of a sentence. This is at odds with much previous work examining the effects of Focus on movement and word order. If Focus is not encoded in syntax, then how can it motivate movement? In the next chapter, I conclude the core argument of this dissertation by suggesting that (1) apparent cases of Focus-motivated movement are often motivated by some other independent feature, and (2) there are correlations between Focus and other features which make it possible for Focus to have indirect effects on word order.

Chapter 6

Focus and Movement

6.1 Focus-correlated Movement

I conclude the core argument of this dissertation with some suggestions about Focus-correlated movement. I use the term “Focus-correlated” deliberately, as I suggest that apparent cases of Focus movement are merely correlated with Focus, rather than being directly motivated by it as many analyses suggest. This is a logical entailment of the analysis given in Chapter 5, because for movement to be directly motivated by Focus requires an F-feature in narrow syntax, which is exactly what I have argued against. But it is not merely a consequence of the current theory—there is some independent evidence that this is true. This chapter provides that evidence, and gives tentative analyses for the phenomena presented.

The term “Focus” has been used in this work to refer to a particular phenomenon. Namely, an element that is in Focus is chosen to be prominent for pragmatic reasons, usually in virtue of the fact that the element represents the minimal information required for the hearer to recover the speaker’s intended meaning. The results of this “pragmatic filter” on prosodic structure is a system which can be formally described in a way similar to Rooth (1992), where every Focused element has an antecedent in discourse which is part of an alternative set that is generated by the Focus. In much of the literature on Focus-correlated movement phenomena, however, the term “Focus” is used to refer to some related but distinct phenomenon. Under the current terminology, then, the motivation for many of these movement operations is not, strictly speaking, Focus. I survey literature that shows this to be the case for “Focus movement” constructions in English, German, Hungarian, Chadic and Italian. I then give tentative analyses for a few of these cases.

I begin by introducing one of the more difficult cases as an example: pseudo-gapping in English. Following Jayaseelan (2001), Tanaka and Smith (2006) and Gengel (2007), constructions like the following (example from Gengel 2007, p.287), where the non-Focused part of a vP is elided resulting in a gap, result from movement of the Focused constituent to the left edge of vP, licensing the deletion of the lower remnant vP.

- (1) This should make you laugh. **It did me.**

Analyses differ in whether the Focused element moves to the left edge of the vP or to the specifier of a Focus projection. The main argument for the latter from Gengel (2007) arises precisely because of the correlation with Focus. Given that I will propose this correlation to be indirect and not encoded as a feature, I will adopt the simpler analysis where the Focused element is in a second specifier of vP. Thus I take (1) to have the structure in Fig.65.

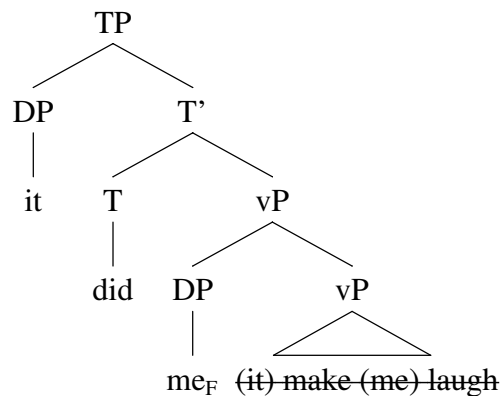


FIGURE 65: PSEUDO-GAPPING

A structure like this one is consistent with the sensitivity of pseudo-gapping to islands, as demonstrated in the following.

- (2) a. *George visited a lake near Iraq, but he didn't Afghanistan.
 b. *Which country did George visit a lake near?
 (Tanaka and Smith 2006, p.9)

It is claimed that (2-a) is ungrammatical for the same reason that the wh-movement in (2-b) is ungrammatical: the adjunct *near Afghanistan* is an island, and therefore the Focused constituent cannot escape it, and the deletion of the remnant vP cannot take place. If it weren't for the island effect, (2-a) would be a valid sentence meaning 'George visited a lake near Iraq, but he didn't visit a lake near Afghanistan.'

I claim later in this chapter that for cases like this where the target of the apparent Focus movement is the edge of a phase (i.e. the edge of vP or the edge of CP), it is not necessary to posit a Focus feature to motivate the movement. Instead, we can appeal to the optionality of so-called “Edge features” (Chomsky, 2001) which are independently necessary in the Minimalist system to allow wh-movement and other basic operations. The idea is that constituents can optionally be merged with an Edge feature, and that before a vP or CP is “spelled out”, constituents marked with an Edge feature must move to the left edge, i.e. a specifier position of that vP or CP. This allows, for example, a wh-word to “escape” a vP and move up to spec,CP without violating independently motivated locality constraints on syntactic derivations (see Legate, 2003). Under this approach to wh-movement, the Edge features are inherently optional (i.e. not every v-head has one) but if they are not included in the derivation, the derivation will crash because the proper movement requirements are not met.

It is possible that the same features are at work in pseudo-gapping, such that the vP in (1) has the structure in Fig.66.

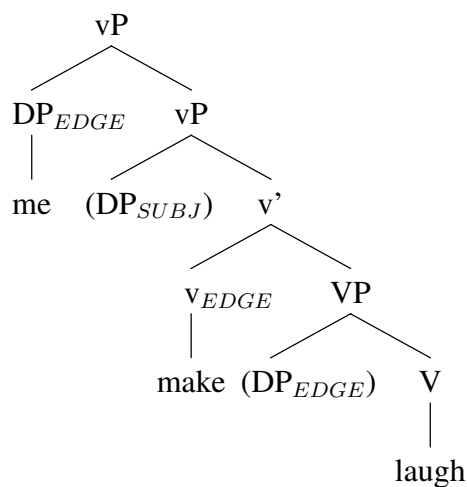


FIGURE 66: VP IN A PSEUDO-GAPPING STRUCTURE

This is consistent with the unavailability of pseudo-gapping in wh-questions, because the Edge feature on v that is required to move the Focus is satisfied by the wh-word instead, and the Focused constituent cannot escape the domain of deletion.

- (3) a. Did John get Mary several presents for her birthday? Mary did John.
 b. *What did Mary do John? (meaning ‘What did Mary get John for his birthday?’)

There is an immediately apparent *prima facie* problem with this: if Edge features are not

constrained to cases of cyclic movement, then how can our analysis prevent just any old element from moving to the left edge of a phase at any time? While this is a valid concern, it turns out not to be too problematic under the conception of language as a communicative tool which I have advocated in this work. Recall from the discussion in 5.2 my argument that what is commonly called “language” should be analyzed in terms of two generative processes: (1) what Chomskyan syntacticians call “the language faculty”, a generative process delineating the space of possible grammatical structures, and (2) a way of representing the output of the grammatical system in discourse, and of filtering that output so that only *felicitous* utterance/context pairs remain. By hypothesis, the space of acceptable sentences is determined by a combination of these two factors. The grammar may over-generate, but if an unattested structure is predicted never to be felicitous in any imaginable context, then the unacceptability of that sentence can be explained by that fact alone, without requiring the grammatical system to prohibit it. I argue that Fig.66 is predicted to be felicitous only in cases where the Edge feature has the effect of removing a Focused constituent from a phrase that has been marked for ellipsis at PF. The unavailability of the feature in other contexts arises from the fact that those contexts never allow the felicitous use of the feature. The correlation between Focus and ellipsis/pseudo-gapping is indirect and pragmatic, and not, strictly speaking, syntactic. This is along the lines of Yang (2006), who claims that Edge features are truly optional, but that both interface conditions and discourse effects mediate whether their use is warranted.

I return to this example later. First, I would like to outline some other apparent cases of Focus movement and give arguments from the literature that they are directly motivated by something other than Focus.

6.1.1 “Focus movement” and Yiddish movement in English

Two cases of apparent Focus-motivated movement are analyzed in Prince (1981a): what she calls “Focus movement” and “Yiddish movement”. These phenomena are related, and perhaps identical in their syntactic analysis. They differ only in the pragmatic contexts which allow them. Example (4) illustrates.

- (4) a. Q: Didn’t you give him a few quarters just to go away?
 A: TEN DOLLARS I gave him! (Focus movement)

- b. “Van Goch”! Did you hear that? She said “Van Goch”.
 Like an ARAB she spoke!
 (Yiddish movement, from the Woody Allen film *Manhattan*)

The difference between (4-a) and (4-b) is that the former construction is available in a wider variety of English dialects, and is only felicitous in a contrastive/corrective context like the one given, and the latter is available only in dialects that have had contact with Yiddish (or so Prince 1981a claims), and is felicitous in any context where the moved phrase is being emphasized and where the remnant is Given.

These movements to the left edge of a matrix clause may represent the same mechanisms involved in pseudo-gapping. Namely, because CP is taken to be a phase (Chomsky, 2001; Legate, 2003) the movement could in principle be motivated by Edge features, where under the current analysis the merging of Edge features into the structure would require some pragmatic motivation.¹ The motivations would have to be dialect-specific in this case, to allow for the sociolinguistic variation with respect to Yiddish movement.

I tentatively propose that dialects which exhibit Yiddish movement have a stronger preference to mark XPs as Given than other dialects. If this is true, then there is a straightforward motivation for Yiddish movement: to extract a non-Given constituent from the TP in order to mark the remnant TP as Given. This is consistent with the pragmatics of (4-b)—Woody is making fun of the way somebody has pronounced the name “Van Gogh”, and thus the context makes it salient that somebody has spoken in a certain peculiar way. The descriptive PP *like an Arab* is extracted and moved to the edge of the CP phase in order that the remaining material below C may be marked as Given and de-accented. The trace of *like an Arab* is interpreted as a variable, and thus, as per Schwarzschild (1999), the context saliently entails the proposition $\exists P_{et,et}. \mathcal{P}(spoke)(she)$, licensing G-marking.

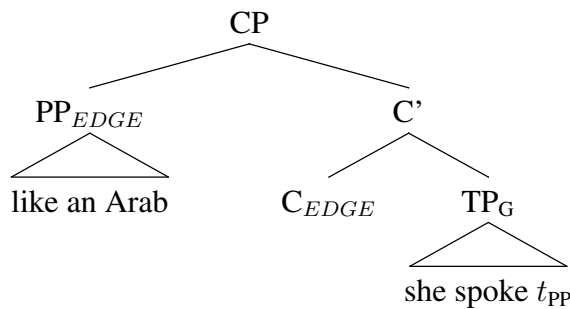


FIGURE 67: YIDDISH MOVEMENT

¹For analyses of IS-motivated movement in terms of Edge features, see Biskup (2006); Yang (2006); Brandtler and Molnár (2011); Fanselow and Lenertová (2011).

The more common pragmatic license in (4-a) evokes the license for movement in pseudo-gapping: the moved constituent is a narrow Focus. In (4-a) there is no Givenness-marking required. Rather, the de-accenting of the remnant follows from the Focus structure, which in turn follows from the corrective nature of the speech act (see 5.3.5).

I return to the details of the pragmatic motivations for Focus movement in 6.2, where I compare it to pseudo-gapping. In the meantime, I want to emphasize an architectural point: there is no *a priori* incompatibility between the current analysis and the foundations of Minimalist syntax, as long as we assume one simple principle. That principle can be formulated as follows: *if a felicitous context in which to use a particular syntactic structure cannot exist in principle, then that structure will be judged to be unacceptable, regardless of its grammaticality*. This principle allows pragmatics to constrain the application of optional movement operations. It can be seen as an economy principle on *numerations*, or selections of lexical items to merge into a syntactic structure. In other words, syntactic optionality is compatible with Minimalism if the optionality is mediated by pragmatic selection rules determining which lexical items one can use in which contexts.² This allows us to conceive of Focus/Yiddish movement as Edge-motivated movement to spec,CP without overgenerating—if there is no pragmatic/communicative advantage for merging the appropriate Edge features, those features will never be included in the numeration in language use. If movement of non-Foci is never felicitous in English, then the movement will be judged to be unacceptable for all such contexts. The challenge, then, is twofold: (1) can we show that Edge-motivated movement of non-Foci is pragmatically undesired in English? and (2) what accounts for cross-linguistic differences in the interpretation of Edge elements?

In this chapter I suggest a sketch of an analysis which accounts for pseudo-gapping and Focus movement in English. I then apply the same principles to IS effects on word order in Italian, which illustrates how syntax and pragmatics conspire to create word order generalizations. Before moving on to these analyses, I briefly survey some literature on Focus-correlated movement in German, Hungarian, Chadic and Italian. In each case, the movement in question is in fact only indirectly motivated by Focus. Ultimately, I aim to show that F-features in narrow syntax are not necessary to derive the full range of facts, which would preserve the current hypothesis that Focus is not encoded anywhere in the grammatical derivation of a sentence, but is rather a byproduct of pragmatic principles for selecting from among multiple grammatical prosodic/syntactic structures.

²For a different view of optionality within Minimalism, see Biberauer and Richards (2006).

6.1.2 Focus and V2 in German

In German, which has a verb-second (V2) phrase structure, the left edge of CP must be filled by some element, and the tensed verb in a main clause undergoes head movement to C. These two requirements are in principle independent, and effects consistent with just one of the requirements have been found in other languages (e.g. Basque, see Haddican and Elordieta, 2013). Following the “cartographic” approach to IS originating with Rizzi (1997), a common approach to German syntax holds that spec,CP is filled via Focus and Topic features. Frey (2004, 2005, 2006) argues that Topic features do not motivate movement directly to spec,CP, but rather that topics (in the “aboutness” sense) move leftward within the TP domain, and that spec,CP is filled by whichever phrase occupies the left edge of TP. Frey nonetheless maintains that spec,CP can also be filled via direct movement of “contrastive” elements. Fanselow and Lenertová (2011) argue instead that spec,CP is always filled via an “unselective Edge feature”. Under this conception, phrases in German are free to scramble as leftward as TP, and spec,CP is filled by whatever the highest phrasal element is, which satisfies the obligatory Edge feature on C (see also Light, 2012; Stevens and Light, 2013). The difference between German and English in this regard is reduced to the fact that English possesses a declarative complementizer with no Edge feature, and German does not. Any correlation between Focus and movement to spec,CP is taken to be an epiphenomenon resulting from tendencies for Focused elements to undergo optional movement (in this case, scrambling above the subject).

To illustrate the problem at hand, consider the following example from Fanselow and Lenertová (2011, p.172).

- (5) Q: ‘What did you see there?’
A: eine LAWINE haben wir gesehen!
a.acc avalanche have we seen
‘We saw an avalanche!’

This illustrates the apparent connection between Focus and V2. Instead of the subject, which fills spec,CP by default, the direct object *eine Lawine* is the first element in the clause. Under analyses of IS which place F-features in syntax, the narrow Focus on *eine Lawine* can straightforwardly account for this—if there is a position above TP for narrow Foci, then the narrowly Focused element will become the target for movement into the periphery of CP. As Fanselow and Lenertová (2011) argue, that connection is tenuous at best. Instead, the generalization seems to be that, all else being equal, spec,CP is filled

by strongly accented elements. It is possible for phrases to receive strong pitch accent via other mechanisms, and it is just as natural in those cases for the accented phrase to occupy the left edge of the CP domain, as in the following from Fanselow and Lenertová (2011).

- (6) Q: ‘What’s new?’
A: einen HASEN habe ich gefangen!
a.acc rabbit have I caught
‘I caught a rabbit!’

There is broad QUD-Focus on the answer, and no contrastive Foci. The strong accent on *einen Hasen* follows from the combination of the emphatic nature of the utterance and the fact that *einen Hasen* receives the strongest pitch accent by default (see 5.1.2). It is not straightforward to analyze this in terms of movement motivated by F-features.

Moreover, it appears that spec,CP can be filled by the leftmost accented element in a broadly Focused sentence, even when that element is part of an idiom.

- (7) Die FLINTE hat er ins KORN geworfen.
the.acc gun has he in-the corn thrown
‘He threw the gun into the corn.’ (idiom, ‘He gave up’)

Fanselow and Lenertová note that the configuration in (7) has an “emphatic” flavor. We cannot analyze *die Flinte* as a Focus, since it has no meaning independent of the idiom *die Flinte ins Korn werfen* meaning ‘to give up’. The configuration in (7) can be seen to instantiate two tendencies: (1) for spec,CP to be filled by a strongly accented element if possible, and (2) for definite DP arguments to scramble leftward (see 4.1).

As underlined by Fanselow and Lenertová as well as Frey, the question of how spec,CP is filled in German main clauses is complex, and the relation to information structure is not straightforward. Whichever mechanisms are responsible, be they prosodic, pragmatic or both, there is no one-to-one mapping between Focus, as it is conceived of in this work, and movement to spec,CP in German.

6.1.3 Hungarian

One of the most studied instances of Focus-correlated movement occurs in Hungarian (see e.g. Szabolcsi, 1981; Kiss, 1998; Szendrői, 2003; Kenesei, 2006; Kiss, 2007; Horvath, 2010). The following example from Horvath (2010, p.1359) illustrates.

- (8) Q: ‘Who did they call up?’
 A: JÁNOST hívták fel.
 John.acc called.3PL up
 ‘They called John up.’

Here the movement of the narrowly Focused direct object *Jánost* is apparent from the position of the verb. Normally, the verb will follow an associated particle like *fel*, but when an argument is narrowly Focused as in (8), the verb moves past the particle, and then the object past the verb, to an apparent Focus position in the left periphery. But this syntactic position is associated with a meaning beyond mere Focus. Kiss (1998) calls it “identificational focus”, and distinguishes it from “information focus”, the latter of which is more along the lines of the notion of Focus discussed in this work. This additional meaning is an entailment of exhaustivity. The syntax in (8) requires that John be the only one who was called up. Contrast this with the example below, which can in fact be used to negate the assertion in (8). The object *Marit* is taken to be *in situ*, and no exhaustivity is conveyed.

- (9) MARIT is felhívták.
 Mary.acc also up-called.3PL
 ‘They also called Mary up.’

As with German, there is not necessarily a direct relationship between this position and Focus in the broader information-structural sense. Examples like (8) are often translated as clefts in English (‘it was John they called up’) because of the strong exhaustivity effect. It is not possible to conjoin the answer in (8) with (9). Moreover, this is a truth-conditional entailment—it is possible to negate the sentence in (8) with (9), or even a sentence meaning ‘They called both John and Mary up.’ This exhaustivity requirement (e.g. that John was called *and no one else*) is not normally a semantic characteristic of Focus. Furthermore, the conventionalized nature of the requirement (i.e. its inability to be canceled as a Gricean implicature can be) suggests an independent motivation for the movement. Horvath (2010) postulates just this. Under Horvath’s account, so-called Focus movement in Hungarian is motivated by a functional head with an Exhaustive Identification (EI) feature which probes for exhaustively interpreted arguments and forces movement into the specifier position of that head.

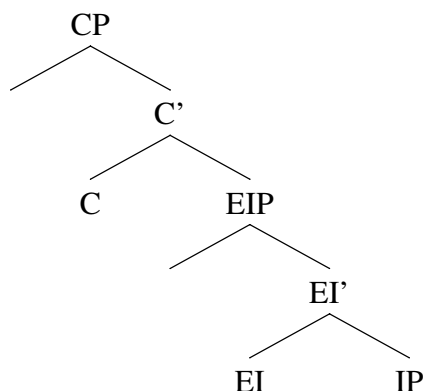


FIGURE 68: EXHAUSTIVE IDENTIFICATION (EI) MOVEMENT

Under this analysis the correlation of EI with Focus is epiphenomenal, arising from the fact that EI has a semantics similar to *only*, which naturally associates with Focused constituents (see 5.3.5). That is to say, it is really a misnomer to deem this “Focus movement”, as it is for many such constructions across languages. That does not mean that Focus does not interact with syntax. It means that the effects of Focus on syntax are indirect, and thus often carry a more narrow interpretation than Focus broadly construed. This sentiment is nicely distilled by Zimmermann and Onea (2011, p.1662), who after surveying data from several languages come to the following conclusion.

(T)here is no strict one-to-one correlation between the general notion of focus and particular marking strategies, but this still leaves open the possibility of there being a one-to-one mapping between a particular grammatical realization and particular subtypes of focus.

Along these same lines, Zimmermann (2008) shows that morphological and syntactic “Focus” marking in Chadic languages is correlated with a conception of “Focus” which is quite different than the conception which applies to languages like English and German (and Hungarian, for that matter). I now turn to two examples.

6.1.4 Chadic (Zimmermann 2008)

Zimmermann (2008) examines data from Chadic languages and argues that what is often called contrastive Focus should be analyzed differently. Zimmermann holds that “Focus” marking in these languages, which can be syntactic or morphological, carries a meaning of “discourse unexpectedness”. For example, Gùrùntùm exhibits Focus marking in the form of a cleft-like construction as in the following (Zimmermann, 2008, p.4).

- (10) Q: ‘What did Audu catch?’
 a. *Á gàmshí màì Áudù náa*
 FOC crocodile REL Audu catch
 ‘Audu caught a crocodile!’

The direct object *gàmshí* ‘crocodile’ is marked with a Focus-correlated morpheme *á* resulting in a syntactic structure similar to English clefts, e.g. “it was a crocodile that Audu caught.” But, like German, apparent Focus-marking operations can target partial Foci. The following example from Hausa illustrates (Zimmermann, 2008, p.5).

- (11) Q: ‘What happened?’
 a. *B’aràayii nèè su-kà yi mîn saatà!*
 robbers PRT 3PL-REL.PERF do to.me theft
 ‘Robbers have stolen from me!’

In Hausa, Focus is often said to be marked via syntactic movement, and yet, as is the case for German, broad Focus cases like (11) introduce a problem for this simplistic view. The subject ‘robbers’ has moved, and Zimmermann argues this to be motivated by discourse considerations, exactly as in example (6), the example of partial Focus movement from Fanselow and Lenertová (2011). The author’s conclusion is as follows.

It is therefore impossible to predict the presence or absence of a contrastive marking on a focus constituent α just on the basis of its inherent properties, or its immediate discourse function as an answer, correction, etc.. Rather, the presence or absence of a special grammatical marking on α depends on the specific discourse requirements at a specific point in the discourse. These are influenced by the intentions of the speaker and her assumptions about the knowledge state(s) of the hearer(s). (Zimmermann, 2008, pp.5-6).

These grammatical constructions in Chadic, Hungarian and German all have a “flavor” of Focus-marking, but as Zimmermann and Onea (2011) note, there is no one-to-one mapping between any of these constructions and any common definition of Focus. Both Italian and English have constructions (pseudo-gapping and “cartographic” movement) which seem to map more tightly onto the notion of Focus developed in this work, but I argue in the remainder of this chapter that these constructions may nonetheless be analyzed as pragmatically motivated Edge movement. I now turn to a brief summary of the Italian data before giving more detailed sketches of both English and Italian.

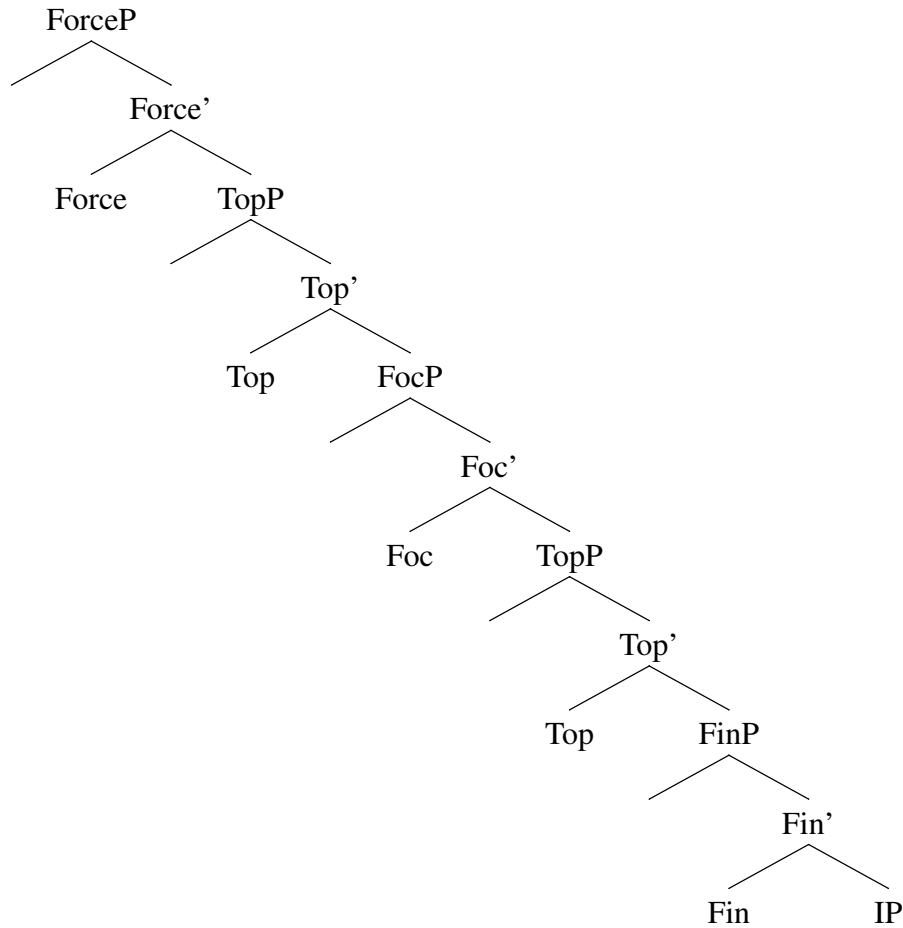


FIGURE 69: RIZZI'S CARTOGRAPHY

6.1.5 Italian

One of the most influential schools of thought regarding the effects of IS on syntax is the so-called cartographic approach of Rizzi (1997). Under this approach, information-structural categories like Topic and Focus are explicitly marked in syntax via a series of functional projections in the left periphery of a CP. Rizzi (1997) claims the basic structure for a clause seen in Fig.69, where CP is divided into “ForceP”, which serves the basic function of a complementizer, and “FinP”, which determines whether the clause is finite. In between those two projections there are two Topic phrases (TopP) and a Focus phrase (FocP), all headed by silent functional projections which attract elements of the appropriate information-structural category into the associated specifier positions.

Belletti (2004) expands this cartography into the IP periphery, such that the Top and Focus positions are similarly iterated between IP and vP. This is not a particularly parsimonious theory—six positions are required to account for two information-structural categories—but it accounts for effects of IS on syntax in the low IP area using only the categories originally proposed by Rizzi (1997). For example, Belletti aims to explain the availability of subject-final intransitive sentences in different information structural contexts. We see that in a broad Focus context, either SV or VS word order is possible.

- (12) Q: ‘What happened?’
 A: Ha telefonato GIANNI / Gianni ha TELEFONATO
 has telephoned Gianni / Gianni has telephoned
 ‘Gianni called.’

This contrasts with the following, where the narrow QUD-Focus on *Gianni* requires VS and prohibits SV.

- (13) Q: ‘Who called?’
 A: Ha telefonato GIANNI / #GIANNI ha telefonato

The SV word order becomes natural again if we make the context one where the subject is contrastively Focused rather than QUD-Focused, e.g. in a corrective context.

- (14) Q: ‘Did Maria just call?’
 A: No. GIANNI ha telefonato

This is explained under the cartographic approach if: (1) default VS word order as in (12) is the result of merging a silent pronoun *pro* into spec,TP and leaving the subject *in situ* below Tense, (2) narrowly Focused subjects move to a Focus position below Tense but above spec,vP, (3) this blocks movement into spec,TP, forcing the subject to remain below Tense, in turn forcing *pro* to be merged, in turn forcing VS word order, (4) the only way for a narrowly Focused DP to raise above Tense is to raise into the second spec,FocP which is in the C-domain, and (5) the Focus projection in the C-domain carries an explicitly contrastive interpretation.

But if we abandon the cartographic approach, which I must do at least partially, these facts may still be accounted for. Firstly, given the free choice between VS and SV in default contexts, the obligatoriness of VS in narrowly Focused contexts can be seen as a byproduct of Italian prosody. In Italian, right-edge prominence is more strongly preferred, and

constituents within the core clause are typically unable to de-accent (Ladd, 1996; Avesani and Vayra, 2005). All things being equal, VS will be strongly preferred to SV in cases of narrow QUD-Focus on S because it places the strongest pitch accent at the right edge of the clause. This is of course violated in contrastive instances like (14). But this may be a case where pragmatic considerations trump phonological ones. I suggest mechanisms for this in 6.2 and 6.3.

Secondly, it should be noted that many examples of what Belletti calls “Topics” are in current terms actually Given-marked elements. Givenness-motivated movement is in no way at odds with the current analysis, because as motivated in Chapters 3 and 4, Givenness, unlike Focus, is directly encoded in syntax. Actually, it would be surprising not to find any such cases. The “Topic” positions of Rizzi and Belletti are taken to be responsible for dislocation constructions as in the following.

- (15) Q: ‘How did you find out about Gianni’s predicament?’
 A: #Ha telefonato GIANNI / #GIANNI ha telefonato / Ha TELEFONATO,
 has telephoned Gianni / Gianni has telephoned / has telephoned,
 Gianni
 Gianni

In (15) the dislocated subject *Gianni* is straightforwardly Given. This is consistent with the current analysis—due to the lack of de-accenting in Italian, Givenness must be marked structurally rather than prosodically. The G-marked DP moves to a clause-external position, which is separated by an intonation boundary.

As discussed in 2.1.2, “Topic” is a title that has been bestowed upon many different, often unrelated, phenomena over the years. Thus it is not surprising that there are other information-structural functions associated with the so-called Topic position in Italian, which are not easily accounted for by Givenness-marking. On the basis of examples like (16), Frascarelli and Hinterhözl (2007) propose three kinds of topic positions in Italian—shifting topics, contrastive topics and familiar topics. Each has an associated functional projection, as shown in Fig.70.

- (16) a. [_{ShiftP}Io, [_{ContrP}una cosa che ho trovato positiva, [é stata la
 I one thing that have.1SG found positive be.3SG been the
 comprensione.]]]
 comprehension
 ‘As for me, something that I considered as positive was the comprehension part.’

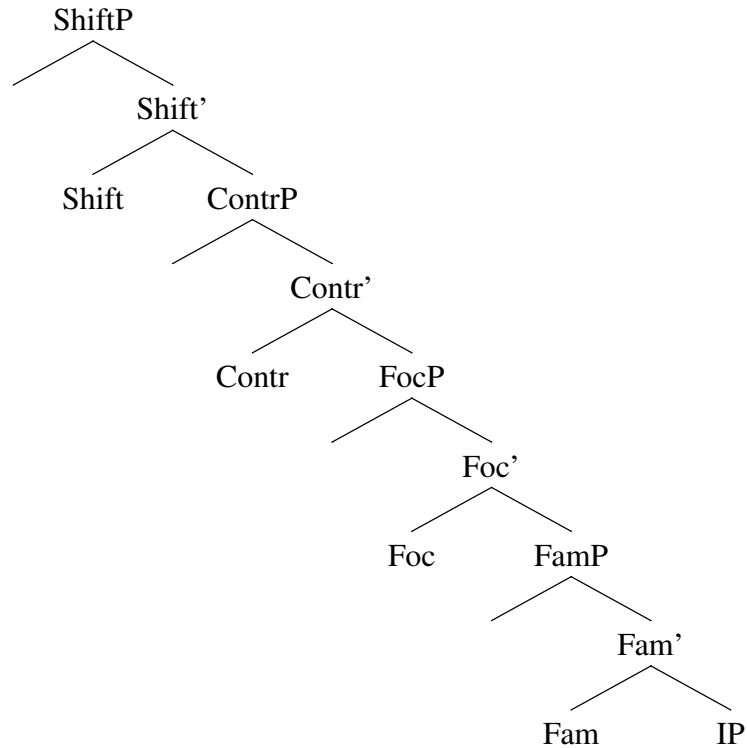


FIGURE 70: A NEW CARTOGRAPHY

- b. [_{ContrP}Io francamente [_{FamP}questa attività particolare [non me la
 I frankly this activity particular not to.me(CL) it(CL)
 ricordo.]]]
 remember
 ‘Frankly, I dont remember that particular activity.’
 (Frascarelli and Hinterhözl 2007, pp.8-9)

The authors’ notion of familiar topic corresponds to the likely Givenness-motivated topic positions instantiated in (15). The other two notions, shifting topic and contrastive topic, serve different functions. Contrastive topics, as discussed in 2.1.3, imply both Focus and discourse non-finality, and are analyzed in Büring (2003). Shifting topics, as noted in 2.1.2, serve the same discourse function as left-periphery “as for” constructions in English, as evidenced by the translation of (16-a).

- (17) **As for me**, something that I considered as positive was the comprehension part.

Assuming that the purpose of shifting topics and “as for” phrases is to shift the hearer’s attention to a particular entity before the utterance is processed, the left periphery is the obvious placement for these elements.

Brunetti (2009) claims that contrastive topics can be analyzed as special instances of shifting topics. Brunetti works within Vallduví’s (1990) framework wherein information structure is conceived of as a separate module of grammar which directs semantic interpretation within a file-card-based semantic system (Heim, 1988). Brunetti claims that Vallduví’s Topic is really a shifting topic, and that contrastive uses of topicalization can be derived via implicature from their basic use, which is to shift the hearer’s attention to a particular discourse entity. The claim is that shifting topics always evoke alternative sets, “as a new topic is sorted among a set of possible ones in the relevant situational context.” (Brunetti, 2009, p.767). A contrastive topic in Italian may be seen as an instance of the same fronting operation, but with the odd semantic property of shifting attention from a topic to itself. This gives rise to an implicature: that the speaker evoked an alternative set suggests that the speaker’s assertion will convey properties of other members of this alternative set. For example, in the English example below, the “Topic” *beans* is made topical by the question. The supposed implicature associated with the fronting of *beans* is that the alternative set {beans, rice} is relevant. This gives rise to the natural interpretation that the answerer only likes beans, and does not like rice.

- (18) Q: We could have beans and rice for dinner. Do you like beans?
A: Beans, I like. (Rice, not so much.)

Leaving it open exactly how notions of Contrast fit into the picture, I suggest that shifting topics are yet another natural pragmatic motivation for violating economy principles regarding Edge movement. Furthermore, I suggest that the only positions in the supposed information-structural cartography that cannot be analyzed as generalized movement to the edge of a phase are the positions associated with so-called familiar topics. Those positions can be analyzed as movement motivated by Givenness, which is straightforwardly compatible with the current conception of IS.

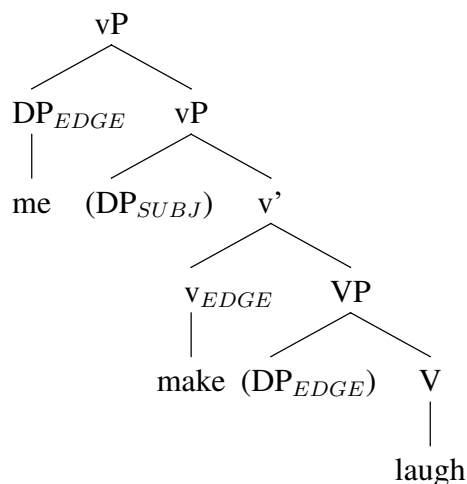
I end this chapter by sketching two analyses. First, I suggest more detailed analyses of English constructions as pragmatically motivated Edge movement. I then apply the same mechanisms to the problem of Italian word order. Ultimately, I argue that Givenness-marking and pragmatically motivated Edge movement together are likely to account for apparent cartographic tendencies, without relying on syntactically encoded Focus.

6.2 Pragmatically motivated Edge movement in English

Recall from 6.1 the phenomenon of pseudogapping, exemplified by (1) which is repeated below as (19)

(19) This should make you laugh. **It did me.**

This has been analyzed (Jayaseelan, 2001; Tanaka and Smith, 2006; Gengel, 2007) as movement of a Focused element (*me*) to the left edge of the vP phase and deletion of the remnant. I have suggested that from the perspective of the syntactic computational system, the movement of the Focused element is not motivated by Focus. Rather, there is an independent case to be made (e.g. Chomsky, 2001) that so-called Edge features can motivate movement to left-edge positions in vP and CP. Edge-motivated movement is typically ruled out in cases where there is no “reason” for the Edge feature. One such reason might be to allow cyclic movement, e.g. in wh-movement constructions. Another such reason, following Yang (2006), might be to create certain effects on discourse.



In this section, I outline a few possible discourse effects of Edge movement and apply those to a rough analysis of pseudo-gapping, Focus movement and Yiddish movement in English.

6.2.1 Pragmatic motivations for Edge movement

I suggest three distinct pragmatic motivations for Edge movement.

1. Movement to the edge of vP can be used to allow deletion of a non-Focused remnant. This allows the speaker to leave out non-crucial information, resulting in a more economical utterance.

2. Movement to the edge of CP can be used to place a particularly salient argument first in the linear order of a sentence to ease planning or processing.
3. Movement to the edge of CP can also be used to extract non-Given information and allow G-marking of the remnant, thereby placing prosodic prominence only on the element at the left edge. This creates a strong emphatic effect for the left-edge element without violating norms of Focus placement.

The first motivation is responsible for pseudo-gapping, the second for Focus movement in English, and the third for Yiddish movement.

Pseudo-gapping is taken to be the result of strategically including an Edge feature on *v* in the numeration of a sentence such that the Focused element will escape *vP* and allow for deletion of the remnant. This has the effect of shortening the speaker's utterance without deleting any material which is crucial for interpretation. In game-theoretic terms: for each Edge feature that is merged into the structure, the Sender's Utility takes a hit. This encodes the idea of "economy of derivation". But at the same time, as discussed in Ch.5, the Sender's Utility is higher for shorter messages. We may call this "economy of production". It must be the case that pseudo-gapping yields an economy-of-production advantage which offsets the economy-of-derivation disadvantage introduced by the presence of the Edge feature.

Focus movement is taken to be the result of strategically including an Edge feature on *C* in the numeration in order to have a particular linear order effect. Namely, the Edge feature is used to align constituent order with an attentional sequence, such that the first constituent prompts an immediate shift in the hearer's attention toward a new topic of conversation. In game-theoretic terms: there must be added Utility for the Sender for creating this alignment which offsets the decrease in Utility due to the violation of economy of derivation. This added Utility may arise from language planning concerns—when planning an utterance, the speaker herself may experience a shift in attention to a non-salient discourse referent, and the alignment of linear order with the order in which referents are brought to mind will require less cognitive effort while planning. This is difficult to quantify, but in principle it should be possible to test whether these concerns can trump other economy principles during utterance production.

Yiddish movement is taken to be the result of strategically including an Edge feature on *C* in the numeration to create a particular intonation pattern in conjunction with remnant G-marking. This in turn has the effect of signaling a particular level of emphasis on the non-G-marked element. In cases of Yiddish movement, without the Edge movement having

taken place, the domain of G-marking would not be as large as semantically possible. This is due to the projection constraints discussed at length in Chapter 3. G-marking is of course optional; however there may be tendencies for some languages/dialects to G-mark more than others. Moreover, the remnant G-marking involved in Focus movement has the effect of making only the left-periphery element prominent, which can have an emphatic effect. This is consistent with the intuition that Yiddish movement seems to imply that there is something remarkable about the meaning of the moved constituent. This is evidenced by the following contrast.

(20) “Van Goch”! Did you hear that? She said “Van Goch”.

Like an ARAB she spoke!

(21) President Obama’s speech was quite stirring. ??ELOQUENTLY he spoke.

I now turn to tentative game-theoretic analyses of these phenomena, illustrating how the notion of Utility might be brought to bear on these issues.

6.2.2 Analysis

Recall the Sender Utility function for the Focus game given in Chapter 5.

$$U_S(a_j, t_i, m) = \begin{cases} 1 + \text{economy}(m) & \text{if } i = j, \\ 0 & \text{otherwise} \end{cases}$$

In Ch.5 the “economy” of the Sender’s message was the inverse of the number of phonological words contained in the message. As mentioned above, this “economy of production” has a structural counterpart: economy of derivation. In the context of this signaling game, a message should be considered less economical if it is atypical with respect to its placement within the entire clause. We can encode atypical left-edge placement by representing Edge features in the message itself. This results in utterance-message correspondences like the following.

Utterance	Message
I gave him [F ten dollars]	“ten dollars”
[F ten dollars] I gave him	⟨“ten dollars”, <i>EDGE</i> ⟩

TABLE 37: EDGE FEATURES IN MESSAGES

We can revise the notion of message economy to depend on the number of words as well as the presence of Edge features. Let $EDGE(m)$ be a binary variable representing the presence/absence of an Edge feature in m .

$$economy(m) = \frac{1}{\|W(m)\| + EDGE(m)} \quad (6.1)$$

Under this metric, the message “ten dollars” has an economy score of $\frac{1}{2}$, and (“ten dollars”, $EDGE$) has an economy score of $\frac{1}{3}$. Using this new definition of economy, we can revise the Utility functions for the Sender in a way that intuitively captures the availability of pseudo-gapping, Focus movement and Yiddish movement.

Pseudo-gapping

Using the revised economy calculation in 6.1 we can expand the Sender’s Expected Utilities in the Focus game. I expand the Utility function given in Ch.5 to include this revised notion.

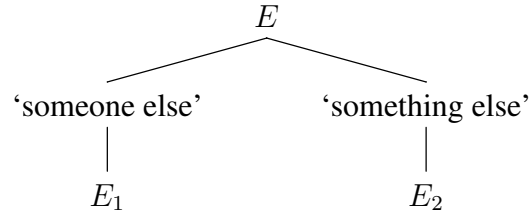
$$U_S(a_j, t_i, m) = \begin{cases} 1 + \frac{1}{\|W(m)\| + EDGE(m)} & \text{if } i = j \text{ (see Eq.6.1),} \\ 0 & \text{otherwise} \end{cases}$$

BOX 11: REVISED UTILITY FOR THE SENDER

The goal of this analysis is to account for the following example, namely why both (22-a) and (22-b) are equally available.

- (22) This should make you laugh. . .
- a. It did me.
 - b. It made ME_F laugh.

The pseudo-gapping sentence, “it did me”, is taken to be an elaboration on why the speaker believes the thing in question will make the hearer laugh. Similarly to the proposal in 5.3.5, we may take this elaborative speech act to be represented by a structured set of discourse expectations as in Fig.71. By hypothesis, there are structured expectations about why the speaker has the belief they have just espoused. There are at least two possibilities: (1) it made someone else laugh or (2) it is similar to something which has in the past made the hearer laugh.



$E_1 =$	{ 'it made me laugh', 'it made my wife laugh', ... }
$E_2 =$	{ 'it is similar to x', 'it is similar to y', ... }

FIGURE 71: AN ELABORATION

Limiting ourselves to a subset of E_1 for illustrative purposes,³ let's compare the two messages represented by the QUD-Focus layers in (22), plus one other possibility—the deletion of vP without movement of the Focused object (m_3).

t_1	'it made me laugh'
t_2	'it made my wife laugh'
m_1	[_F it made me laugh]
m_2	<[_F it did me], <i>EDGE</i> >
m_3	[_F it did]
a_1	'it made me laugh'
a_2	'it made my wife laugh'

TABLE 38: PSEUDO-GAPPING GAME

The labels for m_1 and m_2 as per their semantic content, are the same: $\lambda P. PAST(P(it, me))$. The label for m_3 is $\lambda x. \lambda P. PAST(P(it, x))$. Using these labels and the mechanics from 5.3 we obtain the following Expected Utilities for the Receiver.

	a_1	a_2
m_1	p	0
m_2	p	0
m_3	$\frac{1}{2}p$	$\frac{1}{2}(1 - p)$

TABLE 39: RECEIVER EUS

³Recall from 5.3.5 that the Receiver should be able to distinguish between E_1 and E_2 via the principle of forward induction.

For the first two messages, a_1 is guaranteed, as it is the only action for those messages which yields non-zero Expected Utility. As we did in 5.3, let q be the probability of the Receiver taking action a_1 given m_3 .

$$q = \text{prob}(p > \frac{1}{2}) + \frac{1}{2}(\text{prob}(p = \frac{1}{2})) \quad (6.2)$$

This yields the following EUs for the Sender, calculated using the revised Utility function in Box 11.

	m_1	m_2	m_3
t_1	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{2}q$
t_2	0	0	$1\frac{1}{2}(1 - q)$

TABLE 40: SENDER EUS

We see that for a t_1 sender, either message m_1 or m_2 guarantees coordination. This is not so for m_3 . Moreover, m_3 yields lower EU under most reasonable beliefs. Below we see that the probability of a_1 given m_3 would have to be greater than $\frac{5}{6}$ in order for m_3 to yield a higher EU for t_1 .

$$\begin{aligned} 1\frac{1}{2}q &> 1\frac{1}{4} \\ q &> \frac{5}{6} \end{aligned} \quad (6.3)$$

This predicts that if the Sender is somewhat certain (with probability $\frac{5}{6}$) that the Receiver has assigned a higher prior probability to a certain type, i.e. if it is common knowledge that the Receiver already believes a certain answer to the QUD, then m_3 is optimal. This seems to be basically correct—when there is a common knowledge belief that one proposition is true and not the other, the shorter message suffices, as shown in (23-b).

- (23) a. This should make you laugh. #It did.
 b. A: This should make you laugh.
 B: I bet it made your wife laugh.
 A: It did.

So why does the allowable pseudo-gapping construction correspond to a contrastive Focus on the moved constituent? The answer is that if it didn't, the information deleted would be crucial information for the recoverability of the intended proposition. The following

contrastive Focus game illustrates. This game emphasizes the importance of the pronoun ‘me’ to recoverability.

t_1	‘it made me laugh’
t_2	‘it made my wife laugh’
m_1	[_F me]
m_2	[_F laugh]
a_1	‘it made me laugh’
a_2	‘it made my wife laugh’

TABLE 41: CF GAME

Under this expectation set, all propositions are ‘laugh’-propositions, but only one proposition is a ‘me’-proposition. We obtain the following Receiver and Sender EUs.

	a_1	a_2
m_1	p	0
m_2	$\frac{1}{2}p$	$\frac{1}{2}(1 - p)$

TABLE 42: RECEIVER EUS

	m_1	m_2
t_1	2	$2q$
t_2	0	$2(1 - q)$

TABLE 43: SENDER EUS

Assuming, as we have, that q is strictly between 0 and 1, a t_1 sender will always send the message [_F me]. This is true because the pronoun is needed to choose a unique proposition from among the expectation sets. For this same reason, the pronoun cannot be deleted at the lower layers. Under the current analysis, any constituent that is a possible contrastive Focus will be unable to be deleted without having a negative effect on interpretation. This does not need to be directly encoded in grammar—it follows from the structure of cooperative communicative games.

Note that the game presented here predicts, correctly as I judge it, that both the pseudo-gapped and full versions of the sentence in question are equally available in (22). This is because the boost in Utility for sending a shorter message is exactly offset by the decrease associated with including Edge features in the derivation. However, the boost should be able to overcome the decrease in cases where the full message is very lengthy. This rightly predicts a felicity contrast in (24).

- (24) a. This should make you laugh. It did ME / It made ME laugh
 b. This should make you writhe in disappointment and disgust for hours.
 It did ME / ??It made ME writhe in disappointment and disgust for hours.

I now extend these ideas to rough analyses of Focus movement and Yiddish movement.

Focus movement

Just as we extended the notion of message economy to include “economy of derivation”, i.e. the inclusion of non-necessary Edge features in the sentence from which the message is derived, we can further extend it to include “economy of planning”—the alignment of word order with the order in which meanings come to mind. This encodes the concept of shifting topic—a shift in attention from one discourse entity to another will increase Utility for sentences which place the newly topical discourse entity first in the linear order. By hypothesis, this increase offsets the decrease associated with violating economy of derivation. To incorporate this into the economy equation, I add a “cost” term $c(m)$ to the denominator which can be seen as the cost of *not* aligning a shifting topic with the left edge. This is somewhat similar to the approach taken by Vallduví (1990) and subsequent work, where the existence of left-edge topics is taken to represent a correspondence between linear order and a set of instructions for interpreting the sentence. Under current assumptions, Edge movement to spec,CP happens to be the mechanism made available by UG for achieving such a correspondence.

$$economy(m) = \frac{1}{||W(m)|| + EDGE(m) + c(m)} \quad (6.4)$$

In the following example, the speech act is corrective—it is taken as background knowledge that something was given, but crucially, it was ten dollars and not some other gift as assumed.

- (25) TEN DOLLARS I gave him

I speculate that the hearer’s incorrect assumption makes the correct gift (‘ten dollars’) salient for the speaker, who first calls to mind this meaning, and then situates it within a declarative sentence. If this is true, then any version of (25) that does not place *ten dollars* at the left edge will incur a cost in the form of a positive $c(m)$ term in the denominator of the economy formula. The following game illustrates.

t_1	‘I gave him ten dollars’
t_2	‘I gave him a few quarters’
m_1	[_F ten dollars]
m_2	⟨[_F ten dollars], <i>EDGE</i> ⟩
a_1	‘I gave him ten dollars’
a_2	‘I gave him a few quarters’

TABLE 44: FOCUS MOVEMENT GAME

Both m_1 and m_2 will result in coordination. The better message is the one whose economy is greater according to 6.4.

$$\begin{aligned} economy(m_1) &= \frac{1}{2 + c(m_1)} \\ economy(m_2) &= \frac{1}{3 + c(m_2)} \end{aligned} \tag{6.5}$$

We now ask: when is m_2 better? A simple inequality shows that if the cost of planning the Edge-moved sentence (however that should be quantified) is less than one less than the cost of the sentence with default word order, then it is better to say, “ten dollars I gave him.”

$$\begin{aligned} \frac{1}{3 + c(m_2)} &> \frac{1}{2 + c(m_1)} \\ 3 + c(m_2) &< 2 + c(m_1) \\ c(m_2) &< c(m_1) - 1 \end{aligned} \tag{6.6}$$

Of course, it is mere speculation at this point whether it is planning or some other consideration that is at work here. Moreover, it remains difficult to quantify the idea of economy of planning, and therefore inequalities like the one above remain of little use. However, the current framework does in principle allow predictions to be made, and future research may be able to refine and assess them.

Yiddish movement

We may add three terms to our economy equation, this time to the numerator, which encode the following three assumptions.

1. There is additional Utility associated with signaling emphatic or expressive meanings.

2. There is potential additional Utility associated with including G-features, so long as they are properly licensed by the context.
3. Languages differ in their propensity to G-mark.

To this end, $EMPH(m)$ is a binary term corresponding to whether the speaker is intending a particular expressive meaning, $GIVEN(m)$ is a binary term corresponding to whether there is appropriately licensed Givenness-marking, and \mathcal{C} is a language-specific coefficient representing the propensity to G-mark in that language.

$$economy(m) = \frac{1 + EMPH(m) + \mathcal{C} * GIVEN(m)}{||W(m)|| + EDGE(m) + c(m)} \quad (6.7)$$

We can use this to sketch an analysis of the example of Yiddish movement from 6.1.1.

(26) LIKE AN ARAB she spoke

Here, given the context (Woody Allen is making fun of a person’s use of a velar fricative in the pronunciation of “Van Gogh”), we can interpret the fronting of the modifier PP *like an Arab* as a signal of expressive meaning—the denotation of that PP is taken to be particularly absurd as a description of the person’s speech. Moreover, as pointed out in 6.1.1, the word order makes it possible for Woody to G-mark the remnant TP *she spoke*. We can therefore posit that the Yiddish movement construction introduces $EDGE$, $GIVEN$, and $EMPH$ elements into the message. Consider the two possible configurations of (26).

m_1 [F she spoke like an Arab]
m_2 ⟨[F she spoke like an Arab], $EDGE$, $GIVEN$, $EMPH$ ⟩

TABLE 45: YIDDISH MOVEMENT GAME

The following formulas yield economy terms for the two messages given 6.7.

$$\begin{aligned}
 economy(m_1) &= \frac{1}{5} \\
 economy(m_2) &= \frac{2 + \mathcal{C}}{6 + c}
 \end{aligned} \quad (6.8)$$

We can calculate the relationship between \mathcal{C} and c which must hold in order for Yiddish movement to be preferred.

$$\begin{aligned}\frac{2 + \mathcal{C}}{6 + c} &> \frac{1}{5} \\ \mathcal{C} &> \frac{1}{5}(6 + c) - 2 \\ \mathcal{C} &> \frac{1}{5}c - \frac{4}{5}\end{aligned}\tag{6.9}$$

Just as with Focus movement, this inequality doesn't mean much in the absence of a way to quantify these terms. Nonetheless, this shows how this framework could in principle be used to test these ideas. The intuition underlying this approach is that pragmatically motivated Edge movement results from the interaction of five different quantities, which we will also apply to an example from Italian in the next section.

- Economy of production
- Economy of derivation
- Economy of planning
- Pressure to G-mark
- Pressure to convey expressive meanings

6.3 A look at Italian

I conclude this chapter with a glimpse at word order effects in Italian, taking stock of the possibilities and suggesting an analysis.

6.3.1 Information structure and word order

Recall from the discussion of Frascarelli and Hinterhölzl (2007) in 6.1.5 that there appear to be three information-structural notions which motivate movement in Italian: shifting topic, contrastive topic, and Givenness (which the authors call “familiar topic”). Brunetti (2009) collapses shifting topic and contrastive topic, claiming that the latter can be seen as a special case of the former. There may indeed be a relationship between these two notions. However, in a simple judgment task with various information-structural contexts

introduced, there is a slight distinction between shifting and contrastive contexts, where the former creates more word order possibilities than the latter. For this task, I created contexts corresponding to broad Focus (i.e. a default context), narrow QUD-Focus on either the subject or object, Givenness of either subject or object, contrastive Focus on either subject or object, and shifting topic status for either subject or object. The contexts were in the form of dialogs between a teacher in a classroom and some of his/her students. The following illustrates the basic contextual conditions.

- (27) Q: What just happened?
A: **Gianni** just left. (Broad Focus)
- (28) Q: Who just left the classroom?
A: **Gianni** just left. (QUD-Focused)
- (29) A: I haven't seen Gianni in a while.
B: **Gianni** just left. (Given)
- (30) A: Did Maria just leave?
B: No, **Gianni** just left. (Contrastive)
- (31) A: Has anyone seen Maria?
B: She's hiding under her desk. As for **Gianni**, he left. (Shifting)

Both transitive and intransitive sentences were constructed using various word orders, and tested within contexts analogous to the ones above. The following gives examples of the different syntactic conditions.

- (32) a. Gianni é andato via. (SV)
Gianni is gone away
'Gianni left.'
- b. É andato via Gianni. (VS)
is gone away Gianni
'Gianni left.'
- c. Ha rubato la mela, Gianni. (VO,S)
has stolen the apple Gianni
'Gianni stole the apple.'
- d. L'ha rubata Gianni, la mela. (VS,O)
it(CL)+has stolen Gianni the apple
'Gianni stole the apple.'

	SV	VS	VO,S	VS,O	SV,O	SOV	OSV
S is Given	✓	x	NA	NA	NA	NA	NA
S is shifting	✓	x	NA	NA	NA	NA	NA
S is contrastive	✓	x	NA	NA	NA	NA	NA
S is QUD-Focused	x	✓	NA	NA	NA	NA	NA
Broad Focus	✓	✓	x	x	x	x	x
S Given, O contrastive	NA	NA	✓	x	x	x	x
S contrastive, O Given	NA	NA	x	✓	x	x	x
S Given, O shifting	NA	NA	✓	x	x	x	x
S shifting, O Given	NA	NA	x	✓	✓	x	x
S & O are Given	NA	NA	x	x	✓	x	x
S shifting, O contrastive	NA	NA	x	x	x	x	x
S contrastive, O shifting	NA	NA	x	x	x	x	x

TABLE 46: MEAN RESPONSE ≥ 5 ON A 7-POINT SCALE

- e. Gianni l'ha rubata, la mela. (SV,O)
Gianni it(CL)+has stolen, the apple
'Gianni stole the apple.'
- f. Gianni la mela ha rubato. (SOV)
Gianni the apple has stolen
'Gianni stole the apple.'
- g. La mela Gianni ha rubato. (OSV)
the apple Gianni has stolen
'Gianni stole the apple.'

This task was implemented as an online written questionnaire of native Italian speakers (N=13). Respondents were given all word orders shown above as options for each information-structural context, and asked to rate each variant on a Likert scale of acceptability from 1 to 7, 1 being totally unacceptable, and 7 being perfectly natural in spoken Italian. Table 46 shows all of the syntax/IS combinations for which the mean response was greater than or equal to 5 on the scale, indicating a mean positive acceptability judgment. The default word order in Italian, SVO, was not used.

We see that with simple sentences such as 'Gianni stole the apple', respondents do not allow SOV or OSV as we might expect if multiple left-edge topic positions exist. Furthermore, while the contrastive cases disallow VS in intransitives, they allow VS,O in transitive sentences where the object is Given and the subject is contrastive. This suggests a less-than-straightforward relationship between contrastive status and the left periphery in

Italian. Moreover, the crucial example from Frascarelli and Hinterhözl (2007), repeated below, uses a copular construction whose word order is variable with respect to which argument precedes/follows the copula.

- (33) Io, una cosa che ho trovato positiva, é stata la comprensione.
 I one thing that have.1SG found positive be.3SG been the comprehension
 ‘As for me, something that I considered as positive was the comprehension part.’

One could analyze this as a shifting topic followed by a copular construction which happens to place the contrastively interpreted element to the left of the copula rather than the other way around. The only indicator of a special position for the contrastive *una cosa che ho trovato positiva* is the presence of a prosodic break, indicated by the comma. But this is perhaps not too surprising given the weight of the copular subject and the fact that the authors’ examples are from a corpus of spoken Italian.

For now, I assume that shifting topics are a real phenomenon, and that certain instances of that position being filled by a contrastive, non-shifting element are likely derivable via the mechanisms described in Brunetti (2009). Crucially, the shifting topic context in Italian, both according to previous literature and according to the simple judgment task I have implemented, allows both VS,O and SV,O in transitive sentences where objects are Given. It is this case which I will endeavor to explain using the tools from 6.2.2.

6.3.2 Analysis

Recall the economy formula from the discussion of Yiddish movement.

$$economy(m) = \frac{1 + EMPH(m) + C * GIVEN(m)}{||W(m)|| + EDGE(m) + c(m)} \quad (6.10)$$

We can use this to account for the following example, to explain why, given the parameters of Italian, either an SV,O word order or a VS,O word order is optimal. The context for the example is first illustrated in English. The object *the apple* is Given in S’s answer, and the subject *Maria* represents a shift in attention from Carlo to Maria.

- (34) (Context: the apple has gone missing from the teacher’s desk.)
 T: Which one of you pranksters hid the apple? I bet it was Carlos.
 S: Carlo is innocent. But as for Maria, she STOLE the apple.

The two favored configurations in Italian are shown below.

- (35) a. Maria l'ha rubata, la mela
 Maria it(CL)+has stolen the apple
- b. L'ha rubata Maria, la mela
 it(CL)+has stolen Maria the apple

Let's consider three possible messages, the two represented above and a third, neutral message with SVO word order. The first two messages instantiate movement of the Given object to a special clause-external right-edge position, forcing a resumptive clitic pronoun in the core clause. Message m_1 corresponds to the VS,O order. Analogous to the analysis of VS in intransitive sentences, we may posit that VS,O represents a base-generated word order, where a silent pronoun occupies the normal subject position. If VS is taken to be the default within a core clause with no object, then m_2 can be represented as an underlying VS,O structure with Edge movement of S, resulting in SV,O

t_1	'Maria stole the apple'
t_2	'Carlo hid the apple'
m_1	[L'ha rubata Maria, la mela]
m_2	\langle [L'ha rubata Maria, la mela], <i>EDGE</i> \rangle
m_3	[Maria ha rubato la mela]
a_1	'Maria stole the apple'
a_2	'Carlo hid the apple'

TABLE 47: ITALIAN SYNTAX GAME

The Receiver EUs are straightforward—all messages are unambiguous and therefore coordination will occur for whichever type corresponds to 'Maria stole the apple', which is t_1 in Table 47.

	a_1	a_2
m_1	p	0
m_2	p	0
m_3	p	0

TABLE 48: RECEIVER EUS

The prediction comes down to the Sender EUs, which in this case will be equal to message economy as it is defined in 6.10. Let $c(m)$ be 1 for messages that do not place Maria first,

and 0 for messages that do. Let $EMPH(m)$ always be 0 for this example. Finally, let \mathcal{C} be 1 for Italian.

	m_1	m_2	m_3
t_1	$1\frac{1}{3}$	$1\frac{1}{3}$	$1\frac{1}{5}$
t_2	0	0	0

TABLE 49: SENDER EUS

This rightly predicts that m_1 and m_2 will be equally acceptable, because the deviation from default VS order in the core clause is offset by the advantage associated with placing a shifting topic at the left edge.

Again, this analysis is largely suggestive. I have aimed to show that ideas of economy of derivation, planning and production, as well as their interaction with the concept of Givenness advocated in this work, can be encoded in a game-theoretic model of utterance choice. I leave it to future research to apply these concepts more rigorously.

Chapter 7

Conclusion

Regarding the placement of prosodic prominence in English, Bolinger (1976) boldly claims, “accent is predictable—if you’re a mind reader.” The conception of Focus developed in Chapters 5 and 6 of this work resurrects this claim, but with a twist. Accent is predictable if you’re a mind reader, and in a particular sense we *are* mind readers. That is to say, some phenomena in natural language arise from the fact that the users of language are rational agents, capable of considering the hearer’s state of mind when making decisions about linguistic behavior. The phenomenon of Focus is taken to be a reflex of this—the grammatical systems yield multiple possible variants of the same sentence, and speakers develop rules that map certain kinds of discourse contexts onto certain grammatical choices. I argue that this is fully consistent with Minimalist syntactic principles, whereby the human language faculty is taken to be a minimal computational system mediating sound and meaning. The enrichment of linguistic theory necessitated by Focus lies not in an expansion of the architecture of grammar, but rather in a simple claim about the correspondence between grammaticality and acceptability judgments. Namely, the two are not perfectly correlated in that negative judgments may arise if a grammatical sentence is situated in a context that would never prefer the utterance of that sentence. The decision-making mechanisms involved in determining how context affects felicity (and therefore acceptance) are modeled using game theory, which I see as a promising tool for developing mathematical theories of pragmatics.

And yet, what is commonly called “information structure” is not entirely pragmatic. In Chapters 3 and 4 I give evidence from English and German for syntactic restrictions on the marking of Givenness which are, from the perspective of pragmatics, entirely arbitrary. But these constraints are far from arbitrary when we situate them within modern syntactic

theory—they are actually predicted. This leads to the conclusion that “information structure”, though useful as an umbrella term, has no ontological status in language. Rather, it is disjunctively defined as the set of phenomena arising from either (1) syntactic features which encode certain presuppositions which make reference to discourse context, or (2) the interaction between discourse context, principles of communication, and optionality in grammar. In this sense, as stated in the introduction to this dissertation, information structure echoes the analogy of Chomsky (2011): it is like “today’s weather”, a collection of ontologically distinct notions which conspire toward a single effect.

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