Prosodic Focus

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1 Association with prosodic focus

The pattern of prosodic prominence on an utterance can affect its truth conditions. Take the case of conditionals (Dretske, 1972, 433):

(1)   a.   If Clyde doesn't MARRY <u>Bertha</u>, he won't be eligible for the inheritance.

       b.   If Clyde doesn't marry BERTHA, he won't be eligible for the inheritance.

Here, and in the following, words that are crucially accented will be marked with small caps, and words that are crucially reduced in prominence are underlined. The pronunciation in (1a) could be truthfully used in a scenario in which, given the devious will of Clyde's rich aunt Maureen, he will forfeit his inheritance by failing to legally tie the knot; and (1b) could be truthfully used in a scenario that given a different, but similarly devious will, he'd do so by marrying someone other than Bertha. Using the statements in the opposite scenario makes them false.[1] Such changes in prosodic prominence are often referred to as 'prosodic focus', and the semantic effect effect they have in interaction with other operators, in this case conditionals, is often referred to as 'association with focus' (Jackendoff, 1972, 247ff).

     Why-questions show a similar interaction with prosodic focus (Dretske 1972, 419; the example here was adapted from Partee 1991, 171). For each question, the response in (2) appears correct only when assuming one of the two scenarios above and false in the other:[2]

(2)   A: Why did Clyde marry BERTHA?
        A′:   Why did Clyde MARRY <u>Bertha</u>?
        B: Because otherwise he wouldn't have been eligible for the inheritance.

     Halliday (1967, 38) observes an example showing a truth-conditional focus effect with the modal *must*. A sign on the London Underground could plausibly intend to convey (3a), but surely not (3b):

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[1] Rooth (1999, 233) points out some potential issues with these examples, and constructs improved variations that serve to make the same point.

[2] Interestingly, questions other than *why*-questions appear not to show the same sensitivity to focus (Partee et al., 1990).

(3)   a.   Dogs must be carried.
          b.   Dogs <u>must be carried</u>.

A range of different adverbs show similar truth conditional effects of prosodic focus. The epitomic case of a focus-sensitive adverb is *only*. Assertion (4a) could be refuted by showing that John also introduced Anna to Sue; the one in (4b) by showing that John also introduced Bill to Anna (Rooth, 1985, 2):

(4)   a.   John only introduced Bill <u>to Sue</u>.
          b.   John only introduced Bill to Sue.

Truth-conditional effects also arise with the adverbs *always*, *usually*, and *frequently* (Rooth 1985, 164; Schubert and Pelletier 1987,442):

(5)   a.   Mary <u>always takes John to the movies</u>.
          b.   Mary always takes John <u>to the movies</u>.

Other constructions showing truth-conditional effects of prosodic focus include superlatives, generics, and emotive factives (Partee et al., 1990). There are many other adverbs whose contributions also change depending on the prominence of their complement, but without affecting the truth conditions of the sentence (e.g. *even*, *also*, and negation).

Understanding association with focus requires an understanding of the quantificational operators in question, as well as an understanding of the interpretive effects of shifting prosodic prominence itself. In the following, we will explore these interpretive effects of prosodic focus in detail, before returning to association with focus toward the end of the paper.

2   Contextual Effects on Prosodic Prominence

Sentences can be pronounced with varying prominence patterns, depending on the context they occur in. The following sentence, for example, would typically be pronounced with a pitch accent on both *Ede* and *coffee*. In certain contexts, one can pronounce the sentence with a single pitch accent on the subject *Ede*, as in (6b) (Rooth, 1996a, 271):

(6)   a.   Ede wants coffee.
          b.   Ede <u>wants coffee</u>.

Intuitively, the pronunciation in (6b) serves the purpose of drawing attention to the subject. In order to achieve this effect, the speaker has to actively control the prominence on *Ede* and on the material of the VP to assure that the subject is perceived as more prominent than the VP. This typically requires accenting *Ede* and reducing the pitch level of any accent following it. At least in English, it often results in omitting accents in the post-focal domain altogether. The location of the last unreduced pitch-accent in a sentence, often called the 'nuclear pitch accent', is highly salient, as is any deviation where it falls. A change in the position of the

nuclear pitch accent within a sentence or a constituent is often said to 'prosodically mark focus'. In the case of (6b), prosodic prominence marks focus on the subject.

In order to felicitously use (6b), the speaker has to consider it true and wish to assert that Ede wants coffee, just as with the 'default' prominence pattern in (6a), but in addition, the prominence pattern imposes requirements on the context. One way to license the prominence shift is to provide an antecedent which includes a contrasting subject but is identical otherwise:

(7)   A: Viola wants coffee.
      A′: Does Viola want coffee?
      B: No, EDE <u>wants coffee</u>.   'Correction'
      B′: EDE <u>wants coffee</u>, too.   'Parallelism'

The propositional antecedent can be given in the form of an assertion (7A) or can be embedded in a question (7A′). A prominence shift is possible when the the response contradicts the antecedent proposition (as in B's response), but also when the response is merely parallel in structure to the antecedent without contradicting it (as in B′'s response). We can think of the substitution of *Ede* as an an 'alternative' to *Ede*.

The linguistic substitution for *Ede* in the antecedent does not need to be a particular contrasting alternative, it can also just denote a set of alternatives:

(8)   A: Who wants coffee?   Antecedent question
      A′: Someone wants coffee.   Antecedent indefinite
      B: EDE <u>wants coffee</u>.

The context in (8) makes a set of propositions salient (the question *Who wants coffee?*). Wh-questions can be analyzed as the set of propositions obtained by substituting the wh-word with all possible alternatives (Hamblin, 1973). The prosody of the response also seems to evoke alternatives of this form, which is why this particular type of focus licensing is often called 'Question-Answer-Conguence'. The question does not make any *particular* element of that set salient. The context in (8) expresses that someone wanted coffee, but similarly also does not mention any particular alternative individual. The two contexts are closely related: *Wh*-pronouns are often analyzed as indefinite pronouns, and the question in 8 might actually embed the existential statement in (8). According to some theories it even presupposes the existential proposition (cf. Krifka, 2011).

While different types of linguistic substitutions can license focus, an overt linguistic substitution in the antecedent is not actually necessary. Consider:

(9)   A: Viola wants coffee.   'Evoked Alternatives'
      B: VIOLA <u>wants coffee</u>!
      B′: VIOLA <u>wants coffee</u>?

The responses by B and B′ in the two dialogues in (9) are possible as long the speaker is trying to convey that it is remarkable that Viola, and not someone else, wants coffee. The notion of a set of alternatives is still important here: It seems the responses

are necessarily interpreted relative to a set of alternative utterances that vary in the choice of the subject. These alternatives are not necessarily excluded—the response by [B] in (9) might just reflect that Viola's craving for coffee is particularly noteworthy, but does not necessarily assume or convey that Ede or anyone else does not want coffee.

We looked at contexts that license prosodic focus on the subject, but similar contexts can be created that shift prominence to other types of constituents within a sentence. An example similar to (9) with focus on a modifying adjective is given in (10) (from Klassen and Wagner, 2017, 309):

(10)   A: I brought an Alaskan wine.
         B: An ALASKAN <u>wine</u>!

While there is no indefinite expression or wh-word that can be directly substituted syntactically for a modifying adjective, we can still create contexts that are essentially parallel to those in (7) and (8):

(11)   7A: Did they bring a wine from BC?
         7A′: They brought a wine from BC.
         8A′: What kind of wine did they bring?
         8A′: They brought some wine.
         B: An ALASKAN <u>wine</u>.

Prosodic focus can be used in corrections, in cases of parallelism, in question-answer congruence, in responses to indefinite antecedents, and to evoke implicit alternatives. Whether all of these uses of prosodic focus are one and the same phenomenon is controversial. More descriptive discussions of focus often distinguish different *types* of focus (Gussenhoven, 2007). However, most current semantic theories of focus try to give a uniform explanation for all of these uses. One of the most widely assumed theories is the Alternatives Theory of Focus.

3   The Alternatives Theory of Focus

A commonality in the different uses of prosodic focus we have seen so far is that they all can be understood in reference to a set of alternatives. This notion of semantic alternatives is at the heart of the Alternatives Theory of Focus (Rooth, 1985, 1992b, 1996a). Since the proposal of alternative semantics there have been many semantic but also some psycholinguistic studies that support this notion. For example, that focus specifically activates alternatives and not just generally related words when looking at priming effects (Braun and Tagliapietra, 2010), and participants show better recall for words which constituted relevant alternatives in uses of focus (Spalek et al., 2014).

A set of alternatives can be obtained by substituting alternative meanings for constituents that are prosodically focused. According to the alternatives theory, each linguistic expression, in addition to a ordinary semantic value (notation: $[\![\ldots]\!]^O$), is assigned a *focus semantic value*, a set of alternative meanings (notation: $[\![\ldots]\!]^F$). In

the focus semantic value, any constituent that is marked with the syntactic diacritic F is substituted by contextually relevant alternative meanings of the same type. The focus semantic value for each node in (6b) is calculated as follows:

(12)   a. $[\![\ \mathrm{EDE}_F\ ]\!]^F = \{\ y|\ y \in D_e\ \}$
       b. $[\![\text{wants coffee}]\!]^F = \{\ \lambda w.\lambda x.\ x \text{ wants coffee in } w\ \}$
       c. $[\![\ \mathrm{EDE}_F\ \underline{\text{wants coffee}}]\!]^F = \{\lambda w.\ y \text{ wants coffee in } w \mid y \in D_e\ \}$

The set of alternatives is further restricted by context, for example, *used* will count as alternative for *new* when modifying *bicycle* but not when modifying *boyfriend* (example from Wagner, 2005).[3]

   The focus semantic value by itself does not yet predict the interpretive effects of focus. Rooth posits a presuppositional focus operator $\sim$ that operates over focus semantic values. It takes two arguments, an expression ϕ and a covert pronoun C, and introduces the following presupposition:

(13)   The meaning of $\sim$ (Rooth, 1992b, 1996a):
       Where ϕ is a syntactic phrase and C is a syntactically covert semantic variable, $\phi \sim C$ introduces the presupposition that C is a subset of $[\![\phi]\!]^F$ containing $[\![\phi]\!]^O$ and at least one other element.

The Alternatives Theory of Focus treats prosodic focus marking analogous to pronominal anaphors, which are often treated as carrying presuppositions about the discourse salience and unique identifiability of antecedents. Using the operator $\sim$ will only be felicitous in the presence of an appropriate antecedent for the pronominal argument it takes. Instead of presupposing a uniquely identifiable and salient antecedent referent, as in the case of personal pronouns, $\sim$ calls for a salient set of alternatives. The full representation of (6b) is as follows:

(14)   A: Who wants coffee?
       B:
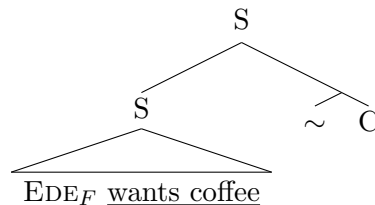
   In our example (14), the antecedent for $\sim$ is given in the form of a question, as set of alternatives. As we already saw, the assertion of one particular alternative can serve as an antecedent. The analysis in Rooth (1992b) posited an ambiguity for $\sim$: One version requires a set of propositions with at least one distinct element (the 'set case'); the other requires one particular salient contrasting antecedent that is distinct (the 'individual case'). However, a separate entry for the individual case will not be helpful for cases of evoked alternatives (examples 9 and 10). Here, we need to assume that a set of alternatives can be accommodated. The presence of

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[3]See Kim et al. (2015) for evidence from online processing for this type of contextual domain restriction.

an explicit alternatives in (7) should make accommodating such a set even easier than in the accommodated cases where no alternative is mentioned, so introducing a special provision for individual antecedents for (7) seems unwarranted. We can assume that Rooth (1996a) that $\sim$ always requires a set, but that often providing one explicit alternative is sufficient to make such set available (minimally, it can be the set of the explicit alternative in the antecedent and the regular meaning).

Apart from introducing a particular set of hypotheses about how prosodic focus works, Rooth (1992b)'s theory also introduces a useful notation that allows us to clarify notions from the descriptive literature on focus. The notions 'narrow', 'broad', or 'wide' focus often used in studies of focus realization (Eady et al., 1986, e.g.). They can be characterized as different attachment sites for F:

(15) Some example focus semantic values:
  a. 'Narrow focus on subject'
      $[\![\text{EDE}_F \; \underline{\text{wants coffee}}]\!]^F = \{\lambda w. \; y \text{ wants coffee in } w \mid y \in D_e\}$
  b. 'Narrow focus on object'
      $[\![\text{Ede wants } [\text{COFFEE}]_F]\!]^F = \{\lambda w. \; \text{Ede wants } y \text{ in } w \mid y \in D_{<e,t>}\}$
  c. 'Broad Focus' (VP-Focus)
      $[\![\text{Ede } [\text{wants COFFEE}]_F]\!]^F = \{\lambda w. \; \text{Ede } y\text{-}es \text{ in } w \mid y \in D_{<e,t>}\}$
  d. 'Wide Focus'
      $[\![[\text{Ede wants coffee}]]\!]^F = \{\lambda w. \; \text{y in } w \mid y \in D_{<s,t>}\}$

Other apparent 'types of focus' (Gussenhoven, 2007) might similarly be characterizable through the attachment site of F. For example, Goodhue (2017) argues that the notion of prosodic *verum* focus can be analyzed as F attaching to the head expressing polarity and $\sim$ taking root scope; vander Klok et al. (pted) argue that 'corrective focus' can be explicated as F attaching to the root node, in addition to the rhetorical relation between utterances (the latter of which is orthogonal though to focus marking).

We can also use the formalism to make explicit ideas about the source of typological variation in focus realization. For example, we can ask whether languages that appear to not mark focus prosodically, for example certain African languages (Güldemann et al., 2015) or the Mayan lanaguge K'iche' (Burdin et al., 2015), lack $\sim$ altogether (that is, they lack an encoding of focus similar to English), or whether they just lack the constraints that impose the phonological consequences of $\sim$ (which we will discuss shortly). We can also use Rooth's notation to express ideas about givenness and focus from other theories. By 'translating' competing theories into a form that uses $\sim$ and F, we can pinpoint whether they differ in their assumptions about the semantics of $\sim$, their assumptions about the syntactic distribution of $\sim$, the syntactic distribution of F, or maybe in their assumptions about why $\sim$ has the phonological effects it has. We will discuss different ideas about all of these aspects of focus in the following sections.

4 The scope of $\sim$

Similar to some other presuppositional operators (e.g. *even, also, too*), the contribution of $\sim$ varies depending on where it attaches syntactically. In (14), the constituent $[\sim C]$ (the $\sim$ operator and its pronominal argument) attaches to the root node. If the root node denotes a proposition, as in the examples (6), the presupposition introduced by $\sim$ requires a contextually salient antecedent question. We will call the constituent that $\sim$ attaches to its 'scope'.[4]

From here on, instead of noting down both $\sim$ and the pronoun with its index as in (16a), we will use a shorthand which simply marks the scope of $\sim$ using $\ulcorner$hooks$\urcorner$, and we will add a superscript for the index of the pronominal argument where necessary, as in (16b):

(16)　　a.　[[EDE <u>wants coffee</u>] [$\sim C_7$]].
　　　　b.　$\ulcorner$EDE <u>wants coffee</u>$\urcorner^7$

In our examples so far, $\sim$ always took scope at the root level. There are examples of prosodic focus, however, in which root-attachment will not yield the correct result. The response in (17) requires an appropriate antecedent of the form *x wine*. The material in the VP, however, seems irrelevant in determining whether or not we are able to shift prominence within the subject. This can be captured by positing that $\sim$ can attach to the subject, as indicated by the $\ulcorner$hooks$\urcorner$ in (17), as opposed to attaching to the root:

(17)　　A:　I brought an Alaskan wine.
　　　　B:　$\ulcorner$ALASKAN <u>wine</u>$\urcorner$ is the best!

Cases in which $\sim$ does not attach to the root node can be called 'embedded foci'. A key example from the previous literature that involves embedded foci is the following (Rooth, 1992b, 80):

(18)　　$\ulcorner$[An AMERICAN$_F$ <u>farmer</u>]$_1\urcorner^2$ was talking to $\ulcorner$[a CANADIAN$_F$, <u>farmer</u>]$_2\urcorner^1$ ...

While (17) could in principle have been analyzed as having $\sim$ at the root, and F-marking both on *Alaskan* and on *is the best*, such an analysis is impossible in (18). The two instances of embedded focus marking occur within the same sentence, and mutually antecede each other (as indicated by the indices).

According to the Alternatives Theory of focus, $\sim$ can attach to constituents of any semantic type. However, languages might vary in the scope possibilities for $\sim$, vander Klok et al. (pted), for example, argue that in French, $\sim$ necessarily attaches to the root, since in structures similar to (18) there are no comparable prominence shifts in French:

(19)　　J'ai entendu dire que Guillaume irait un pique-nique.
　　　　'I heard that Guillaume will go to a picnic.'
　　　　Ouais, il va apporter une salade FROIDE et une soupe FROIDE.

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[4]It is sometimes also called the 'domain' of $\sim$.

'Yeah, he is going to bring a cold salad and a cold soup.'

In French, a shift in prominence as in (19) is not altogether impossible (sometimes speakers did shift prominence in the experiment), but only rarely occurred in the experiment, while it is all but obligatory in similar examples in English.

The notion of the scope of $\sim$ allows us to define a number of relations that a linguistic expression might have relative to $\sim$ and F:

(20)   i.   'Marked as focused': Any constituent in the scope of $\sim$ that is F-marked

        ii   'Marked as given': Any constituent in the scope of $\sim$ that is not F-marked and not in the scope of an F-marker

        iii   'Not marked as given or focused': Any constituent that is not in the scope any $\sim$-operator or embedded under an F-marker

In the following, we will use these terms as defined here. According to this terminological convention, the word 'wants' in (21) is not marked as given or focused, while *Ede* is marked as given, and *wants coffee* is marked as focused:

(21)   A: What about Ede?

        B: ⌐Ede [wants coffee]$_F$ ⌐

We can think of these three categories as different linguistic 'information statuses'. We will see that these definitions are fruitful in understanding the linguistic phenomena typically associated with the intuitive notions of being 'given', 'contrastive', or 'new', but they should not be confounded. How to account for the intuitive notions is part of the bigger project of developing a formal semantic analysis of focus phenomena, which the alternatives theory of focus may just be one part of. For example, it is clear that one has to distinguish a whole scale of different types of ways in which a constituent can be 'given' (Prince, 1981; Baumann and Riester, 2013), which goes beyond what is called 'marked as given' here, but it is very possible that these distinctions simply affect the likelihood of ending up being marked as given in the sense here, and other apparent differences need an explanation orthogonal to prosodic focus marking.

5   The prosodic effects of $\sim$

Jackendoff (1972, 237) characterizes the phonological effect of focus as follows: "If a phrase P is chosen as the focus of a sentence S, the highest stress in S will be on the syllable of P that is assigned the highest stress by the regular stress rules." In Roothian terms, this means that if $\sim$ attaches to the root (the S-node in Jackendoff's terms), the main prominence must be within the constituent that is F-marked. Rooth (1992a, 114) and Truckenbrodt (cf. 1995, 160)generalize this idea to embedded foci and argue that $\sim$ generally affects phonological prominence relations within its scope. We can capture this idea with the following informal constraint:

(22)   Phonological Condition on Prominence

        Within the scope of $\sim$, F-marked material must be more prominent than

non-F-marked material.

The formulation here is similar to that given in Bader (2001, 68), who posits a constraint *GÍVEN, requiring that that 'a given constituent is not metrically prominent'. This constraint is only similar to the one in (22) if we understand 'given' as 'marked as given' in our sense. Truckenbrodt (cf. 1995, 160) formulates a different constraint: "If F is a focus and DF is its domain, then the highest prominence within DF will be within F." It is not straightforward, however, how to apply this constraint in the presence of multiple F in the scope of $\sim$.

The phonetic realization of focus prominence involves both a boost of constituents that are marked as focused and a reduction of constituents that are marked as given (Breen et al., 2010). What is important appears to be the relative prominence relation rather than the precise phonetic realization (cf. discussion in Williams, 1997; Wagner, 2005; Büring, 2016).

The question of what is the correct formulation of the constraint that relates $\sim$ and prosodic prominence depends on assumptions about phonological and phonetic implementation that go beyond what can be discussed in this paper. One important insight is that he relationship between our linguistic information statuses and the phonological/phonetic effect observed is not uniform across different linear positions: For example, a context that licenses prosodic focus on the object is compatible with a rendition that also places an accent on the subject, but the reverse is not true:

(23)   a.   A: What does Ede want?
              B: ⌜EDE wants COFFEE$_F$⌝
        b.   A: Who wants coffee?
              B: # ⌜EDE$_F$ wants COFFEE⌝

The reason for this asymmetry is that an accent later in the utterance will be perceived as more prominent. So even the rendition in (23a) will fulfill the constraint in (22) in that the object is more prominence than the subject, but 23b will not (cf. discussion in Truckenbrodt, 1995). At first blush, the generalization seems to be that within the scope of $\sim$, material marked that is marked as given that can optionally carry pitch accents when it precedes a constituent within the scope of $\sim$ that marked as focused, but not when it does not. A more accurate characterization is that accents in the post-focal domain are possible, but they have to be sharply reduced in pitch range, such that the percept nevertheless remains on constituent marked as focused. Recent experimental evidence for pitch accent realization on constituents that are marked as given (according to our definition) can be found in Féry and Kügler (2016).

A second and related insight about the phonological reflexes of focus is that constituents that carry default prominence sometimes appear to be compatible with a wider range of contexts that constituents that show a prominence shift. Chomsky (1971, 200) observes the following example:

(24)   It wasn't an ex-convict with a red SHIRT that he was warned to look out for.

Chomsky (1971) argues that this sentence realized with a single accent on *shirt* is compatible with a wide variety of contexts, which affect where the F-marker in the response needs to be placed:

(25)   Was he warned to look out for

        a.   an automobile salesman?
        b.   an ex-convict wearing dungarees?
        c.   an ex-convict with a carnation?
        d.   an ex-convict with a red tie?

This phenomenon that default prominence realizations often seem compatible with a wider set of contexts was called 'focus projection' in Höhle (1982). An arguably more adequate term to characterize the phenomenon is to call these instances 'focus ambiguities' (Jacobs, 1991): Certain pronunciations seem to be ambiguous with respect to the focus structure of the utterance.

It is not obvious which particular examples show competing focus structures that indeed lead (or at least can lead) to phonetically identical realizations. According to Gussenhoven (1983), predicates can remain unaccented if followed by an argument, but not if they are followed by a non-argument. According to this hypothesis, *ex-convict* would require a separate accent, since *with a red shirt* can hardly be seen as an argument of the head noun. It seems plausible that this is indeed the case, and Gussenhoven (1983) presents experimental data justifying the proposed principle. Selkirk (1984) proposes a theory that similarly assumes that adjuncts should do not enable adjacent constituents to remain accentless, while arguments do. von Stechow and Uhmann (1984) present cases that suggest that only *internal* arguments have this property (see also Selkirk, 1995). Büring (2006) discusses some observations that are problematic for these claims.

The most discussed case of an apparent focus ambiguity involve SVO sentences. The claim is that broad focus on the VP and narrow focus on the object are, or at least can be, realized in identical ways. Gussenhoven (1983) investigated this looking at dialogues like the following (focus representation added):

(26)   a.   A: Do you live by yourself?
            B: ⌜I [share a FLAT]$_F$⌝.
       b.   A: I hate sharing things, don't you?
            B: ⌜I share a FLAT$_F$.⌝

In a perception experiment, listeners were not able to choose which type of context the responses they heard had originally been uttered in. The task involved a forced choice between two dialogues, one with the same question as in the dialogue in which it was originally recorded, and one with the respective other context.

This perception result is compatible with the idea that indeed, there is a genuine focus ambiguity at play here. This would be compatible with the idea that when default prominence and focus prominence result in the same prominence relations, then they can accidentally sound identical. This is the interpretation of the phenomenon in Chomsky (1971), and implicit in many accounts since, including that of

Gussenhoven (1983). It is also the interpretation assumed in Alternatives Theory, as presented here.

Selkirk (1984) and Selkirk (1995), on the other hand, devise a theory that treats these ambiguities as non-accidental, and devises a novel mechanism of 'focus projection' where a focus feature literally projects to other constituents under certain circumstances. Production studies, however, have shown that the realization of broad focus differs from the realization of narrow focus on the object Eady and Cooper (1986); Breen et al. (2010). Breen et al. (2010) also showed that at least under certain conditions, listeners can make use of them to retrieve the original context. Even if there was a complete neutralization between these two different focus structures, Jacobs (1991), Wagner (2005), and Arregi (2016) discuss arguments why explicit projection rules are unnecessary, and in fact undesirable when looking at the full range of cases.[5]

6 Presupposed Salience vs. Presupposed Truth

The presupposition introduced by $\sim$ is about the salience of the antecedent, not about them being part of the common ground of shared knowledge, that is, it is not a presupposition about the truth of the antecedent. For example, the expression denoting the proposition embedded under a factive predicate is typically not prosodically reduced, although it is presupposed as being true (Wagner, 2012a, 108):

(27)   Mary wanted to go swimming in the lake.
    a.   She didn't realize that it was too COLD.
    b.   She didn't REALIZE that it was too cold.

The most likely pronunciation of the response is (27a). The pronunciation in (27a) would be most natural in a context where the lake being cold has been made salient beforehand. And yet both renditions intuitively still entails that the lake was cold. While prosodic reduction of the complement can modulate whether the presupposition projects for certain factives like *notice*, the size of this effect is rather small (Tonhauser, 2016). Furthermore, it is unclear whether prosody would have any effect at all with factives like *know*.

Similar examples showing that presupposed content is not automatically prosodically reducible can be constructed with other presupposition triggers like clefts (Wagner, 2012a) and definite descriptions (Wagner, 2012a; Büring, 2016). This shows that presupposed information is not necessarily salient and cannot automatically be prosodically reduced. Conversely, focus marking does not come with any truth-conditional presuppositions, although it is sometimes claimed that focus comes with an existence presupposition, such that one of the alternatives has to be true (Geurts and van der Sandt, 2004). Prosodic focus, however, is compatible with a

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[5]Apart from affecting prominence, focus has also been argued to affect prosodic phrasing, at least in some languages. The focus on prominence here is justified by the fact that at least in English, focus seems to leave phrasing intact for the most part (Norcliffe and Jaeger, 2005). This might be true more generally for at least some languages (Féry and Ishihara, 2009).

context which makes explicit that no such presupposition is intended. Take A's question below. The use of the NPI *any* suggests that whether someone dropped a ball at all is not established, and, as already observed by Jackendoff (1972, 246), prosodic focus in the response is compatible with a response that explicitly denies the alleged presuppositon (Wagner, 2012a, 110):

(28)   A: Did anyone drop the ball?
           B1: Jane did.
           B2′: No one did.

Prosodic focus contrasts sharply in this regard with clefts, which *do* comes with an existence presupposition, as is discussed in more detail in Rooth (1999, 234).

The condition imposed on context by prosodic focus is about the salience of antecedents, not about their truth. In the words of Chafe (1974), it is about what the speaker is 'conscious' of. This makes $\sim$ apparently very different from other presuppositional operators. However, it makes it rather similar to surface anaphoric phenomena like VP ellipsis, which Hankamer and Sag (1976) argued require a linguistic antecedent. It is a strength of anaphoric theories like the Alternatives Theory of Focus that it can explain this link between prosodic focus and ellipsis phenomena, see Rooth (1992a) and Tancredi (1992) for a discussion of the many parallels between these phenomena.

7 Why is focus marking (sometimes) obligatory?

Prosodic focus marking is often obligatory when possible. In the following example, the VP is obligatorily reduced:

(29)   A: Viola wants coffee.
           A′: Who wants coffee?
           B: #Ede wants coffee.

Why would this be? In the absence of a focus operator (when the entire utterance is new, according to our definition), there is no focus presupposition, and hence the response with default prominence should be just fine. Also, suppose there is wide focus marking on the entire proposition instead of narrow focus on the subject, as in (30a)—again, that should be compatible with the context. Such cases are often called 'overfocused' and need to be ruled out. The only structure predicted to be impossible given the context is one with focus on a constituent other than the subject, such as (30b):

(30)   a. ⌜[Ede wants coffee]$_F$⌝
          b. ⌜Ede wants [coffee]$_F$⌝

One way to think about the obligatoriness of focus marking is in analogy to other presuppositional operators, in terms of the principle 'Maximize Presupposition', and is explicitly argued to be driving force behind focus and givenness marking in Wagner (2005); Sauerland (2005). This principle was first used in (Heim, 1992)

to enforce the use of definite articles over indefinite ones whenever the maximally presupposition of the definite article is fufilled (# *A sun is rising*). It has also been implicated in the pressure to use additive operators when they are licensed (Eckardt and Fränkel, 2012).[6]

(31)   Last week, Ede wanted coffee. This week,
        Ede ?(also) wanted coffee.

That focus marking is made obligatory through competition has been widely assumed in other approaches as well, for example in Williams (1997), who posited the principle 'Don't overlook anaphoric possibilities'. Under this view, it is the possibility of using an alternative structure with focus on the subject that blocks using the structures in (30a) because the former encodes a an anaphoric relation that the latter does not. It is a result of competition between expressions with different focus assignments. The underlying idea is that in determining the focus structure of a linguistic expression, all possible focus assignments are considered, and the representation with the strongest true presupposition is chosen.[7]

An account in terms of Maximize Presupposition accounts for why the meaning of the default pronunciation effectively becomes enriched with an antipresupposition (Percus, 2006), such that using *Ede wants coffee* with normal prominence antipresupposes that there is an antecedent that would license shifting prominence to the subject. Essentially, this is a blocking effect: We could have used an alternative utterance that does encode that presupposition.

The account predicts that in a situation in which two different focus presuppositions can be marked, it is the stronger one that wins out. This is confirmed in examples in which $\sim$ is used and there is more than one option with respect to the scope of $\sim$ Truckenbrodt (adapted from 1995, 171):

(32)   A: Does [an American farmer]$_1$ like Mary]$_2$?
        B: #No, ⌜a CANADIAN$_F$ farmer⌝^{1} likes MARY.
        B′: No, ⌜a CANADIAN$_F$ <u>farmer likes Mary.</u>⌝^{2}

In both responses, a focus presupposition is marked, but only one of them is felicitous. It is the stronger presupposition, that is the relation to the bigger antecedent, that must be marked. Adapting ideas from unpublished work by Roger Schwarschild, Truckenbrodt (1995) argues that this can be explained by a 'maximality-requirement for the choice of the domain' of $\sim$. In other words: The scope of $\sim$ has to be chosen to be as wide as possible.

The principle that the domain of $\sim$ has to be maximized is not general enough, however. It also seems that sometimes the number of $\sim$s is maximized, to ensure that as much as possible is marked as given (I'm using a slightly awkward example to make it parallel to (32):

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[6]Although throwing up the hands and/or raising pitch on the last word may also work instead of using *also* here. See Wagner and Klassen (2015) for phonetic evidence.

[7]Maybe the candidate set is even wider: Mayr (2010) argues that in fact other linguistic expressions that have the same denotation and their possible focus structures are also considered, based on evidence from the choice between bound and co-referent pronouns.

(33)   A: [An American farmer]^1 asked me [who likes Mary]^2.
           B: ⌜[⌜A CANADIAN$_F$ <u>farmer</u>⌝^{1}]$_F$ <u>likes Mary</u>⌝^{2}.

Two separate instances of ∼ are necessary here: There is no salient antecedent of the form *An x farmer likes Mary*, but there are antecedents of the form *an x farmer* and *x likes Mary*. Both occurrences of ∼ are obligatory it seems, so a more general principle than one that enforces maximizing the domain of ∼ is needed, and Maximize Presupposition would do the job.

     It is not clear, however, that an account in terms of Maximize Presupposition always makes the right prediction in cases in which there are multiple potential antecedents. If encoding both at the same time is impossible, speakers often seem to have a choice. Consider the following example (Klassen and Wagner, 2017, 311):

(34)   A: Yesterday, Jolene and Dolly pitched the tent. What happened today?
           B: (This time,) JOLENE <u>pitched the tent</u>.
           B′:   (Again,) JOLENE pitched the TENT.

In the absence of the adverbials *this time* and *again*, the experiments reported in Klassen and Wagner (2017) show that a slightly higher proportion of speakers used the rendition with subject prominence, but essentially there is optionality in this context. Once the adverbs are added, most speakers will choose the pronunciations that are indicated in (34). This is as expected if the variability in pronunciations correlates with these pronunciations evoking different alternative sets. But does either of these pronunciation mark a stronger presupposition? One problem is that it's not obvious which focus presupposition, if any, B′'s response encodes. The following focus structure for B′, for example, seems too weak, since any alternative proposition should be sufficient to license it, and hence B's response should be preferable, as it encodes a stronger presupposition:

(35)   B: ⌜JOLENE$_F$ <u>pitched a tent</u>⌝
           B′:   ⌜[JOLENE pitched A TENT]$_F$⌝

     So shouldn't the pronunciation with subject prominence always 'win' the competition for maximizing presupposition? Maybe it is not actually the case that all possible focus structures for a given utterance compete. Examples like (34) suggest that speakers sometimes have a choice which focus marking among a number of options they consider to be salient or most relevant for the point they want to make. Schwarzschild (1999) discusses related cases and argues that the rhetorical relation of an utterance is taken into account in making these anaphoric choices. A comprehensive study that looks at a wide variety of cases including examples like (33) and (34) would be needed to assess what structures do compete and are subject to the pressure of Maximize Presupposition, and which do not and constitute genuine choices about the meaning a speaker wants to encode.[8]

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[8]For word-order effects related to givenness which also seem amenable to analysis in terms of Maximize Presupposition see Kucerova (2007).

8 Antecedence through Entailment

Clark and Haviland (1977, 6) observed that constituents can sometimes be prosodically reduced which are not actually part of the antecedent but are only contextually entailed (see also Rooth 1992a):

(36)   John is a Democrat. BILL <u>is honest,</u> TOO.

The speaker in Clark & Haviland's example expects the listener to accommodate that being a Democrat entails being honest, and therefore *John is a Democrat* can serve as an antecedent marking for the focus marking on *Bill* in the following sentence (as well as the presupposition of *too*). This can be related to a more general pattern of 'bridging' inferences (Haviland and Clark, 1974) sometimes required to make derive an antecedent through entailment. Antecedence through entailment was also implicated in examples in which hyponyms can be treated as if they were contextually salient and marked as given, for example the noun phrase *animals* in the example below (example from: Rochemont 1986, 50; see also: Allerton 1978, 142):

(37)   A: I saw some GORILLAS in the SUBWAY today.
        B: Oh, really? We saw <u>some animals at the</u> ZOO <u>today</u>.

Schwarzschild (1999) proposed a theory in which antecedence is *always* evaluated by checking entailment relations. It builds on a notion of entailment that can be applied cross-categorically. This is achieved by converting expressions of every type into propositions through existential closure and then checking for entailment (see Rochemont 1986 for related ideas). This notion of antecedence can account both for antecedence through entailment for propositions (as in 36), as well as for noun phrases and constituents of other types (as in 37).

Antecedence through entailment does not not always appear to be possible, however. Consider the following example (Büring, 2016, 119):

(38)   (For years now, Kim has refused to learn any musical instrument. And now...)
        a. #SAM <u>won't practice piano</u>.
        b. SAM <u>won't practice</u> PIANO.
        c. SAM <u>won't practice</u>.

Someone refusing to learn any musical instrument entails that someone won't practice piano, and yet this does not seem to be quite good enough to license the prosodic reduction of the VP in (38a)—while not outright infelicitous (the judgment reported in Büring 2016 seems too strong), shifting prominence seems at least less likely than not shifting prominence. This poses a problem for the building a theory that defines antecedence through entailment, like Schwarzschild's.

One reason why (38a) might be difficult is that the context actually makes salient an entire set of musical instruments which will include instruments other than pianos. It's possible then that the focus structure of (38b) is actually (39),

with focus on piano, and that this structure is somehow preferred over just marking the VP as given as in (38a):

(39)   ⌜SAM$_F$ won't practice PIANO$_F$⌝.

What is the source of the preference of (39) over (38a), however? Maybe the observed preference has something to do with the fact that (38a) competes with (38c). If the choice of instrument matters, then (39) might be preferable (which draws attention to the fact that it's a piano as opposed to some other instrument), if it does not, then (38c) might be (why bring up the piano at all if the choice of instrument does not matter?).[9]

Let's consider again the original statement about democrats in (36). The inference required here seems both more contrived and more informative than the one in the piano example. It rests on the background assumption that being a democrat automatically entails being honest—an assumption that most people irrespective of where they fall on the political spectrum would disagree with. The speaker's choice of prosody in (36) crucially relies on this background assumption and therefore *conveys* that the speaker makes this loaded assumption. So maybe *democrat* seems felicitous in part because the required accommodation step—the added work we have to put in to make the prosody work—draws attention to an informative background assumption. More generally, maybe antecedence through entailment are correct, but other factors can affect which representation will be preferred in a given context, and sometimes make prosodic reduction through bridging inferences difficult. Indeed, Haviland and Clark (1974) and other studies since have shown evidence that bridging inferences take time and are costly.

Keshet (2015) discusses related examples in which antecedence through entailment seems difficult, and argues that bridging is not about entailment, but rather about whether a question under discussion that would provide the appropriate antecedent can be easily accommodated given the context. Under this view, entailment relations merely play an indirect role, in that they affect what questions can or cannot be easily accommodated.

9   Isn't the notion of givenness sufficient?

The examples we in (7)–(9) that illustrate different was of providing an antecedent for prosodic focus on *Ede* all have one thing in common: The context provides a linguistic antecedent for the VP *wants coffee*. They vary whether and how substitutions for the subject *Ede* are introduced. What if the prosodic reduction of the VP actually just requires the meaning denoted by the VP to be salient, resulting in sole prominence on the subject?

Rather than imposing a requirement that substitutions of the subject (which is marked as focused) have to be salient *and* that the VP meaning (which is marked as given) has to be salient, couldn't we have a theory that takes the prosodic effect simply as reflex of the salience of the VP meaning? What if the interpretive effects

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[9]Thanks to Dan Goodhue for discussion of this example.

of prosodic focus are because the absence of prominence is interpreted, while the presence of prominence is not? Schwarzschild (1999) develops a theory that is based on this idea.

In this account, what the prosody in (6b) requires is that a linguistic expression is salient antecedent that denotes or entails the following:[10]

(40) $\exists x.x$ wants coffee.

Although Schwarzschild (1999) is not formalized using Rooth (1992b), we use Rooth's formalism instead. The differences between Schwarzschild (1999) and Rooth (1992b) can be stated as follows:[11]

(41)   Schwarzschild's 1999 theory:

      a.   **Antecedence through Entailment:** Antecedence is defined through entailment.

      b.   **Pure Givenness marking:** The scope of $\sim$ does not need to contain an F.

      c.   **Ubiquitous $\sim$:** All nodes that are not F-marked have $\sim$ attached to it.

In combination with the principal Maximize Presupposition, this gives a Roothian implementation of Schwarzschild (1999). Maximize presupposition will force to drop as many F-markers and use as many $\sim$ as possible.[12]

In order to find the focus structure that complies with Maximize Presupposition, we need to recursively establish which F-markers (if any) can be omitted. Let's look at how this plays out in our example:

(42) $\ulcorner\ulcorner$Ede$_F\urcorner$ $\ulcorner\ulcorner$wants$\urcorner$ $\ulcorner$coffee$\urcorner\urcorner\urcorner$

The meanings of the constituents *wants, coffee, wants coffee*, and *x wants coffee* are all contextually salient and hence can be marked as given, only *Ede* is not, and hence receives an F-marker and must be accented. It is key in Schwarzschild's theory (when stated in Roothian terms) that $\sim$ can be used with no F-marker in its scope, and arguably this would be a key assumption in any theory that tries to explain focus effects in terms of the givenness of the reduced material. We can call such uses of $\sim$ instances of 'pure givenness marking', since it involves marking a constituent

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[10]Just as in Rooth's theory, this is not a presupposition about truth. That someone wants coffee does not have to be true—rather, there has to be some linguistic expression that, maybe after existential closure, would entail this if it were true. *No one wants coffee* would be a good antecedent, because the existential closure of the expression *wants coffee* entails (40).

[11]We already discussed pro and contra of assumption 41a in the preceding section. Assumption 41a can possibly be even strengthened: If focus variables can be interpreted freely with any constituent of the same type, then adding a $\sim$ to a constituent that is F-marked actually might only introduce a trivial presupposition, and $\sim [a]_F = [a]$. If this is the case, then we can restate Schwarzschild's theory as positing that $\sim$ attaches to every node. This would mean that all constituents are either marked as focused or marked as given in our sense. See Büring (2008) for a discussion of Schwarzschild 1999 that makes this assumption.

[12]Schwarzschild uses instead an ad-hoc constraint AvoidF that penalizes using F-markers, but that seems less insightful than Maximize Presupposition.

as given (un-F-marked in the scope of $\sim$) without any constituent being marked as focused (F-marked).

Pure givenness marking (i.e., uses of $\sim$ without F in its scope) is assumed to be impossible in Rooth (1992b) and Rooth (1996a), but is assumed to be possible at least in some syntactic configurations in (Rooth, 1992a). Rooth (1992b, ex. 4, notation adapted) uses pure givenness marking to account for the deaccentuation of contextually given direct objects:[13]

(43)   We are supposed to take statistics and [semantics] this term, but I don't like ⌜semantics⌝.

In Schwarzschild's theory, only the absence of F-marking in the scope of $\sim$ is interpreted (that is, being marked as given has an interpretive effect). Any constituent that is not given must be F-marked. This is due to assumption (41c).

What cannot exist in this theory is a situation in which a constituent is not F-marked and also not in the scope of $\sim$. In other words, our third information status, not being marked as given or focused, does not exist in this theory. But what about constituents that are intuitively 'new', that is, they are neither contextually given nor do they seem to be contrastive? For Schwarzschild, there is no difference to the treatment of those and intuitively focused or contrastive constituents. In an out-of-the-blue context, our original sentence will require multiple accents because neither *Ede* nor *coffee* is given.

(44)   [EDE$_F$ [wants$_F$ COFFEE$_F$]$_F$]$_F$.

The reason the verb, *wants*, does not require an accent is because Schwarzschild assumes that it can be F-marked without being accented, due to rules of 'focus projection', that imply that the F-marker on the object can license an F-marker on the verb.

This theory of prosodic focus can cover a broad range of cases, as shown in Schwarzschild (1999). One main difference in predictions compared to Rooth's theory is that any prominence shift for Rooth necessarily involves alternatives to an F-marked constituent, while this is not the case for Schwarzschild. A first apparent indication that prominence shifts necessarily evoke alternatives and cannot just mark the givenness of the reduced material comes from what Schwarzschild calls all-given contexts.

(45)   Does Ede want coffee?
   a.   EDE wants COFFEE.
   b. #EDE wants coffee.

On the face of it, the impossibility of placing prominence on *Ede* speaks against the idea that the absence of prominence on *invite Sue* can simply encode that this

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[13]To be able to handle such cases of 'pure givenness', our phonological constraint that negotiates the prosodic effects of $\sim$ would have to be revised such that un-F-marked material in the scope of $\sim$ has to reduced even in the absence of there being an F-marker in its scope. We will not explore the implications of this here.

meaning is contextually given. Surely *wants given* is given in this context. Rather, it suggests that ,as predicted by the Alternatives theory of focus, the pronunciation (45b) necessitates a set of alternatives with substitutions for *Ede*, which are not provided here. Schwarzschild, aware of this issue, argues that in a case in which there are multiple possibilities on how to pronounce an expression with minimal F-marking the constraints enforcing default pronunciation will decide on the correct pronunciation is. Under this view it is the grammatical pressure to use default prominence unless it results in more F-markers that prohibits the speaker to mark the givenness of the VP in (45).

However, grammar seems to relinquish its proscriptive preference for default prominence in precisely those circumstances in which Rooth would predict a prominence shift to be possible, namely if the speaker wants to convey that it is remarkable someone else does not want coffee, in other words when alternatives are at play (see also 9):

(46)   a.   Does Ede want coffee?
       b.   EDE <u>wants coffee</u>, but not Viola.

Despite the fact that the *Ede wants coffee* as a whole is given, a prominence shift is possible. One could argue that (46a) is not actually the antecedent for the F-marking in (46b), but rather an (accommodated) question *Who wants coffee*—after all, an antecedent set of propositions also needs to be assumed under the alternative analysis of Rooth's theory. So while this is not a strong argument against the givenness theory, it is seems somewhat uninsightful to have to resort to a default prominence preference to account for (45b), which is straightfowardly predicted by Rooth's 1992b theory without further assumptions.

We can test more directly, however, whether a prominence shift to subject position necessarily involves alternatives. Here's a case where Schwarzschild's theory clearly predicts that pure givenness marking of the VP should be possible:

(47)   Solving this problem won't be easy. I know one thing:
       a.   If VIOLA <u>solves the problem</u>, there will be a party.
       b.   If Viola SOLVES the problem, there will be a party.

The response in (47a) triggers the inference that there will likely be no party if certain other people or possibly anyone other than Viola solve the problem. With the response in(47b) is used, no such implication is made. This is unexpected in Schwarzschild's theory: There is no reason why evoking alternatives to *Viola* should be necessary or even preferred in (47b). The givenness of the VP should make a prominence shift obligatory even when no contrast is intended.[14] Under Rooth's theory, the intuitions are as expected. Alternatives to *Viola* are necessarily involved when prominence is shifted, and we take these alternatives into account when interpreting the conditional.

We can see the interpretive effects of prominence shifts also in scalar implicatures.

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[14]This pronunciation in (47b) in involves verum focus, or maybe it just marks *the problem* as contextually given.

Here is a variation of an example from Rooth (1996a, 82, I added the alternative version including *whether I passed*):

(48)   My roommates Steve and Paul and I took a quiz in our self-paced calculus class, which was graded right away by the TA. Afterwards, George asked me {how it went}/{whether I passed}. My answer was:

a.   I passed.
b.   I PASSED.

A prominence shift to the subject triggers necessarily triggers an inference about the roommates (one or more didn't pass, unless the speaker continues saying something like *... but I don't know about the others.* At least when the context includes *whether I passed* there should be no such inference necessary, since no alternatives to the subject should be necessary. In sum, it seems that at least with respect to shifting prominence to the subject, the interpretive effects are as expected in Rooth's theory: Shifting prominence requires salient alternatives to the accented constituent, not just an antecedent for the constituent that is marked as given.

Another argument against a giveness-only theory comes from Wagner (2005, 2006b). Consider:

(49)   a.   No Antecedent
            Guess what John's aunt, who is incredibly generous, brought for his birthday: A new BICYCLE!
       b.   Contrastive Antecedent
            Guess what John's aunt, who deals with used bicycles, brought for his birthday: A NEW bicycle!
       c.   Non-Contrastive Antecedent
            Guess what John's aunt, who produces expensive bicycles, brought for his birthday: A new BICYCLE!

The examples in (49a) and (49b) seem unsurprising: The word *bicycle* is reduced when it is contextually given. But (49c) suggests that in order to to reduce *bicycle*, givenness is not enough: The alternative to *new* in the context has to be a 'real' alternative, one that is incompatible with it. Evidence from a production study for this constraint is reported in Wagner (2016), evidence from a corpus study in Riester (2015). The fact that there are constraints on the kinds of alternatives that license the contrast shows that the notion of alternative is necessarily to understand this prominence shift. These examples raise questions about what are and are not 'good' alternatives, which are further discussed in Büring (2008); Katzir (2013); Büring (2016).[15]

Prominence shifts to the subject and prominence shifts to a modifying adjective necessarily evoke alternatives on the F-marked constituent. This is expected under the version of Rooth's theory that requires there to be more than one alternative

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[15]A further argument against Schwarzschild's theory is discussed in Kehler (2005), who observes contexts in which double accent patterns are bad although they should lead to few F-markers, see Büring (2008) for further discussion. More arguments are discussed in Wagner (2005, 2006b).

salient for every use of *sim*, but it is unexpected under Schwarzschild's approach, which generally allows for pure givenness marking. We can conclude that at least for these syntactic configurations, assumption (41b) appears to be false. A theory of focus and givenness entirely based on givenness marking does not seem to work, at least not the one proposed in Schwarzschild (1999).

10 Ubiquitous ∼ ?

The third central assumption of Schwarzschild's 1999 theory of focus and givenness is (41c). It holds that every non-F-marked constituent must be contextually given. In our formalization of this account this is embodied in the claim that ∼ attaches to every node (or at least every node that does not bear an F-mark), which the assumption of 'ubiquitous ∼' in 10. This assumption is central to the theory in order to explain, for example, why constituent that consist only of given material but are not themselves given cannot be prosodically reduced and marked as GIVEN. In the following example from (Tancredi, 1992, 87), both *slapped* and *John* are contextually given, but not *slapped John*:

(50)   John slapped Sue, then...
        a.   SUE slapped JOHN.
        b. #SUE slapped John.

While each individual word is given, there is no antecedent of the form *x slapped John*, hence the prosody in (50b) is not possible. If it was possible to simply omit ∼ at the root, then the prosody should be acceptable, hence it is important to have the principle of Ubiquituous-∼, which enforces the insertion of ∼ here even though its presupposition is not fulfilled.

However, when looking at a broader range of examples, the assumption of Ubiquitous-∼ appears to be simply incorrect. Consider first a case in which a VP expresses the same meaning as an antecedent VP, but with a different choice of words:

(51)   John gave up. Then SUE threw in the towel.

The constituents *threw, towel, threw in* are not given here, hence the lack of prominence on the VP should be infelicitous. These words are not F-marked, hence ∼ should attach to them introducing the requirement that they are given. And yet the whole expression *threw in the towel* is happily marked as given and prosodically reduced. This is as expected based on the Alternatives Theory of Focus: At the level at which ∼ attaches, the only requirement is that there is an antecedent with the meaning *John threw in the towel*. There is indeed such a salient antecedent, due to the idiomatic meaning of *throw in the towel* which is equivalent to *give up*. Nothing in the Alternatives Theory requires the individual pieces of a constituent that is marked as GIVEN to be contextually given themselves.

A related argument based on epithets is presented in Wagner (cf. 2012a, 111). The following example from Ladd (1980, 64) illustrates that a DP that is co-referent

to an antecedent can and in fact must be marked as given:

(52)   A: How did your operation go? B: Don't talk to me about it—
    a.   ...I'd like to strangle THE BASTARD.
    b.   B: ...I'd like to STRANGLE <u>the bastard</u>.

The epithet as a whole refers to a referent that is already contextually salient, but the predicate *bastard* is not. In other words, not every constituent that is not F-marked need to be evaluated for whether it is given. The predicate with the DP is new information, while the referent of the DP that embeds it constitutes contextually salient already. It is only at the DP-level that the condition on givenness marking is fulfilled. This is again line with the predictions of theories like Rooth (1992a) or Wagner (2006b), where $\sim$ does not have to attach at every node, but conflicts with those of Schwarzschild (1999). Within these theories, epithets can be analyzed with the same tools as other cases in which an anaphoric co-referent DP contains a description with new information, without any making any additional stipulations. Such anaphoric definite descriptions with new descriptive material are frequently used in news papers to 'squeeze' in more information about the referent, as observed in Bosch (1988, 211). By contrast, the content of accented definite descriptions must be crucial in establishing a unique referent. I destressed, anaphoric uses of definite descriptions as in (52) the coreference is taken to be pre-established, and leaves it to the listener to draw the relevant premise (here: *The doctor is a bastard!*). Prosody gives the crucial cue that co-reference is intended (Bosch, 1988; Umbach, 2001).

11   Are all prominence shifts contrastive?

We saw that at least in some configurations, pure givenness marking is impossible, and prominence shifts necessarily evoke alternatives. According to some theories of focus *every* case of anaphoric prosodic reduction goes along with some other constituents being contrastive. In the words of Williams (1997): 'The lesson is that it is impossible to destress one thing without stressing another, and the stress that falls on the other is loaded, not empty.' In Roothian terms, we can capture the idea by saying that every $\sim$-operator needs at least one F-marker in its scope, in other words, by prohibiting any case of pure givenness marking (as discussed in Wagner, 2005, 2006b).

One case that seems problematic for this view is that the observation that leaving a direct object unaccented (and more generally DP arguments) appears to result in no other requirement than that of requiring its meaning to be contextually salient. Chafe (cf. 1976, 32), for example, observes the following case:

(53)   I bought a painting last week.
          I really LIKE <u>paintings</u>.

It seems implausible here to assume that a contrasting predicate to *like* such as *hate* is necessary for the prominence shift. Perhaps a little less clear in this regard are examples observed by (Ladd, 1980, 53,55):

(54) a. A: Why don't you have some French Toast?
          B: I've forgotten how to MAKE <u>French Toast</u>.
      b. A: Has John read Slaughterhouse-Five?
          B: John doesn't READ <u>books</u>.

Most previous analyses have argued that what triggers an interpretive effect in these examples is simply the reduction of the direct object—the accentuation of another constituent (in these cases the predicate) does not require a contrast (Selkirk, 1984; Tancredi, 1992; Rooth, 1992a; Selkirk, 1995; Schwarzschild, 1999). And yet, if direct objects can indeed be marked as given without anything else being marked as focused (with the corresponding interpretive effect of requiring contrasting alternatives), the question that arises is why these cases are different from, say, the stress shift to a modifying adjective we observed in (49). For those, we saw that leaving the head noun unaccented crucially require a salient contrastive alternative to the adjective. There are several possibilities why these two cases might be different.

The first is that it could be that there is a contrast in the predicate in (53) after all, it might just be hard to detect. We can rule this out by looking at a case where accommodating an alternative should lead to infelicity. Consider the following example, where it is unclear what other alternative to *ate* we could substitute that wouldn't result in oddness (Wagner, 2005, 2006b, cf.):

(55) A: Would you like some quiche?
      B: I already ATE <u>some food</u>.

A second possibility is that only constituents of a certain semantic type (maybe individuals) can be marked as purely given, but certain others (maybe constituents that denote predicates, such as adjectives and VPs) cannot. But we already saw in (53) that not only complements that refer to individuals show apparent pure givenness marking: What is given is the predicate *painting*, not the individual paintings.

A third possibility is that the syntax of $\sim$ is restricted, such that it cannot directly attach to head nouns as in (56a), but it can attach to direction objects, as in (56b). Spathas (2010) proposes such a theory, and argues that focus can only be evaluated at certain nodes ('phases'), a set which includes DPs but excludes head nouns. In order to assure that prominence shifts to the adjective it will have to be F-marked then, which explains the necessity of a contrast in this case:

(56) a. *A NEW ⌐<u>convertible</u>.¬
      b. ⌐A NEW$_F$ <u>convertible</u>.¬

Under this view, the reason the case of direct objects is different is that $\sim$ can directly attach to those, so a representation with an F-marked verb is not necessary to explain the prominence shift:

(57) a. I already ATE ⌐<u>some food</u>.¬
      b. I already ⌐ATE$_F$ <u>some food</u>.¬

While imposing a syntactic restriction on $\sim$ seems very plausible, it does not appear

to be sufficient to explain the full pattern. As we saw above, a stress shift from the VP to the subject also necessarily evokes alternatives. According to Spathas's theory, the VP should be a possible attachment site for $\sim$, but as discussed in example (47), alternatives on the subject are necessarily evoked.

(58)   a.   Viola ⌜wants coffee⌝.   *(no alternative required → too weak!)*
        b.   ⌜Viola$_F$ wants coffee⌝.   *(alternative required)*

A fourth possibility is proposed in Wagner (2005, 2006b), who argues that the actual presentation for cases like (55) is one in which what is F-marked is the predicate denoted by the clause minus the direct object. This is made possible by moving of the object:

(59)   ⌜[λz. I already ATE x]$_F$ some food⌝

The prediction of $\sim$ is that this representation requires a salient which contains other predicates applying to *some food*. A question that would fit the bill to provide such an antecedent is the following:

(60)   What about (some) food?

Then all that is needed is an alternative to the property applying to food that is salient, and such property is contextually entailed (in Schwarzschild's sense) in (55). If we can find a reason why DPs can undergo movement and feed the F-marking of the remaining property but head nouns and VPs cannot, then we can explain the syntactic distribution of 'pure' givenness markings observed so far. This seems syntactically plausible, since at least in English, DPs can be topicalized, for examples, but not head nouns. This analysis could also rationalize why in many languages, given constituents overtly move, although it raises the question why in English, this movement appears to be covert.

Whatever the plausibility of the movement posited, Büring (2016) points to an important independent problem with this analysis: Why is it that marking the nominal predicate in (49) as given imposes such a strict condition on the alternatives to the adjective (they seem to have be mutually exclusive), but the prominence shift in (55) does not? While *high-end* is not an alternative *new*, it seems that just about any predicate applying to food would have to count as an alternative to *I had x*. The divergence in how restrictive the notion of 'contrast' is treated in the two cases, Büring argues, suggests that that we will not be able to use the same tool to explain both types of cases.

The upshot is that there is currently no explanation for the syntactic generalization of when pure givenness marking appaers to be possible in Wagner (2005) and Wagner (2006b). Most current approaches have a way to mark 'pure' givenness in addition to marking prosodic focus (Reinhart, 2006; Féry and Samek-Lodovici, 2006; Büring, 2016), but none of these offer an explanation for when it is and isn't possible. A downside of a model is includes both pure givenness and contrastive focus is that it creates a system with a lot of redundancy, since many examples can be analyzed as 'loaded' focus marking (as Williams calls it) or 'pure' givenness

marking.[16]

12 Purely phonological contrasts

Bolinger (1961, 93) reports a Gardner Rea cartoon, published in the New Yorker (April 14, 1956, p. 36), in which a man stands upside down, feet on the ceiling. The psychologist says:[17]

(61)   In such a case, our first concern is to persuade the patient that he is a stalagMITE.

This example suggests prima facie that at least sometimes, focus marking is about the substitution of alternative linguistic expressions, rather than about alternative meanings, as assumed in the Alternatives Theory of Focus. However, Artstein (2004) argues that 61 and related cases of prominence shifts within words can be accounted or with the same tools that explain semantic focus and givenness marking. The idea is that apparently meaningless sub-word constituents such as *stalag* and *mite* can be assigned a denotation after all: They can denote the individual that consists of the phonological string. So *mite* denotes an individual: the phonological string [majt]. This analysis in terms of individuals explains why in echo-questions, word-parts are substituted by *what* (rather than, say, *which*): *Stalag-what?*.

Using the phonological sequence as a denotation is less contrived than it may seem at first. As Artstein (2004) points out, we can generally refer to the sound of a word and predicate over them: *Mite begins with an [m]*. By the same token, an expression like *Dwight*, which has a regular meaning, can either denote the individual Dwight Bolinger, but it can also be used to denote the phonological (or orthographic) string [dʷajt]. The range of constructions that phonological alternatives can play a role in mirrors the range of uses of semantic alternatives, and includes focus association (Artstein, 2004, 2):

(62)   John only brought home a stalagMITE from the cave.

Similarly, Ladd (2008, 234) observes an instance of an embedded focus marking word-parts from a BBC broadcast:

(63)   Greek divers have found the wreck of the British liner BritTANic, sister ship of the TItanic. . .

If we follow Artstein (2004) in assuming that a linguistic expression can be treated as denoting its own phonological form then we can account for such cases without any additional assumptions.

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[16]For a detailed criticism of two such systems, (Selkirk, 1995) and (Reinhart, 2006) see Wagner (2005).

[17]The cartoon uses underlining instead of small caps.

13 No Semantic Contrast without Phonological Contrast?

Consider the following examples (Williams, 1980, p. 11/12, ex. 26–29):

(64) a. John saw Mary, and then MARY saw JOHN.
      b. John saw Mary, and then HE was seen by HER.
      c. #John saw Mary, and then JOHN was seen by MARY.
      d. #He saw her, and then HE was seen by HER.

It seems that the double contrast marking on both arguments in the second conjunct is impossible when the resulting pronunciation leads to phonologically identical phrase-final words with nuclear accents. Williams (1980) attributed this to a 'Rhyming constraint', which imposes a constraint on the subsequent intonational phrases: They cannot end by identical nuclei, where nucleus is defined as the word carrying the nuclear stress and all subsequent material (the intonational nucleus and tail in the terminology of the British tradition, O'Connor and Arnold 1961).

Another interpretation of the facts is that the possibility of (phonological) givenness marking blocks or pre-empts the possibility of marking the contrast. In this interpretation, what's odd about (64c) adn (64d) is that one *could* have marked the final argument as given, by choosing a different focus structure:

(65) John saw Mary, and then JOHN ⌐[was seen by]$_F$ MARY⌐.

A production experiment reported in Wagner (2012b) showed indeed evidence that speakers who pronounced the sentence as in (65) rate the sentence as much more acceptable than speakers who pronounced it as in (64c). One way to think about this effect is the following: We have seen evidence that focus marking requires a semantic contrast. Maybe focus marking also always requires a phonological contrast (Wagner, 2012b). The more general constraint on intonational phrases proposed by Williams seems too strong: Note that repeating intonational phrases with identical nuclei (in Williams's sense) is not always infelicitous:

(66) Yesterday, I forgot my book, and today again, I forgot my book!

What different about (66) is that no givenness marking (phonological or other) is possible here. If focus marking requires a phonological contrast, the question arises why this might be case. It certainly does not follow from anything in the Alternatives Theory of Focus. One possible interpretation is that marking *Mary* as phonologically given is preferred over marking *Mary* as semantically contrastive. It is not obvious though why the preference should go this way.

While the rhyming constraint proposed by Williams (1980) may have been too strong, William's intuition that this effect has an important relation to rhyme was correct: Wagner and McCurdy (2010) provide evidence that William's effect can explain why identical rhymes (right/write) are unacceptable in English but acceptable in French (which doesn't show the Williams effect).

14 Is F-marking needed?

We discussed cases of obligatory focus marking in which $\sim$ attached to the entire expression, but embedded focus marking (17) is often also obligatory:

(67)   A: I brought an Alaskan wine.
       B: #Alaskan WINE is the best!

This suggests that we must recursively evaluate for every node whether prominence shift is possible or not (or we must consider output candidates in which all possible focus structures are generated and then pick the one that has the strongest set of presuppositions that are fulfilled). One interesting question is how local decisions about a prominence shifts are. Wagner (2005) and Wagner (2006b) pursues a particular hypothesis about locality: The claim is that at every step, it is sufficient to consider the meaning of two sisters in order to decide whether a prominence shift is possible (and then in fact required through Maximize Presupposition).

This hypothesis makes focus/givenness-based decisions about prominence more similar to the way default stress assignment works: Generalizations about sentence stress assignment can be successfully stated by recursively evaluating the relationship between sister nodes and assess which prominence relation should be preferred (Chomsky and Halle, 1968; Arregi, 2002).

This hypothesis was made more precise Wagner (2005, 2006b) using Roothian terminology: The claim is that an F in the scope of $\sim$ is always in its immediate scope, that is, it is always one or both of the two sister nodes of the node $\sim$ attaches to.[18]

If this locality hypothesis is true, then we can actually completely do away with F-marking altogether. This is accomplished in Wagner (2005, 2006b) by positing a two-place operator RELATIVEGIVENNESS which takes a focus constituent as one argument (equivalent to the F-marked constituent in Roothian terms) and a second constituent that is 'marked as given relative to it' as its second argument (equivalent to an un-F-marked constituent in the scope of $\sim$).[19] For each node with two daughters, we need to check whether RELATIVEGIVENNESS can be inserted, and if so then Maximize Presupposition will assure that it is. The claim is that this highly local competition, in conjunction with assumptions about default prominence in the absence of any RELATIVEGIVENNESS operator, will be sufficient to predict the global stress pattern any sentence.

This highly restrictive hypothesis about the locality relation between $\sim$ and F is compatible with a surprising range of facts (Wagner, 2005, 2006b). It turns out, however, that it is too restrictive. Remember that with respect to shifting prominence to a a modifying adjective, the examples in (49) showed that only 'truly contrastive' adjectives show are eligible antecedents for contrast marking. How

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[18]This hypothesis is stronger than the one that $\sim$ has at least one F in its scope, which is also assumed in this theory, as already discussed.

[19]The implicit assumption is that $\sim$ cannot actually attach to a node that has a single daughter, and givenness/focus marking is therefore argued to always be relational, following similar ideas in Williams (1997).

consider the following variation of the examples (Katzir, 2013, 8):

(68)   Mary was required to bring an expensive convertible.
      a.   And John is required to bring a CHEAP <u>convertible</u>.
      b.   And John is required to bring a RED <u>convertible</u>

Example (68b) is most natural with prominence shifted to *red*, although before, we had seen similar cases in which it was not sufficient to have an antecedent to license a stress shift on an adjective that is not mutually exclusive (our example involved *high-end/new*). Intuitively, it is clear what is going on: While being *red* does not exclude being *expensive*, if someone collects *red* convertibles this does contextually imply here that he doesn't collect *expensive* convertibles (being expensive is not a sufficient criterion for John's collection and may also not be necessary). We can account for this example if $\sim$ attaches to the VP and F attaches to *red*, in which case we have contrastive alternatives of VP meanings. Crucially, it evaluating whether *red* is a valid alternative to *expensive*, we need access to the embedding predicate *collect*. This, however, is incompatible with the strict locality hypothesis in Wagner (2005, 2006b). We conclude that F does not have to be in the immediate scope of $\sim$.

15   Alternatives or Unalternatives?

Unalternatives semantics (Büring, 2015, 2016) tries to do away with F-marking, and also tries to develop a theory of focus/givenness marking in which decisions about the prominence relation between sisters are made in a recursive and local manner, just as Wagner (2005). The main difference between Unalternative Semantics to prior approaches resides in its account of why focus marking is obligatory when possible. We saw that one way to explain why focus and givenness marking is obligatory when possible: Maximize Presupposition. This principle enriches the meaning of expressions depending on which alternative expressions they compete with. Unalternative Semantics (Büring, 2015) can be characterized as a theory of focus that 'builds in' the effect of maximize presupposition into the semantics focus without positing competition. Take an utterance with default prominence:

(69)   SMITH ordered BREAKFAST.

The default stress pattern is in principle compatible with any contextual focus set, but according to Unalternative Semantics it nevertheless involves a focus operator $\sim$. The pronunciation used here restricts the to contexts in which it is *impossible to shift prominence to a non-default prominence relation for any node*. In other words, it cannot be used in contexts that would have fulfilled the presupposition introduced by shifting prominence to *ordered* or to *Smith*. For example, the fact that the prominence relation between *ordered* and *breakfast* is the default prominence rather than the one with prominence on *ordered* will add the condition that alternatives of the form *x breakfast* are 'Unalternatives'.

It is important to realize that being an unalternative does not mean that no

alternative of the form *x-ed breakfast* can be contextually salient and play into the interpretation of 69. Consider the following example, which shows default prominence on the direct object within the VP:

(70) A: Ready to go?
     B: I've only ordered BREAKFAST so far.

A may well infer from B's statement that B hasn't been served breakfast, started to eat it, or finished it. These inferences show that alternatives of the form *x-ed breakfast* are still considered. But one could also infer that B has still not checked out of the hotel, so not all alternatives have this shape. This is compatible with Unalternative semantics. What Unalternative semantics predicts, however, is that for the VP *ordered breakfast* to receive default prominence, it cannot be the case *all* alternatives are of the shape *x breakfast*—in a way, the theory could thus more appropriately called Unfocus Semantics, since it recursively adds constraints to a representation specifying what cannot be focused. The constraints that are added recursively are precisely those that Maximize Presupposition would predict, at least in the version proposed in Wagner (2005, 2006b) where this competition-evaluation happens recursively.

In standard Alternative Semantics, overfocusing is prevented by competiton and arbitrated by Maximize Presupposition. In Unalternative semantics, there is no need for competition since constraints on the possible antecedents for focus marking are recursively added by considering the prominence relations in the tree (every non-default prominence relations adds an Unalternative restriction). Every lost opportunity to switch to a marked prominence pattern imposes the constraint that the constituent that fails to receive exceptional prominence cannot be the only one that varies in the alternatives computed for that constituent.

A challenge for Unalternative Semantics is that there is some direct evidence that supports a competition-based analysis. In a theory based on Maximize Presupposition, the enrichment with anti-presuppositions (equivalent to the Unalternatives in Unalternative Semantics) only ensues when there is a competiing expression with a stronger meaning. For the case of prominence shifts, this means that there must be a competitor for which prominence is shifted and a stronger meaning is encoded. But sometimes prominence shifts are impossible for phonological reasons. When a morpheme rejects prosodic prominence, then placing prominence on an adjacent morpheme can still be compatible with narrow focus on the meaning that the unstressable morpheme encodes. Consider the case of focusing on the past tense in English:

(71) She's not going to walk out, she WALKED out.

The morpheme *-ed* in English is not easily accented, other than maybe in a metalinguistic way that highlights the orthography. It is still possible to place semantic focus on the past tense, however, but in that case the prosodic accent reflecting this focus falls on the verb stem. Note, however, that this is equivalent to the default prominence location. The reason this does not result in infelicity is that there is

in fact no competing pronunciation that would encode the stronger presupposition. As expected by the competition-based explanation, the facts change when the tense is expressed with a stressable morpheme, for example *used to* or in the presence of *do*-support, in which case accenting the stem is infelicitous:

(72)   She's not planning to play baseball,

    a.   she PLAYED <u>basketball</u>.
    b.   she USED TO/DID <u>play basketball</u>.
    c. #she used to/did PLAY <u>basketball</u>.

This pattern generalizes to at least one language that features a broader range of morphemes that are unaccentable: Lekeitio Basque. In Lekeitio Basque, main prominence (marked with ˆ) typically falls on the constituent directly preceding the main predicate of a sentence. Within that constituent, prominence normally falls on the first lexically accented word, in this case *book*, otherwise it falls on the last syllable of the last unaccented words. However, it is possible to shift prominence within that constituent to a different word if there is a contrast, just as in English:

(73)   a.   LIBÛRU barriža ekarri-dot
             book   new.A bring-AUX
             'I brought the new BOOK'/'I brought the new book'
    b.   libúru barrižâ ekarri-dot
             'I brought the NEW book.'

The rendition in (73a) with prominence on *book* is compatible with several focus possibilities (on *book*, on the DP, on the VP...), while the rendition with prominence on *new* in (73b) requires an appropriate antecedent of the form *x book*. However, a prominence shift to a word that is lexically unaccented is not possible, and in the presence of unaccented words the 'default' prominence pattern is compatible with a broader range of focus possibilites (Hualde et al., 1994, 62):

(74)   a.   etxe barrizâ ikusi-dot, es subi   barriža
             house new.A see-AUX no bridge new.A
             'I saw THE NEW HOUSE, not the new bridge.'
    b.   *etxê barriža ikusi dot, es subi barriža 'I saw the new HOUSE, not the new bridge.'

The word *house* is lexically unaccented, hence default stress falls on *new* in this case (74a). Even though *house* is contrastive here, it cannot carry the main prominence (see Arregi, 2016, for more discussion on the Basque data).

    A competition-based analysis predicts the Basque and English facts: There is no enrichment without valid competitor. This pattern is not expected in a theory that directly reads of focus possibilities of the prosodic prominence relations. It seems that at each recursive step, an assessment has to be made whether one could actually shift prominence.[20]

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[20]A second potential problem for Unalternative semantics regards the locality issue discussed in the previous section. If alternatives need to be contrastive in some sense, it seems that in example

16 Obligatory Association with Focus?

As illustrated at the outset of this paper, prosodic focus can interact with the contribution to meaning made by other operators such *only*, which are consequently often called focus-sensitive operators. How do such association effects come about?

For Rooth (1992b), there is actually no direct relation between *only* and prosodic focus. Rather, the restriction of the alternatives observed for example in (4) comes about indirectly, whenever a hidden pronoun that introduces constraints on the domain of alternatives considered for *only* is coindexed with the pronoun that $\sim$ operates over, but not if the pronouns are coindexed with distinct antecedents:

(75)   Mary only (C_1) $\ulcorner$[READ$_F$ the recognitions.$\urcorner \sim C_1$]

When considering the sentence *reco* out of context, this may seem too weak as a theory of the association between *only* and focus: Surely, one spontaneously understands in (75) that the alternatives that *only* ranges over are restricted to substitutions of the predicate. But this might just be the simplest assumption to make in order to accommodate the antecedent for focus marking. It is clear that domain restriction is needed in addition to the constraint introduced by $\sim$, for example, (75) does not exclude *all* properties that relate Mary and recognitions ('owning', 'holding', 'liking', ...), but only those that could be contextually relevant ('understand'). Using prosodic focus at most imposes the weak constraint that the alternatives only vary in the transitive predicate. According to Rooth's theory even that is not necessary: If there are separate antecedents for the hidden variable that $\sim$ and *only* operate over, the prediction is that no association should be necessary.

Let's consider an example from Williams (1997, 607) that supports this view:[21]

(76)   I only promised Mary a SMALL SUM, and I only promised PETE a small sum, as well.

For this to be non-contradictory, *only* must associate with *a small sum* in the second conjunct, but prosodic focus falls on *Pete*. A related example involving a prominence shift to an adjective is presented in (Wagner, 2006a, 317), I adapt it here to make it more similar to Williams's:

(77)   Jo only took Ancient Greek, so he didn't take Latin; and Sue only took MODERN Greek, so she didn't take Latin either.

These examples show that *only* does not necessarily associate with a prominence shift in its scope. This is as expected if there is no direct association, as is predicted by the accounts of focus association in Rooth (1992a); Roberts (1996) and Martí

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(68) the contrastiveness condition is evaluated at the matrix VP level, with an F-marked adjecgive *red* embedded in the VP. In unalternative semantics, the restrictions have to be added at the first node at which a non-default prominence is chosen however. Whether or not this leads to problems is how the contrastiveness condition is implemented exactly.

[21]Roberts (1996, 2012) discusses a related example showing a broader alternative set than the prosodic focus marking suggests.

(2003). To be sure, if we allow the possibility of nested $\sim$ operators, these examples are compatible with a theory that posits obligatory association with F:

(78)   Sue only ⌜took [⌜MODERN$_F$ Greek⌝]$_F$.⌝

However, these examples are just what would be expected if there is no direct relationship between *only* and prosodic focus at all (Rooth, 1985, 1992b; Dimroth, 2004). And yet, in certain syntactic configurations, association with prosodic focus has been reported to be obligatory (Büring, 2015, who credits Roger Schwarzschild for the example):

(79)   A: What did you only eat in Paris?
         B: I only ate CRÊPES in Paris.

The example indeed seems odd in a way that Williams's example (76) does not, but it remains unclear why. This example involves a repeated focus or 'second occurrence focus', a phenomenon which has been subject to several recent studies (Partee, 1991; Kadmon, 2001; Krifka, 2004; Rooth, 1996b; Beaver et al., 2007; Howell, 2007; Ishihara and Féry, 2008; Rooth, 2010; Büring, 2015), but we will not explore this further here.

    How direct the relation between focus sensitive operators and their foci is remains an open question. Rooth (1996a) notes, however, that a theory that allows for direct association between operators other than $\sim$ and focus may be too powerful. There are no natural language operators (to the extent that we know) that work like the made-up operator *tolf*:

(80)   a.   I tolfed that he$_F$ resembles her: I told him that he resembles her
         b.   I tolfed that he resembles her$_F$: I told her that he resembles her
         c.   I tolfed that he$_F$ resembles *her*$_F$: I told him and her that he resembles her

If we can freely make reference in the lexical entry to the alternative sets introduced by focus, then why couldn't we write a lexical entry for *tolf*? Given that the indirect theory of association is more restrictive, von Fintel (1994, 36) this type of indirect theory of association the null hypothesis.

17   Association without Focus

Sentences that involves *only* and involve a prominence shift (such as 75) are not felicitous without a context that provides an appropriate antecedent for the prosodic focus marking (or at least makes it easy to accommodate)—independent of the precise contribution of *only*. Williams (1997, 608) discusses the following case:

(81)   a.   Yesterday, I only saw blue trucks on the road.
         b. #Yesterday, I only saw BLUE trucks on the road.

I might say (81a) to convey that all trucks I saw on the road were blue, and without

implying anything about whether I saw any cars. If nothing else is said, this seems in fact like a plausible interpretation of (81a). If I drove through Montréal, it is plausible that I only saw few trucks (which therefore could have all been blue by coincidence), but many cars (which would be less likely to all have been blue). Even if I intend the reading in which *only* is restricted to range over alternatives of the form *x trucks*, encoding this restriction with a prominence shift to the adjective would be odd. There simply isn't a salient antecedent to warrant such a shift in prominence.

This shows that prosodic focus is not in fact necessary in order to restrict the alternatives to *only* to a set of alternatives of the form *x trucks*. We can call this phenomenon association without focus. Sudhoff (2010b,a) presents experimental evidence from a production experiment for association without focus in German. Marking a constituent with focus and *only* associating with that constituent can be fully dissociated: A 'contrastive' prosody is only used in the presence of a salient antecedent for contrast marking, and association with *only* alone had no effect on the prosodic realization of the relevant constituents.

Association without focus seems to be real, and suggests that there is no necessary relationship between the operator *only* and the alternatives it ranges over, and focus prosody. While Rooth (1992b) does posit such an indirect relationship, it is not clear whether this account in is compatible with association without focus. From a technical point of view it is, since we can just posit that (81a) simply lacks a ∼ operator. But if the pronominal argument responsible for the alternative for *only* can find an antecedent, why couldn't a ∼-operator use that same antecedent? And shouldn't we have to use that antecedent if focus-marking is generally made obligatory by Maximize Presupposition?

18   Selective Association

Within a VP constituent, there can be multiple accented constituents for which alternatives are evoked within a VP. It appears that a focus operator can selectively associate with one of them. Consider (Wagner et al., 2010, 3, contexts are simplified here):

(82)   a.   Gramma gave a scarf to both Maryanne and John. She only gave a BUNNY to MARYANNE.
        b.   Gramma gave a scarf and a bunny to John. She only gave a BUNNY to MARYANNE.

The production experiment reported in this study shows that selective association is indeed possible here. If both accented constituents are in the syntactic scope of *only*, this would be evidence that *only* can 'pick' an associate out of a number of possible associate, which on the face of it lends further support to an indirect association account. One way to think about these examples is that there is a single ∼-operator which binds both foci, and is anaphoric to *gave a scarf to both Maryanne and John.* This leads to a broader set of alternatives than are considered in the in-

terpretation of (82a), which seems to range over the subset that are of the form *gave x to Mary*. This could be analyzed within an indirect theory of association through the same mechanisms that allows association without focus:

(83)   Gramma only C_1 ⌜gave a BUNNY$_{F1}$ to MARYANNE$_{F2}$⌝$_1$.

Another possibility is, however, that the constituent that whose alternatives do not appear to be considered by *only* moves out of its scope leading to the following LF:[22]

(84)   To MARYANNE, Gramma only ⌜gave a BUNNY$_{F1}$⌝

In the following example, however, it is harder to argue for a movement analysis:

(85)   She only likes the birthday presents that Gramma gives her. And she only likes ⌜the birthday CARDS that GRANDPA gives her⌝.

If the relationship between *only* and prosodic focus is indirect, then maybe this is just another example in which the alternatives available for focus marking do not align with the alternative restriction of *only*, similar to the cases of association without focus. But maybe more has to be said. Rooth (1996a) presents an example in which there are two operators associating with focus, *also* and *only*, and argues that selective association is possible:

(86)   We only$_1$ recovered the diary entries that Marilyn$_1$ made about John. We also$_2$ only$_1$ recovered the diary entries that Marilyn$_1$ made about Bobby$_2$. 'Also with respect to diary entries about Bobby, we only recovered the ones that Marilyn made.'

Rooth (1996a) uses this example to argue in favor of the possibility moving foci in order to associate, and argues further that this example shows that this movement does not obey island constraints (in this case the relative clause island). The possibility of selective association in the presence of multiple foci has been questioned in experimental work reported in Beck and Vasishth (2009), whose argue that (86) should be unacceptable. We will cannot discuss this any further here.[23]

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[22]Extraction from the scope of ∼ has been argued to be impossible in Beaver and Clark (2008), but it's not clear that it really is, for example, the following example seems fine:

i.

A comprehensive discussion of extraction and focus association could easily fill a separate review article.

[23] Another possibility is that focus operators can directly associate with certain F-markers in their scope to the exclusion of others, which would require them to select their foci by their index. Indexed foci are also argued for in Kratzer (1991) based on the famous Tanglewood example:

(87)   I only went to Tanglewood because you did.

The intended reading is one in which the speaker defends herself against the accusation of being a copy-cat, and conveys that there is no other town x such that she went to x there because the interlocutor did. The questions raised by this example are complex, see Krifka (1991) and Beaver and Clark (2008) for discussion. One view, defended for example in Erlewine and Kotek (2016)

19   No Association Without (some) Prominence?

One observation that is suggestive of a more direct relationship between *only* and prosodic focus is that it appears that *only* cannot associate with a constituent that has no prosodic prominence whatsoever (Beaver and Clark, 2008, 150):

(88)   A: You had many discussions with Sandy, but what I want to know is the extent to which you talked about Fred. Of all the times you talked with Sandy, how often was Fred the person you talked about?
         B′: I [only]F discussed'im with Sandy. Cannot mean: 'I only discussed Fred (and no one else) with Sandy.'

Related observations are reported in von Fintel (1994, 45) and Rooth (1996b), in Bayer (1996, 59) for German, and in Hoeksema and Zwarts (1991, 67) for Dutch. If the relationship between *only* and prosodic focus is indirect, then this seems surprising. Using Büring's terminology, one could argue that using a clitic introduces an Unalternative: It is incompatible with narrow focus on the referent of the clitic.

   Beaver (2004) note another twist to this observation. In the same set of circumstances, association with *always* is actually possible (Beaver and Clark, 2008, 150):

(89)   A: You had many discussions with Sandy, but what I want to know is the extent to which you talked about Fred. Of all the times you talked with Sandy, how often was Fred the person you talked about?
         B: I [always]F discussed'im with Sandy. 'Whenever I discussed someone with Sandy, I discussed Fred.'

So it is not the case that one generally cannot restrict the domain of any quantifier such that what is varied is only the referent of the cliticized argument, the effect seems to be specific to focus operators like *only* and *even*. This and a number of other differences between operators like *only* and operators like *always* are used in Beaver (2004) to argue that *only* associates with focus directly, while *always* does not.

20   Syntactic Association?

Following Rooth (1985, 1992b), most current analyses of *only* assume that the mechanism through which *only* associates with prosodic focus is that the alternatives of the constituent *only* attaches to are restricted according to the placement of prosodic focus. For example, of *only* attaches to a VP, the idea is that the alternatives it operates over are always VP meanings, even if the only part of the VP meaning that varies is the part contributing by a DP embedded it in it. This view is often called in-situ theory of association with focus. In our examples (4), in which *only* attaches

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(but see also Krifka 1991), is that once a movement analysis if adopted, the need for indexed foci vanishes. But see Longenbaugh and Bassi (2017) for evidence against this interpretation of the facts.

to the VP and associates with a DP embedded in it, the relevant alternatives are always VP-meanings, which only vary alternative meanings to that of the DP that carries prosodic prominence.

An Alternative view is that in such cases, the LF that is interpreted is actually different from the apparent surface syntax. In our example (4a), for example, the DP *Bill* moves to associate with *only* according ot this view. Drubig (1994); Bayer (1996); Krifka (2004) and Wagner (2006a) present a range of arguments in favor of such a movement account. Wagner (2006a) presents arguments for a particular analysis according to which the LF of *only* always looks as follows, with a focus constituent in the complement position of *only*, and a second background argument:

(90)   [[*only* focus constituent] background]

In the case of (4a), the associate DP moves to the complement position of *only* at LF, leading to the following representation:

(91)   [[only Bill] [λx. John introduced x to Sue]].

The empirical argument in Wagner (2006a)in favor of association by movement is based on the distribution of NPIs. *Only* generally licenses NPIs, but not within its focus (von Fintel, 1999; Beaver and Clark, 2002). For example, *only* attaching to the subject licenses NPIs within the VP, but not within the subject:

(92)   a.   Only Amy invited any friends.
        b.   *Only any friends attended the party.

The generalization that *only* licenses NPIs in the unfocused part of the sentence is not quite accurate, however. When we restrict the focus *only* associates with to only a sub-part of the subject it attaches to, NPIs are not licensed even within the part of the subject that is not focused:

(93)   a.   *Only <u>anyone's</u> FRIENDS$_F$ attended the dinner.
        b.   Only <u>someone's</u> FRIENDS$_F$ attended the dinner.

When just looking at instances of *only* attaching to the subject, the generalization is simple: Irrespective of the actual focus *only* associates with (which has to be somewhere within the subject), NPIs are licensed anywhere in the VP but nowhere in the subject. In other words it appears that *only* does not license NPIs in the constituent it attaches to. And yet, when considering the case of VP-*only*, it is clear that association with a sub-part of the VP as in (4a) *can* license NPIs elsewhere in the VP:

(94)   a.   John only introduced BILL$_F$ <u>to anyone</u>.
        b.   John only introduced <u>anyone</u> to SUE$_F$.

The distribution of NPIs in the (apparent) scope of *only* can be explained if the DP *only* associates with actually moves. Evidence for a movement analysis comes from observations that suggest that the posited movement obeys islands constraints

(Wagner, 2006a).[24]

Association through movement does not do away with the need for a mechanism to further restrict the alternatives that are considered, for example, in order to explain the apparent association with *friends* in (93b), we still need a mechanism to restrict the alternatives to the DP to give the semantic effect of association with the head noun.[25]

This syntactic approach suggests a different interpretation of the differences between *always* and *only* observed in (Beaver and Clark, 2003, 2008). After all, *only* can (on the surface) attach to a range of constituents, while the syntax of *always* is substantially more restricted. As argued in Wagner (2006a), we can explain this if *only* in English can attach to either of its argument, and *always* differs from *only* simply in that it is a true propositional adverb that only takes one argument. Whether such a syntactic analysis can explain differences between *only* and *always* such as the one observed in 89 remains to be seen.

There are also semantic problems with the idea that VP-only *only* necessarily ranges over VP meanings. The issue was first observed in a in Rooth (1985, 85, fn 14), and then shown in its fully generality in Zimmermann (2017). Consider first a case in which *only* attaches to a subject (Zimmermann, 2017, 12):

(95)   Only three is an odd number.

This sentence is intuitively clearly falls, and yet, if we assume with Rooth (1985) that *only* ranges over propositional alternatives of the form $\lambda w.x$ *is an odd number in w*, then it should come out as true. The reason is that numbers are rigid designators, and a proposition of the form *x is an odd number* is either true in all worlds or false in all worlds (its truth does not vary by world). Therefore, any sentence of the form *x is an odd number* that involves an actual odd number denotes the *same* proposition (it is a tautology, true in every possible world). The particular example might by itself not be entirely convincing. After all, a theory that takes *three is an odd number* to denote the same proposition as *five is an odd number* is not fine-grained enough to capture our intuition that they mean different things. However, Zimmermann (2017) argues that the problem recurs with less 'pathological' examples, including ones in which VP-*only* associates with a proper name embedded inside the VP, as in our example (4a). It seems that *only* needs to vary over alternatives to the proper name itself, not over alternatives to VP-meanings or propositional alternatives. In other words, *only* needs 'access' to the meaning of the DP it associates with, as is expected if direct association is possible, but is unexpected in the in-situ theory.

A movement theory doesn't automatically fix the issue. However, association by movement would be one way to explain how *only* can access the DP embedded

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[24]Erlewine and Kotek (2016) more recently argue based on variations on the Tanglewood example (mentioned in in footnote (23)) in favour of association by movement, but see Longenbaugh and Bassi (2017) for issues with this argument.

[25]One could question then what the motivation for associating by movement is, if the same semantic effect could be achieved in-situ by restricting the alternatives. The proposal in Wagner (2006a) is that the existential presupposition introduced by *only* can be maximized by minimizing the size of the focus constituent.

with the VP. Another possibility is to assume a more complex representation of the meaning of the constituent *only* attaches to. The structured-meaning account to focus assumes that focus creates a structured meaning consisting of a tuple of the meaning of the focus constituent and a property that applies to it (von Stechow and Wunderlich, 1991; Krifka, 1991, 2001), which, as pointed out by Zimmermann (2017), provides a rich enough representation to define appropriate truth conditions for cases in which *only* associates with DP meanings.

Challenges for the movement of association are discussed in Hirsch (2017), who argues that a theory that posits that the semantic operator *only* can attach to constituents a range of constituents of different semantic type is problematic. The surface syntax, which indeed shows syntactic flexibility, is taken to show that the word *only* we observe on the surface might not reflect the syntactic attachment of the operator, but rather be a form of concord (see also Bayer, 2016). We will cannot explore these syntactic issues in more detail here.

21 Do we need a semantic theory of focus?

Throughout this article, we have used the Roothian formalisms to express different ideas about focus and givenness marking, and association with focus. The crucial ingredients, are the operator $\sim$ that takes a set of alternatives as its argument; the syntactic F-marker that are involved in constraining the alternatives under consideration; assumptions about how speakers make choices between different possible focus structures (e.g., AvoidF vs. Maximize Presupposition); and a phonological principle that captures the effect of $\sim$ on the pronunciation of an expression.

It is useful to 'translate' claims about how focus and givenness is marked in the grammar into Rooth's notation, so different theories become more comparable. The theories we reviewed can be characterized as differing from Rooth's in their assumptions about the content of $\sim$ (e.g., does it require there to be a contrasting alternative in the alternative set or not? Does it allow for entailed antecedents or only identical antecedents?), in the syntactic locality restrictions on the distribution of $\sim$ and F (can $\sim$ attach to any constituent? Is the placement of Fs in the scope of $\sim$ free or is it restricted?); or in the assumed phonological constraint(s).

For example, we can characterize the theory presented in Schwarzschild (1999) as differing from the standard theory in Rooth (1992b) in that entailed antecedents are allowed, in assuming that $\sim$ be used to with no F-marker in its scope, as assuming that $\sim$ attaches to every node (or at least every non-F-marked node). We can characterize the account in Wagner (2005) as assuming that entailed antecedents are allowed, that $\sim$ always has at least one F-marker in its scope, as assuming that each F has to be in the immediate scope of $\sim$, and as assuming that $\sim$ imposes a contrastiveness condition on the antecedent. We can also distinguish families of theories, for example Rooth (1992b) and Wagner (2005) assume that there can be utterances without any $\sim$ in it, while Selkirk (1995) and Schwarzschild (1999) make assumptions equivalent to assuming that every utterance has at least one $\sim$ in it.

This formalism is also helpful to make explicit dimensions along which languages may vary typologically, and to express particular claims about the nature of partic-

ular cross-linguistic differences. Féry and Ishihara (2009), for example, argue that French differs from English in the phonological constraints on phrasing (and as a result, on prominence shifts), while vander Klok et al. (pted) argue that they differ in the scope possibilities of $\sim$.

As we better understand more focus phenomena and more of the cross-linguistic variation in how focus and givenness affect grammar, we might discover that we need additional ingredients in our theory (maybe we need to be able to mark new vs. given in the scope of $\sim$), or less (maybe F-marking is not necessary). However, the picture presented so far suggests that it is uncontroversial that we need *some* grammatical theory of focus and givenness, but this is not generally assumed.

One interpretation of contextual effects on prosody is that they are reflexes of the prior activation of cognitive presentations, similar to the effects observed in priming studies. Certain words might be reduced simply because their meaning, an aspect of their structure, or maybe even just the phonological form had some prior activation. Such prior activation might make them more 'accessible', and this could lead to reduction effects during production. Alternatively, speaker could make certain choices (like giving more prominence to one word over another word) because they take into account what parts of the message will be easy or difficult to decode by the listener. Such accounts based on 'accessibility' are pursued in the psycholinguistic literature on prosodic reduction. For a recent review see Arnold and Watson (2015) and Wagner and Klassen (2015). Wagner and Klassen (2015) and Klassen and Wagner (2017) present experimental evidence that certain existing accessibility and predictability accounts cannot explain effects of contrastive focus, since they crucially relay on pragmatic factors that lie outside the purview of accessibility accounts, while Turnbull et al. (2017) for recent evidence in favor an account in terms of predictability.

There are also theories of prosodic prominence that are purely based on pragmatics, without any semantic operators such as $\sim$. A recent example is the theory proposed in (Bergen, 2017). The basic idea in Bergen (2017) that the special focus prosody that we observe in examples like 6b is not a result of hidden grammatical structure ($\sim$, F, ...) that is sensitive to the presence of salient alternatives, but rather that using focus prosody triggers pragmatic inferences that will lead a listener to conclude that certain alternatives were taken to be salient by the speaker. The particular model of pragmatics assumed is the rational speech act model, which assumes that speakers make rational decisions about how to achieve their goals in a conversation given that they have to operate in a noisy channel. The idea of this account is that in our example 6b, the reason speaker gives added prominence to *Ede* and reduces the rest of the sentence is a decision to reduce the noise rate for the emphasized part of utterance (presumably at the expense of increasing the noise rate for the reduced part in this case since there is also a reduction in the post-focal domain). This would make sense, for example, in the context where it is salient to both speaker and hearer that the question under discussion is *Who wants coffee?*. Bergen (2017) shows that the rational speech act model can rationalize some particular uses of prosodic focus, purely based on pragmatic reasoning. Bergen (2017) also highlights, however, that this does not necessarily mean that speakers of En-

glish actually do use exactly this type of reasoning every time they use prosodic focus.

It seems clear that aspects of the prosodic focus system must be conventionalized—why else would languages differ in whether and in what circumstances they mark focus prosodically (as already discussed in Ladd, 1990)? Bergen's proof-of-concept argument shows that some uses of prosodic focus can be rationalized purely with pragmatics, but also raises the question why these same examples should work differently in, say, Romance languages. Also, one can ask why it is that other means of reducing noise do not seem equally adequate as a way to encode focus in English (such as slowing down a particular word in the utterance instead of shifting prosodic prominence). However, the mere fact that using prosody to convey certain kinds of focus in Romance or the fact that in English focus must be conveyed with a certain phonological tool rather than alternative ones does it by themselves speak against this theory. It is possible that listeners would draw similar inferences to non-conventional ways of reducing noise, even if they wouldn't spontaneously use those in a conversation, and even if they feel like these are not part of their 'grammar'. And if they do, one could think of this pragmatic account as a way to explain how, diachronically, today's conventionalized focus marking system came about.

It is clear that a pragmatic account of the types of prosodic effects discussed in this review should be the null hypothesis. It might turn out that Rooth's notation is a useful tool to capture generalizations about prosodic focus, but does not actually correspond to a semantic operator that forms part of what is semantically encoded in the message. However, it would take a pragmatic model predicting the full set of complex phenomena outlined in this overview to show that a semantic theory is not needed, but the fact that such a model does not exist yet does not mean that it couldn't.

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