The Representation of Focus, Givenness and Exhaustivity[1]

Roger Schwarzschild
MIT
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Abstract
This paper ends with rules of interpretation for a grammar in which an expression can have an *N*-marking ('novel'), an *F*-marking ('focus'), both or neither. Silent exhaustivity operators associate with focus and are susceptible to intervention by overt associators. *F*-marking can trigger *N*-marking on an expression even though it represents old information. A second occurrence focus is a focus that is not *N*-marked.

Introduction

Focus boosts intonational prominence, givenness weakens it. What happens when an expression is both given and focused? We'll look at a suite of examples pointing to three conflicting answers to this question. In one case, the result is reduced prominence, in one case increased prominence, and in one case the result is infelicitous. I will negotiate a path out of the conflict by embracing the following hypotheses:

◇ Givenness and focus co-exist in the grammar. Each is represented with its own syntactic marker associated with its own phonological consequence.[2]

◇ Givenness status is determined relative to the discourse context and the immediate syntactic context in which an expression is found in a way that minimizes the amount of material deemed novel (Schwarzschild 1999).

◇ Every focus associates with a focus-sensitive operator[3].

◇ There are silent exhaustivity operators that associate with focus (Chierchia 2013, Fox 2007, Katzir 2013 a.o.)

◇ Structures containing nested focus-sensitive operators in which all the associated foci are in the scope of the inner operator are problematic. (Beck and Vasishth 2009)

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[1] To appear in Rajesh Bhatt, Ilaria Frana, and Paula Menéndez-Benito (eds.), *Making Worlds Accessible, A Festschrift for Angelika Kratzer* (2019)

[2] This view is endorsed in some form in Beaver and Velleman (2011), Féry and Ishihara(2009), Féry and Samek-Lodovici (2006), Katz and Selkirk (2011), Kiss(1998), Kratzer and Selkirk(2009, 2017), Rochemont (2016) and Selkirk (2008).

[3] "The focus theory that forms the foundation of this discussion must be explicitly distinguished from the semantic *association-with-focus* theories, such as the structured meaning theory of focus (see Jacobs (1983, 1991b), and von Stechow (1991)) or the theory of alternative semantics Rooth (1985)). Within these theories it is assumed that every focus-sensitive particle is associated with a focus and, conversely, that **every focus is associated with a focus-sensitive operator**." Winkler(1997:13-14)

My analysis of the conflicting examples is offered as further support for these hypotheses. The discussion will also produce a new corollary to the theory of givenness. In Schwarzschild(1999), I did not discuss association with focus, but once foci are added to the mix, it turns out that an expression which otherwise would be deemed Given, acquires novel status because of the presence of focus. Such expressions will appear to confuse the phonology of givenness and the phonology of focus.
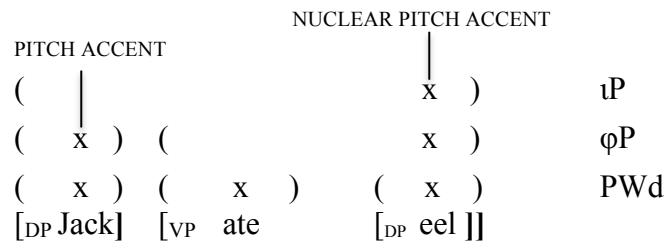
The data to be discussed will include the *crêpes* example, which has been a matter of some controversy in the literature on second occurrence focus. I will propose that the difficulty with this example has to do with nested focus-sensitive operators. So I side with Büring(2015, 2016) in viewing these examples as problematic, but with Rooth(2010) and with Beaver and Velleman(2011) in thinking the problem is not the business of focus phonology.

Finally I will break ranks with the abovementioned authors for whom second occurrence focus is the result of a competition among foci, as well as those who take it to be anaphora-to-focus (Selkirk 2008, Krifka 2004). Rather, I endorse the idea that second occurrence focus results from the confluence of independently derived focus and givenness marking simultaneously implemented in the phonology as in Féry and Ishihara(2009)

Ingredients for Intonation

In this section, we'll briefly review factors that determine how an expression is intoned. *Intonation and Meaning* (Büring 2016) is a remarkably comprehensive and clear treatment of this question. The diagram in (1) below, based on Chapter 6 of that book, reflects the role played by syntax:

(1)

```
                                   NUCLEAR PITCH ACCENT
          PITCH ACCENT                    |
     (        |                      x    )        ɩP
     (    x   )   (                  x    )        φP
     (    x   )   (      x    )   (  x    )        PWd
     [DP Jack]    [VP  ate      [DP eel ]]
```

In (1), prosodic structure and pitch accents are associated with the sentence *Jack ate eel*. The construction is guided by constraints that refer to syntax, such as the following:

(2)   • The right edge of an XP aligns with the right edge of a φP
       • The head of ɩP is aligned with the head of its rightmost daughter

As a consequence of these constraints, if an adjunct is added to the sentence, the nuclear accent, felt to be the highpoint of prominence in the utterance, shifts to the adjunct. This is indicated with SMALL CAPS in (3)

(3)   Jack ate eel in VENICE.

Sometimes, a word or phrase will fail to receive the prominence expected based on its syntax because it expresses content previously introduced in the discourse. In this case, we say that the expression is Given. Such is the fate of *the dog* in (4)B, which unlike *eel* in (1) does not receive a nuclear accent. Likewise, (5)B differs from (3) because in (5)B, *Venice* is Given so its prominence is weakened and the accent remains on the object.

(4)   A: Jack is getting better. He now has an apartment and a dog.
       B: Has he NAMED the dog?

(5)   A: What did Jack eat in Venice?
       B: He ate EEL in Venice.

Sometimes the location of main prominence is correlated with a difference in content. (6) is one such case.

(6)   a. Jack only ate EEL in Venice.

       b. Jack only ate eel in VENICE.

(6)a is felt to convey that in Venice, Jack ate eel and nothing else, while (6)b is felt to convey that Jack ate eel in Venice and nowhere else. *EEL* is focused in (6)a and *only* is a focus sensitive operator that associates with it. In (6)b, *only* associates with the focused occurrence of *VENICE*.

Focus meets Givenness: The Puzzles
Consider the following interchange:

(7)   Q: What food would Renee only eat in PARIS?

       A: She'll only eat CRÊPES in Paris.

At first, the response in (7)A sounds fine. But upon reflection one has the intuition that the wrong question has been answered, that (7)A says that Renee eats nothing but crêpes in Paris making it inappropriate as an answer to (7)Q. Here's an intuitive analysis: to get a felicitous interpretation *only* has to associate with focused *Paris* but the accent on *crêpes* gets in the way and the lack of accent on *Paris,* due to its Givenness status, doesn't help matters. The problem is solved by fronting *crêpes,* taking it out of the scope of *only*:

(8)   a. Crêpes, she'd only eat in Paris.
       b. It's crêpes she'd only eat in Paris.

We draw two <u>tentative</u> conclusions from (7):

(9)   (a)   If an expression is focused but also Given, it doesn't get an accent, or at least
              not a nuclear accent. (*Paris*)

(b)   A focus-sensitive operator cannot associate with a reduced focused phrase across an intervening accented expression. (*only*)

The conclusion in (9)(b) is contradicted by this next example, and others like it in Büring(2016:§7.3.3):

(10)   Q: Radiology? Why did you take radiology?
          A: because they only OFFERED radiology.

In (10)A, *only* associates with *radiology*. We readily understand that radiology was all that was offered. Despite its focus status, *radiology* is not accented because it's Given, in keeping with (9)(a). The surprising fact is that the prominence on *offered* does not interfere here with the focus-association. In fact, the more emphatically one pronounces *offer*, the better it gets, while in (7), the more emphatically you pronounce *crêpes*, the worse it gets.
    The next example, in (11) below, was offered by Tony Kroch (pc) as a challenge to the Givenness account invoked earlier regarding (4)B, NAMED *the dog*. In that case, the object DP *the dog* is Given, so prominence falls on the transitive verb. That's not what happens in (11)A$_2$:

(11)   A$_1$: Jack had a car and a yacht.
          B: What did he do when he lost his money?
          A$_2$: He sold the YACHT.

In Kroch's example, *yacht* intuitively contrasts with *car*. So one might say, and I will, that *yacht* is focused. And then one might go on to say that the prominence falls on *yacht* because of focus. But that can't be right, for recall in the last two examples we saw that an expression that is focused and Given does not get an accent, (9)(b).
    Summarizing now, our first example seems to show that an intervening prominence interferes with association with focus. Our second example shows it doesn't. Our first two examples show that Givenness leads to deaccenting even if there is focusing. Our last example showed that it doesn't. In the next three sections, I'll say more about how focus and givenness works. Following that, we'll return to our examples with a fresh perspective.

Givenness: *N marking*
Below is brief summary of the theory of Givenness[4] as presented in Beaver and Velleman (2011) using the syntactic marker *N,* reserving *F* for focus. *N* is mnemonic for *not-given* or it can be taken to stand for *new* so long as *new* can be understood in a relative sense. When I replace the knob on the front door, the door is old but the knob is new. The knob is new because it was just made or it's new, in the relative sense, because it just became part of the door.

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[4] See Büring(2016:chapters 3-5) and Rochemont(2016) for balanced discussion of this theory.   The theory is presented in this section somewhat informally. There is a precise statement in the final section of the paper.

The theory runs on an implication relation that relates expressions, propositional and non-propositional alike. It subsumes coreference and entailment relations and it generalizes to functional types by raising or lowering the type of any predicative expression to propositional type by existentially quantifying arguments. Constituent questions are understood to be predicates of propositions. The relation is illustrated in (12) and the rules for deploying *N* markers are in (13). Following that are examples to illustrate how it works.

(12)   IMPLY relation

   • Generalized entailment

   Jack ate eel in Venice IMPLIES *Jack ate eel.*

   ate eel in Venice IMPLIES *ate eel*   ($\exists x\ x$ ate eel in Venice $\vDash \exists x\ x$ ate eel)

   • Coreference

   if [*the Senator*]$_i$ and *she*$_i$ corefer, then [*the Senator*]$_i$ IMPLIES *she*$_i$.

   • Constituent questions behave like existential statements

   What did Jack eat? IMPLIES *Jack ate something*

   What did Jack eat? IMPLIES *ate something*   ($\vDash \exists x\ x$ ate something)

   • Yes/No question behave like declaratives

   Has he named the dog? IMPLIES *named the dog*

(13)   Givenness Rules

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(I)   If an expression α is not *N*-marked then it must be that:

   a. a piece of prior discourse IMPLIES α.

                              or

   b. a piece of prior discourse IMPLIES the result of existentially
          quantifying any *N*-marked parts of α

(II) *N*-mark as little as possible.

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The main prominence falls on *eel* in an utterance of *Jack ate eel in Venice* when uttered in response to the question *What did Jack eat in Venice*?

(14)   {What did Jack eat in Venice?}
         Jack ate EEL in Venice.

Let's see why that is so. With the exception of *eel*, all the words in the sentence can satisfy (I) without *N* marking because they're IMPLIED by words in the question. Since they can be without *N*-marking, by (II) they should remain un-*N*-marked. *eel* cannot satisfy (I) so it must be *N*-marked. Next, we consider constituents within the sentence:

(15)
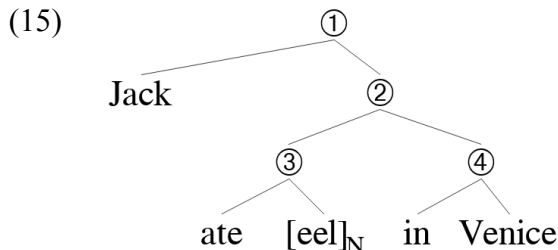
④ satisfies (I), it's implied by the same expression in the question. ② also satisfies (I). Since *eel* is *N*-marked, ② requires an antecedent that IMPLIES:
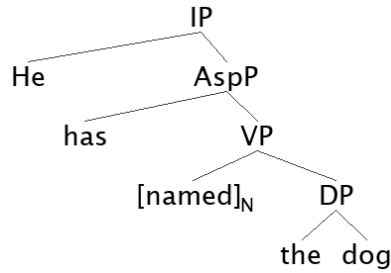
(16) $\exists x\, \exists y\; x$ ate y in Venice.

The question in (14) IMPLIES (16). Note that the first existential, '$\exists x$' is from generalized entailment and the second existential is due to the *N*-marking. By similar reasoning, ③ and ① satisfy (I) and so by (II) none of these constituents should be *N* marked. Next we adopt the rule in (17) correlating *N* marking with prominence:

(17)   *N*-marking Phonology
         If α and β are sisters, and α is *N*-marked or contains an *N*-marked expression and β is not *N*-marked and does not contain *N*-marking, then α is more prominent than β.

This rule entails that *eel* will be more prominent than any other expression in (15). It will bear the nuclear accent. (17) is not in Schwarzschild(1999) or in Beaver and Velleman(2011). It can be thought of as a constraint ranked high relative to syntactic constraints like those in (2). Recall that those constraints by themselves require nuclear accent on *Venice*. Givenness, expressed here as lack of *N* marking, reduces prominence on *Venice*. The object *the dog* suffers a similar fate in (18):

(18)   {Jack owned an apartment and a dog}
         Has he NAMED the dog?

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                    IP
              ┌──────┴──────┐
             He           AspP
                      ┌─────┴─────┐
                     has          VP
                              ┌────┴────┐
                          [named]N      DP
                                     ┌───┴───┐
                                    the    dog
```

*the dog* is Given due to prior utterance of *a dog*[5] while *named* is not Given, hence it must be *N*-marked.

To best illustrate the way in which *N* represents *new* in the relative sense, we turn to an example in which, to use Beaver and Velleman's phrase, there is *N*-marking "for the sake of a larger expression".

(19)   {Who did Mary name when Doug was in the courtroom?}
        She named [DOUG]N.

All the words in (19) satisfy Givenness rule (I) so by rule (II), none of them should be *N*-marked. But the story doesn't end there. Turning to the constituents of *She named Doug,*

(20)
```
                  ①
            ┌─────┴─────┐
          She           ②
                    ┌────┴────┐
                  named     Doug
```
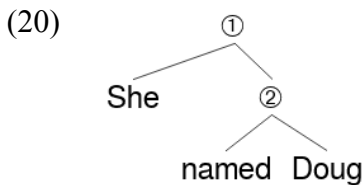
we find that ① does not satisfy (I); nothing in prior discourse IMPLIES that Mary named Doug. In fact, nothing IMPLIES that anyone named Doug, so ② also fails to satisfy (I). Consider now what happens when *Doug* is *N*-marked:

(21)
```
                  ①
            ┌─────┴─────┐
          She           ②
                    ┌────┴────┐
                  named    [Doug]N
```
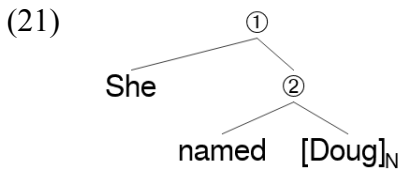
The preceding discourse IMPLIES that she named someone. This means that in (21), both ① and ② satisfy (I) and, in fact, *N* marking *Doug* achieves this result with the least

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[5] This reasoning requires it to be the case that *a dog* in (18) IMPLIES *the dog*. That constrains our choice of semantics for definites and indefinites. One option is to treat them as non-quantificational and coreferential in (18) at the level at which the Givenness rules apply.

amount of *N*-marking.[6] Summarizing, the structure in its entirety demands *N*-marking of *Doug* even though the word itself is not newly mentioned.

Association with focus: *F-marking*

(6) above displays a correlation between locus of intonational prominence and truth conditional content. That connection between sound and meaning is mediated by a logical form that includes *F*-marking. The examples are repeated in (22) with the *F*-marking. Below each example is a gloss instantiating the general statement in (23) of the interpretation of *F*-marking.

(22)   a. He only$_1$ ate [eel]$_{F1}$ in Venice.

   'he ate eel and nothing else in Venice'

   b. He only$_1$ ate eel in [Venice]$_{F1}$.

   'he ate eel in Venice and nowhere else'

(23)   *F*-marking contributes to truth conditions by determining what alternatives are excluded by *only*[7]

In (22), I've coindexed *only* with the *F*-marker. I anticipate examples featuring more than one operator and the indexing will help us keep track of the intended associations.

   The examples in (22) have yet to be *N*-marked. The rules for *N*-marking discussed in the previous section should apply here as well. However, since association with focus contributes to the meaning of a sentence, its presence can affect what needs to be implied by prior discourse and so focus can influence the placement of *N*-markers. This point will be developed below. Once the sentence is *N*-marked, its locus of intonational prominence will be determined by the rule in (17) correlating *N* marking with prominence. In addition to its influence on the locus of prominence, *F*-marking has its own local phonology and we'll comment on that towards the end.

   One assumption that will be quite important below is that *only* itself can be *N*-marked, as in the following example from Beaver and Velleman (2012:1677):

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[6] In (21), *N*-marking on *Doug* is determined at the node immediately above it. But the decision may wait for a higher node, as it does in (i) below from Sauerland(2005):
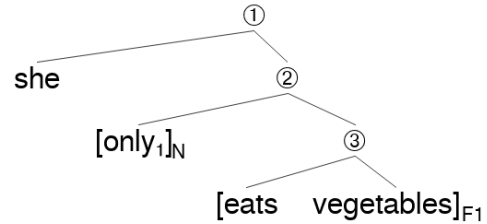
(i)   {Which of praising and applauding did Mary do to John?}
   She PRAISED John.

Sauerland observes that "the verb and the object are given, but the verb phrase is not." This means that there must be an *N*-marker on *praised* or on *John,* but as Sauerland's discussion implies, an *N*-marker on either word will suffice. It's only at the next level that the choice is made. The question *which did Mary do to John*? IMPLIES that Mary did something to John, making *she* [*praised*]$_N$ *John* ok, but nothing IMPLIES that Mary praised anyone, so *she praised* [*John*]$_N$ is not ok.

[7] There is a precise formalization in the final section of the paper.

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(24) a. Mary eats vegetables?
    b. That's not all.
       She [only]$_N$ eats vegetables.

```
                                          ①
                                        /    \
                    she                       ②
                                            /    \
                              [only₁]ₙ             ③
                                                 /    \
                                        [eats   vegetables]_F1
```

③ in the structure on the right in (24) is IMPLIED by the question in (24)a., so it needs no N-marking. However, if there were no N-marking at all in the sentence, ① would violate Givenness, for nothing entails that Mary only eats vegetables. N-marking *only*, allows ① to obey Givenness, since the question in (24)a. IMPLIES (25) below, assuming that the identity function is a possible value for X.

(25) $\exists X$ She X eats vegetables.

Katz and Selkirk(2011) detected a "super-high H tone" on *only* in all-new utterances. Lee(2012) reports the same for the Korean adverb *ozik* 'only'. These observations lend some plausibility to the idea that *only* participates in intonationally relevant N-marking. I will assume that whenever *only* is newly uttered it is N-marked.

***Exhaustivity*: silent EXH**
    There is a robust intuition that (26)A can be used as an exhaustive answer to the question in (26)Q.

(26) Q: What did Jack eat?
    A: Jack ate [eel]$_N$.

By this we mean that (26)A can be used to convey that Jack ate eel and nothing else. According to a growing consensus, an exhaustive interpretation is a sign of a silent operator that may associate with focus (see for example Chierchia 2013:§2.3.2, Katzir 2013:341, Spathas 2010:§2.5). If we spell out that operator in (26)A using the notation in Fox (2007) we get:

(27) Q: What did Jack eat?
    A: EXH₁ Jack ate [eel]$_{F1}$

The action of EXH is described in (28) below, which makes reference to F_i-alternatives. An F_i-alternative for a sentence α is a proposition that would be expressed by α if its F_i-marked parts had meanings other than the ones they actually do (Rooth 1985). The proposition that Jack ate oatmeal is a reasonable F_1 alternative to *Jack ate [eel]$_{F1}$*. Unreasonable alternatives to *Jack ate [eel]$_{F1}$* would be that Jack ate food or that Jack ate baby eel (see Bar-Lev and Fox 2017 and references therein for a theory of what counts as a reasonable alternative)

(28)   For any sentence α, "EXH_i α" is true just in case α is true and any reasonable F_i-alternative to α is false.

The reply in (26)A includes *N*-marking and the one in (27)A includes *F*-marking. Putting those together we get:

(29)   Q: What did Jack eat?
        A: EXH₁ Jack ate [[eel]_{F1}]_N

According to the Givenness rules, (29)A is felicitous, because:

(30)   *What did Jack eat?* IMPLIES ∃X(EXH₁ Jack ate X)

Since there are no *F*-marks left in '(EXH₁ Jack ate X)', there are no *F*-alternatives and so EXH is innocuous. In the final section of the paper, we'll spell out the interpretation of *F*- and *N*-markings in such a way that when the Givenness rules are applied, an expression that is *N* marked is treated in one and the same way whether or not it is also *F*-marked. But that shouldn't be taken to mean there is no interaction between *F*-marking and *N*-marking, focus and givenness. Consider the following example:

(31)   Q: Did Karen buy a horse or did Marc buy a horse?

        A: EXH₁ [[KAREN]_{F1}]_N bought a horse.

The presence of EXH and its associated *F*-marker accords with the exhaustivity inference one feels here: Marc did not buy a horse. But what about the *N*-marking? There is a piece of preceding discourse, the first disjunct, that IMPLIES *Karen buy a horse* and all subconstituents thereof, so why should there be any *N*-marking? Here's where the focus is relevant. No part of the preceding discourse IMPLIES the exhaustified proposition, that Karen, but not Marc, bought a horse.[8] So having no *N*-marking in (31)A would be unacceptable. On the other hand, if *Karen* is *N*-marked, then the exhaustification plays no role in Givenness, just as in (29)-(30) above. This is a special case of *N*-marking (*Karen*) for the sake of a larger expression, the whole sentence.

    The presence of *N*-marking on *Karen* will have the effect of attracting the nuclear accent, due to the phonological rule in (17). The *N*-marking in turn was caused by the *F*-marking. So an unsuspecting observer might misattribute the intonational prominence to the *F*-marking, taking the accent placement to be a marker of exhaustivity.

    In the two examples of exhaustivity discussed so far, I've posited an EXH operator based on an intuition that the utterance gives rise to an exhaustive inference. I haven't given a theory of when EXH is present. In both (29) and (31) and in examples to be discussed, one can easily see that a speaker without guile would desire to produce an

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[8] The question can be understood to imply that only one of Karen and Marc bought a horse. I assume this is the result of an operator that combines with the whole disjunction (Roelofsen and Farkas 2015) as opposed to having exhaustivity operators inside each disjunct.

utterance with an exhaustive interpretation. Nevertheless, as the papers cited earlier make clear, there's more to the distribution of EXH than forthright conversation.

Armed now with a matured understanding of focus, givenness and exhaustivity, we return to the puzzles with which we began.

Annotating the Puzzles

We return now to the puzzles that triggered our investigation. Using the tools developed above, we'll show that across the three examples, expressions that are focused and given ($+F, -N$) are never prominent relative to their surroundings. This resolves one of the contradictions with which we began. Following that, we'll turn our attention to the infelicity of the *crêpes* example.

Our *crêpes* example is repeated in (32), newly annotated. For the moment, we'll ignore the fact that the example is ultimately infelicitous and concentrate on the intuition that the locus of prominence is on *crêpes*.

(32) Q: What food would Renee only$_2$ eat t [in PARIS]$_{F2}$? *Crêpes*

A: EXH$_1$ She'd only$_2$ eat [[CRÊPES]$_{F1}$]$_N$ [in Paris]$_{F2}$.

Concentrating first on the *F*-marking, EXH$_1$...F_1 is what makes (32)A an exhaustive answer. The presence of exhaustivity is what allowed us earlier to paraphrase (32)A with a cleft:

(33) It's crêpes that she only eats in Paris.

only$_2$ ...F_2 appears in the answer because it appears in the question. Together the two foci and their associated operators should produce the proposition that: crêpes is such that Renee eats them in Paris and nowhere else, and it's the only such thing. Moving now to *N*-marking, observe that *crêpes* must be *N*-marked because it has not been IMPLIED. No further *N*-marking is necessary. The entire sentence satisfies Givenness rule (I) because:

(34) (32)Q IMPLIES $\exists X$(EXH$_1$ She'd only$_2$ eat X [in Paris]$_{F2}$)

The *F*-marking on *in Paris* does not trigger *N*-marking, unlike in (31) above. That's because in this case there **is** an antecedent, (32)Q, that IMPLIES the exhaustive/*only* meaning. Since there is no *N*-marking on *Paris* and there is *N*-marking on *crêpes,* the nuclear accent falls on *crêpes* making it more prominent than *Paris* as required by the phonological rule in (17).

Next, we turn to our *radiology* example:

(35) Q: Radiology? Why did you take radiology? *Radiology*

A: [They]$_N$ [only$_2$]$_N$ [OFFERED]$_N$ [radiology]$_{F2}$.

In this case, there is no evidence of an EXH operator, at least not one that associates with an expression within the answer. If there is any exhaustive inference, it's that (35)A is the only reason that radiology was taken. Evidence of the *F*-marking on *radiology* comes from the intuition that *A* is saying that nothing but radiology was offered. Turning now to *N*-marking, except for *radiology*, every word, including *only* requires an *N*-mark. No *N*-marking is needed on higher constituents because:

(36)   *you take radiology* IMPLIES $\exists$XYV(X Y Ved *radiology*)

The *F*-marking on *radiology* does not trigger *N*-marking, again, unlike in (31) above. This time the reason is that *only* itself is *N*-marked, an option I assume is unavailable to silent EXH. Since there is no *N*-marking on *radiology* and there is *N*-marking on *offered,* the nuclear accent falls on *offered* making it more prominent than *radiology* as required by the rule in (17).

We turn now to our final example:

Yacht

(37) A_1: Jack owned a car and a yacht.
          B: What did he do when he lost his money?

          A_2:   EXH$_1$ He sold$_N$ [[the-YACHT]$_{F1}$]$_N$

Given the context of A_2's remark, the question of selling the car must be salient. As this was not confirmed, an eavesdropper would assume that the car was not sold. Indeed, (37)A_2 is understood to convey that, hence the presence of EXH…F$_1$. In this case, the *F*-marking does trigger *N*-marking, as in (31). *sold* also requires *N*-marking since it is not Given. This means that the phonological rule in (17) is silent on their relative prominence and the syntactic constraints with which we began lead the nuclear accent to the object. *yacht*, it turns out, is not a focus and given phrase, despite the fact that *yacht* has been mentioned. It's another example of *N*-marking for the sake of a larger expression. This example should be contrasted with (4) repeated below:

(38)   A: Jack is getting better. He now has an apartment and a dog.
          B: Has he NAMED the dog?

In this case, since apartments are not normally named, the question of naming the apartment is not salient, so no EXH is called for and so there is no *F*-marking on *dog* to trigger *N*-marking.
          At this point, we've addressed the status of focused-given expressions. They uniformly display reduced prominence. In the next section, we'll briefly discuss the phonology of *F*-marking and its role in focus-given phrases. For now we return to the murky status of the *crêpes* example and we begin by noticing a telltale arrangement of foci and the operators that associate with them.

(39)   Q: What food would Renee only$_2$ eat *t* [in Paris]$_{F2}$?   *Crêpes*

          A: EXH$_1$ She'd only$_2$ eat [[CRÊPES]$_{F1}$]$_N$ [in Paris]$_{F2}$.

In (39)A, focus sensitive *only* intervenes between EXH and its associate, *crêpes*. Examples of this kind with pairs of overt operators have been discussed (Krifka 1991, 2004, Rooth 1996a, Wold 1996) with some debate about their acceptability. Beck and Vasishth(2009) conducted an experimental study showing "that such configurations are very problematic". Beck(2016) traces the problem to the inner operator which cannot help but associate with all the foci in its scope. Concretely, that means that the indices on EXH and *only* represent intended but unrealizable interpretations.[9] On that analysis, (39)A excludes Renee's eating anything but crêpes in Paris and that entailment spells trouble in the discourse in (39).

In the literature cited above, various combinations of overt focus sensitive operators are considered, however the one that is most relevant to our concerns, *only…only* is, as far as I know, not mentioned. Here's an example of that type:

(40)   Alan, Bob and Carl are in a restaurant enjoying a bottle of red wine together. Alan remarks "Bob only drinks wine in RESTAURANTS". Bob corrects him with "I only said I only drink WHITE wine in restaurants".

(41)   #I only$_1$ said I only$_2$ drink [[WHITE]$_{F1}$]$_N$ wine in [restaurants]$_{F2}$.

Bob's remark sounds odd because *only$_2$* appears to associate with *white* giving rise to an interpretation according to which Bob drinks white wine in restaurants but not red wine. That conflicts with the fact that Bob is in a restaurant drinking red wine. The intended interpretation glossed in (42) would have been felicitous in this discourse:

(42)   It's only about white wine that I said I only drink it in restaurants.

The trouble in (39) has to do with the arrangement of foci and the operators that associate with them within the answer. Answerhood per se is not a factor. Here's an example in which the troublesome constellation is created in a correction context:

(43)   {Darlene only gave peanuts to the ELEPHANTS.}
        #No, she only gave WATER to the elephants.

        EXH$_1$ She only$_2$ gave [[WATER]$_{F1}$]$_N$ [to the elephants]$_{F2}$.

Assuming the difficulty in the *crêpes* example is indeed to do with nested operators allows us to make sense of the following observation:

(44)   "Rooth (2010) points out that (31b) [RS *Crêpes*] becomes felicitous if uttered with 'a rising intonation indicating a partial answer on the first focus *crêpes*.' We agree with these judgments, and have verified them with several consultants." Beaver and Velleman(2010)

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[9] Beck and Vasishth viewed their experiment results as evidence against Kratzer(1991)'s analysis of foci in terms of distinguished variables, represented here as indices on the *F*-markers and adopted in the formalization in the last section of this paper. This conclusion is unwarranted and was dropped in Beck(2016).

If rising intonation indicates a partial answer, it must mean there is no EXH operator. In that case there is no focus on *crêpes* and no intervention. *crêpes* is *N*-marked but not *F*-marked.

(45)   A: She'd only$_2$ eat [CRÊPES]$_N$ [in Paris]$_{F2}$.

As reported earlier, the *crêpes* example is often initially perceived as felicitous and on second thought sounds inappropriate. Suppose that speakers understand *only* as associating just with *crêpes*:

(46)   A: She'd only$_1$ eat [[CRÊPES]$_{F1}$]$_N$ in Paris.

The *N*-marking would still satisfy Givenness, so the intonation would not give a reason to think there is problem and if *crêpes* is the only thing she eats in Paris, as (46) says, then it must be the only thing she eats in Paris and nowhere else, assuming there is such a thing. So (46) would satisfy the questioner and would do so exhaustively. Moreover, we might be inclined to imagine the question is restricted to exotic foods. In that case, it's less disturbing to say that Renee eats only crêpes. The following example tries to control for that effect:

(47)   Guest$_1$:   We've just finished an extensive study of who gets called on in our college classes, with a break down by gender and ethnicity.

       Host: I read the report. Can you tell our audience which group only gets called on in PHILOSOPHY courses?

       Guest$_2$:   Ah yes. Interesting. We only call on AMERICAN MEN in philosophy courses. But then everyone is called on in those classes.

In this case, the alternatives to American men are fixed in the discourse, so even if one were to choose (48) in place of (49), the result would still be infelicitous. I do get a clearer negative judgment in this case.

(48)   Guest$_2$:   We only$_2$ call on [[AMERICAN MEN]$_{F2}$]$_N$ in philosophy classes.
(49)   Guest$_2$:   EXH$_1$ We only$_2$ call on [[AMERICAN MEN]$_{F1}$]$_N$ [in philosophy classes]$_{F2}$.

There is another confound here pointed out to me by Simon Charlow. If *crêpes* were to move prior to interpretation outside the scope *only* it would eliminate nesting. In his discussion of overt nested operators, Rooth(1996a) considered this possibility which is why you'll find examples there where both foci are locked inside an island. I don't know why QR doesn't just save the *crêpes* example. Maybe it does for some speakers.

In stating our puzzles, we began with the two claims in (50). For each claim, we had validating and contradicting examples. In both cases, exhaustivity turned out to be the missing ingredient.

(50)   (a)   If an expression is focused but also Given, it doesn't get an accent, or at least not a nuclear accent.

(b) A focus-sensitive operator cannot associate with a reduced focused phrase across an intervening accented expression.

The first conclusion appeared to be challenged by the *yacht* example. In the end, we determined that *yacht* was not in fact Given. Although it was recently mentioned, it was focused and associated with EXH. That association changed the meaning in such as way, that *N*-marking was needed on *yacht,* for the sake of the exhaustified utterance. The second conclusion turned out to be wrong in general. It's not an intervening accented expression that causes a problem, it's an intervening focus, in this case, a focus whose presence has to do with exhaustification.

I've restricted attention to a small number of key examples which might lead to spurious generalizations, one of which I'd like to dispel. The intervening accented expression in the *crêpes* example is a DP while in the *radiology* example it's a verb. What follows are two examples where matters are reversed.

(51)   A: I steam any kind of vegetable – even eggplant or potatoes. Then there are special cooking techniques that I reserve for particular vegetables.

   B: Really? What method do you only use on celery?

   A: #I only BRAISE celery.

   EXH$_1$ I only$_2$ [[BRAISE]$_{F1}$]$_N$ [celery]$_{F2}$

This example is odd like the *crêpes* example due to the presence of nested foci. In this case, the offending focus is on a verb, *braise.*

(52)   A$_1$: I gave Stella a book.
   B: Just a book? why?
   A$_2$: because I only$_{1,N}$ gave [MANNY]$_N$ [a book]$_{F1}$.

(52)A$_2$ is ok, just like the *radiology* example, but this time the unoffending intervening accented expression is a DP. There's no call for an EXH associating with *Manny*; he isn't the only one who got a book.[10]

Focus phonology
   F-marking is often hard to hear. The following are the results of laboratory studies:

(53)   Phonetics of associated foci[11]

_____

[10] This *N*-marking is also plausible – given *B*'s remark:
   A$_1$: EXH$_1$ I gave Stella [a book]$_{F1}$.
   A$_2$: because I only$_1$ gave [MANNY]$_N$ [a book]$_{F1}$.

(a) If an expression is *N*-marked,
   adding an *F*-mark associated with *only* **increases duration and pitch prominence**.

(b) If an expression is pre-nuclear and not *N*-marked,
   adding an *F*-mark associated with *only* **increases duration and pitch prominence**.

(c) If an expression is post-nuclear and not *N*-marked:
   adding an *F*-mark associated with *only* **increases duration and intensity**

The statement in (53)c. applies to the words *radiology* and *Paris* in our examples (7) and (10). While the presence of *F*-marking is hard to detect on lexical items in the absence of phonetic measurements, Hoeksema and Zwarts (1991) observed that weak Dutch pronouns could be used as detectors because they resist increased duration and intensity. Susanne Tunstall independently made the same observation for English and von Fintel(1994) employed pronouns as a tool for detecting foci, a tool which has since been used extensively. Applying it here, we replace *radiology* with *it* in (7) to dramatic effect:

(54)   Q. Why did you take radiology?
       A. #because they only OFFERED it.

it cannot be *F*-marked and Given[12]. Once *F*-marking *it* is ruled out in (54), for some reason, one interprets *only* as associating with *offer* and in this case that sounds nonsensical. A comparison of (54) with (55) confirms that the problem lies in the *F*-marking not merely in the lack of *N*-marking that steers the nuclear accent to the verb:

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[11] Rooth 1996b, Beaver *et al.* 2007, Féry and Ishihara 2009, Wagner *et al.* 2010, Katz and Selkirk 2011. The language of *N*-marking and *F*-marking is mine, not that of the authors whose results I'm summarizing.

[12] I find (i) below more or less ok:

(i) The robot only pointed at Jane and Jane only pointed at IT.

So it's the increased duration and intensity <u>without accent</u> that seems to be a problem for *it*. Verena Hehl observed that pronominalization with *that* instead of *it* does not cause the kind of disruption seen in (54). Krifka(2004) notes this contrast as well. Rooth(1996b) and Beaver and Clark(2008) say that phonological reduction of a pronoun (any pronoun) is what causes the effect seen in (54).
   The effect brought about with the pronoun *it* may arise less dramatically with short lexical items. I perceive it in Rooth(1992)'s celebrated *rice* example: *people who GROW rice, generally only EAT rice.* I often hear that as excluding alternatives to eating, which is not the intended reading. This feeling goes away when the noun phrase *rice* is expanded: *people who GROW genetically modified rice, generally only EAT genetically modified rice.* Rooth(2010) suggests that the same is happening in our *crêpes* example – *in Paris* is too short to be a muted focus. But here I don't find that expansion helps:

(ii)   What food would Rosa only eat at the beach in Belgium?
       She'd only eat MUSSELS at the beach in Belgium.

(55)   Q. Why did you take radiology?
       A. because they OFFERED it.

I've portrayed the pronunciation of *radiology/Paris* as jointly determined by the phonology of *N*-marking and *F*-marking. As Féry and Ishihara(2009:303) write, "focus boosts prominence (higher pitch/longer duration), givenness weakens prominence (lower pitch/shorter duration)" and an expression that is "both focused and given, is subject to both effects."   In the remainder of this section, I briefly recount other approaches to muted foci like those on *radiology* and *Paris*.

Rooth(1996b, 2010), Büring(2015,16) and Beaver and Velleman(2011) offer accounts in which foci compete, with the loser muted. They would begin with the assumption that *offer* is focused as in (56) below and then they would show that it trumps *radiology* forcing it to be less prominent[13].

(56)   Q: Radiology? Why did you take radiology?

       A: [They]$_N$ [only$_2$]$_N$ OFFERED$_{N,\mathbf{F}}$ [radiology]$_{F2}$.

The additional *F*-marking that these accounts rely on is not implausible, for there is an intuitive contrast between *offer* and *take*. But the contrast intuition is weaker or nonexistent in the second lines of the examples in (57), presented in Selkirk(2008) as a challenge to focus-competition analyses (Selkirk uses acute accents to mark pitch accents. *G* stands for 'given' and corresponds where marked to lack of *N*-marking.)

(57)   Only [Eleanor]$_F$ was introduced to Franklin by his mother.
       and his whóle lífe, he lóved only [Eleanor]$_{F,G}$.

       The New York Times gives only [newspaper subscriptions]$_F$ to the city's poor.
       I don't thínk they can líve on only [newspaper subscriptions]$_{F,G}$.

       We were ordered to only think [good thoughts]$_F$.
       But we were bóred by only thinking [good thoughts]$_{F,G}$.

In one of Beaver and Velleman's own examples, repeated in (58) below, it is hard to see what notion of contrast is being invoked. Earlier we discussed the *N*-marking of *only* in this small discourse (see (24)). But *N*-marking is not sufficient in Beaver and Velleman's system to draw the primary accent away from *vegetables*. To accomplish that goal, "*only* must be F-marked in addition to being N-marked, because it is being contrasted with what has come before".

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[13] In this particular case, as Büring discovered, the competition rules according to Rooth(1996b) or Büring(2016) would either yield no winner or the wrong one depending on the scope of the focus on *offer* ('scope of focus' is a term of art crucial to the rules of competition). Rooth(2010) is a response to that predicament.

(58) a.   Mary eats vegetables?   Beaver and Velleman (21-22)
     b.   That's not all.
             She ONLY$_{F,N}$ eats vegetables$_F$.

    In Selkirk's view there is no competition among foci, rather, for an expression to be focused and *G*-marked, previous discourse must imply not only the expression's content but also the contribution of the focus marking. For the *radiology* example, that would requirement would be satisfied if there was a focus in the antecedent[14]:

(59)   Q: [Radiology]$_F$? Why did you take [radiology]$_F$?

        A: [They] [only$_2$] OFFERED [radiology]$_{F2,G}$.

In (59)Q, a focused antecedent for (59)A seems plausible, but that isn't always the case. Beaver and Velleman discuss Rooth(1992)'s example, *people who grow rice, generally only eat rice.* They point out that the second occurrence of *rice* bears only secondary accent even though the first occurrence is not focused. Assuming the second occurrence of *rice* is focused and associated with *only*, the secondary accent would require F,G marking but with no antecedent focus, as Selkirk's theory would require. A similar point can be made with the following dialogue:

(60)   Q: How was your trip?
        A$_1$: Hmm… we ate crickets in Mexico.
        A$_2$: Unfortunately, we ONLY ate crickets in Mexico.

(60)A$_2$ has several readings, one of which is that crickets were all we ate. That reading corresponds to an LF in which *only* associates with a focus on *crickets,* which is then

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[14] I should add that an actual prior *F*-marking is not required. Selkirk's *G*-Marking Condition is semantic. It makes references to 'focus semantic values'. Consider Vallduví(1990)'s example (287):

(i)   {A last-minute guest arrives at the host's house. The host has known the guest's
             family for years}
        Host: I'm glad you could come for dinner. Had I known before, I wouldn't have
             made pig's feet.
        Guest: I love pig's feet. It's my SISTER who *only* eats *prime cuts*.

Clearly the guest understands the host to have implied that the guest likes only prime cuts. That's sufficient to treat *prime cuts* as focused and given. While Krifka(2004)'s term "second occurrence focus" is generally applied to muted foci like on *prime cuts* none of the theories surveyed here follow Krifka in requiring an antecedent focused utterance (Rooth 1996b example (25) addresses this point).

focused and Given. If *crickets* is pronominalized, making the focus + Given phonology difficult, another reading surfaces:

(61)   Unfortunately, we [ONLY$_1$]$_N$ ate them in [Mexico]$_{F1}$.

Depending on the reading, *crickets* or *Mexico* would have to be *F,G*-marked in A$_2$ on Selkirk's account, requiring the corresponding expression to be focused in A$_1$.

Contrastive focus

In our discussion above of Beaver and Velleman's analysis, an *F*-mark was added to *offered*:

(62)   Q: Radiology? Why did you take radiology?

        A: [They]$_N$ [only$_2$]$_N$ OFFERED$_{N,\mathbf{F}}$ [radiology]$_{F2}$.

The marking was supposed to represent a felt contrast with *take.* That intuition remains, regardless of who is right about muted foci. In the proposed representation in (62)A, no operator associates with that contrast *F*-mark. Earlier, we explained the difference in acceptability between this example and the *crêpes* example in terms of an operator, EXH, that associates with a focus in the scope of *only*. So if there is an operator associating with a possible contrast focus, it must not interact with *only* the way EXH did. This could be because it is attached directly to the contrasting expression or because it doesn't interact with *only.* (The latter option does not make sense on the Beck theory of nested foci adopted here).

Kiss(1998) argued for a distinction between identificational focus and information focus. Kiss's "informational focus" corresponds more or less to *N*-marking. Among the identificational foci, Kiss distinguished those that are [+exhaustive] and those that are [+contrastive]. [+exhaustive] corresponds more or less to association with *only* or EXH. Büring (2016:203) proposes as much for Hungarian based on Horvath(2010). This leaves [+contrastive] defined as operating "on a closed set of entities whose members are known to the participants of the discourse". That fairly describes the added focus in (62). Repp (2016) recommends the term *explicit alternatives*. The theory presented here needs to be further developed to create a home for this category and whatever coherence relations might go with it (Kehler 2005).

Zimmermann(2007) presents a different idea about linguistic devices categorized as 'contrastive focus'. According to him, the key pragmatic feature is low expectation on the part of the hearer. That type of contrast <u>could</u> involve an associated operator, if Chierchia(2013:§2.3.2) is right that there are covert counterparts of *even* alongside covert counterparts of *only.* And if there are covert *even*s, there could be trouble when they have an *only* in their scope. Consider the following example:

(63)   A: I've only$_2$ eaten rabbit in [Paris]$_{F2}$.
        B: That's nothing. I've only eaten MEAT in Paris.

(63) B doesn't work as intended, assuming the speaker means to say that Paris is the only place she's eaten meat and not, that meat is the only thing she's eaten in Paris. B's intended message can be paraphrased as:

(64)   I've eaten meat in Paris and nowhere else.
       Eating meat in Paris and nowhere else is more surprising than eating rabbit in
       Paris and nowhere else.

The surprise part of (64) looks like the kind of thing you find with scalar *even*, leading to (65):

(65)   EVEN$_1$ I've only$_2$ eaten [[MEAT]$_{F1}$]$_N$ in [Paris]$_{F2}$

And now we have the familiar nested configuration, in which *only* grabs the focus on *meat* meant for the higher operator.
        'Contrastive focus' is a cover term for distinct types of focus (Repp 2010). Some of them are *F*-marking associated with a covert counterpart of *only* or *even* and some require a different kind of analysis. And yet other prominences that are described as contrastive focus might simply arise from uneven *N*-marking (see (58) in the previous section).

New

Kratzer and Selkirk(2017) insist that "grammar is blind to Newness: There are no phonological, syntactic, or semantic operations that are sensitive to the mere newness of a constituent." The proposal made here adheres to that negative generalization, if by *new* we mean simply 'not previously mentioned'. But if the intention is the relative notion of *new*, the one captured in the rules for *N*-marking, then I understand the point to be that we must do away with *N*-marking and instead use *G*-marking (Féry and Samek-Lodovici 2006, Selkirk 2008, Kratzer and Selkirk 2017, Büring 2016:74-76 and elsewhere). This would mean adding a *G*-marker to any un-*N*-marked constituent discussed so far and removing all *N*-markers. And it would mean rewriting our rules changing '*N*-marked' to 'not *G*-marked' and 'not *N*-marked' to '*G*-marked'. This may seem like a trivial move, but it would complicate the precise statement of the semantics of givenness (see the next section). Here are some considerations:

• For Kratzer and Selkirk(2017), information structure markers are syntactically potent and not merely a device to aid in the statement of the pragmatics-phonology interface. As such, *G*-markers may play a role in the production of marked word orders in which given material precedes new material (Neeleman and van de Koot 2016). A left periphery operator, for example, might be attracting *G*-marked constituents (*pace* Kučerová 2012 for whom givenness stays in the semantics). By contrast, Rochemont(2013) argues that the novelty of a constituent is never motivation for its displacement (*pace* Petrova and Speyer 2011).

• The *N*-marking Phonology rule in (17) suffices for this paper. But a more serious account of the interface may require relating prominence to givenness, as in the

works cited above. If we assume that information structure markers are privative features then we would need to choose *G* marking.

- According to the Givenness rules, a given expression is a type of anaphor. And that anaphora can be selective (Schwarzschild 1999:§5). Spelling this anaphora relation out in detail could involve having a *G*-marker to hang an index on.

Formalization

In this section, you will find a precise formulation of the rules of Givenness and an interpretation for EXH. Following Kratzer(1991), I treat *F*-markers as variables and I extend that treatment to *N*-markers. I adopt Wold(1996)'s method for working this out with a single assignment function parameter. Expressions are interpreted relative to a world and an assignment function. Declarative sentences are assigned truth-values.

Following Beck(2016)'s discussion of nested operators, I interpret *only/*EXH unselectively, so that an occurrence of one of these operators associates with all foci in its scope. This follows Kratzer's treatment, although the ingredients are there to make *only* selective as Wold had it.

Three kinds of indices

(66) Plain indices, *N*-markers and *F*-markers.

$\mathbb{N} = \{0,1,2,3...\}$, TYPE is the set of type labels.

plain indices:	$\mathcal{P} = \mathbb{N} \times$ TYPE	(eg $\langle 5,et \rangle \in \mathcal{P}$)
N-markers:	$\mathcal{N} = \{Ni : i \in \mathbb{N} \times$ TYPE$\}$	(eg $N\langle 5,et \rangle \in \mathcal{N}$)
F-markers:	$\mathcal{F} = \{Fi : i \in \mathbb{N} \times$ TYPE$\}$	(eg $F\langle 5,et \rangle \in \mathcal{F}$)

The type of an index or marker constrains the kind of value it is assigned.

EXAMPLE $g(N\langle 5,et \rangle) \in D_{et}$.

If the type label is *e*, it may be left off.

(67) Rules for interpreting *F*- and *N*-marked expressions

a. if $Fi \notin$ dom(g), $[\![\alpha_{Fi}]\!]^{w,g} = [\![\alpha]\!]^{w,g}$ c. if $Ni \notin$ dom(g), $[\![\alpha_{Ni}]\!]^{w,g} = [\![\alpha]\!]^{w,g}$,

b. if $Fi \in$ dom(g), $[\![\alpha_{Fi}]\!]^{w,g} = g(Fi)$ d. if $Ni \in$ dom(g), $[\![\alpha_{Ni}]\!]^{w,g} = g(Ni)$

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$F1 \notin$ dom(g), $N3 \notin$ dom(g) $\rightarrow$ $[\![[Jack]_{F1}]_{N3}]\!]^{w,g} =$ Jack

$F1 \notin$ dom(g), $N3 \in$ dom(g) $\rightarrow$ $[\![[Jack]_{F1}]_{N3}]\!]^{w,g} = g(N3)$

$F1 \in$ dom(g), $N3 \notin$ dom(g) $\rightarrow$ $[\![[Jack]_{F1}]_{N3}]\!]^{w,g} = g(F1)$

$F1 \in$ dom(g), $N3 \in$ dom(g) $\rightarrow$ $[\![[Jack]_{F1}]_{N3}]\!]^{w,g} = g(N3)$

Meaning for *only/*EXH

The meaning of EXH is given below. I assume EXH attaches to *t*-type expressions. My definition is uninformed by recent advances in alternatives-research (Bar-Lev and Fox 2017). I want to imbue EXH with the power to ignore any prior assignments to *F*-markers and to start fresh. To that end, I introduce an operator '+' on assignment functions defined as follows:

(68)   + operation on assignment functions

For any assignment functions *g, h*:

(i) $\text{dom}([g+h]) = (\text{dom}(g) \cup \text{dom}(h))$

(ii)   for any $u \in \text{dom}([g+h])$:

if $u \in \text{dom}(h)$, then: $[g+h](u) = h(u)$

if $u \notin \text{dom}(h)$, then: $[g+h](u) = g(u)$

(69) $[\![\text{EXH } \varphi]\!]^{w,g} = 1$ *iff* $[\![\varphi]\!]^{w,g} = 1 \land \forall p_{st} ((p(w)=1 \land p \in \text{ALT}_g\text{-}\varphi) \to p \vDash \lambda w.[\![\varphi]\!]^{w,g})$

$\text{ALT}_g\text{-}\varphi \overset{\text{def}}{=} \{\lambda w.[\![\varphi]\!]^{w,g+h} : \text{dom}(h) = \mathcal{F}\}$

Observe that if φ contains no *F*-marking, then $[\![\text{EXH } \varphi]\!]^{w,g} = [\![\varphi]\!]^{w,g}$.

This meaning for EXH will also serve to a first approximation as the meaning of *only*. What's missing is the presupposition and possible arguments for *only* not of type *t*.

Givenness rules

The Givenness rules rely on entailment generalized to all types. This generalization is carried out by an operator ExClo which has the effect of existentially quantifying arguments:

(70)   ExClo   (existential closure – raising to type *t*)

If φ is a meaning of type *t*: $\text{ExClo}(\varphi) = \varphi$

If α is a meaning of type *ab*: $\text{ExClo}(\alpha) = 1$ *iff* $\exists u_a \text{ ExClo}(\alpha(u)) = 1$.

EXAMPLE $\text{ExClo}([\![attack]\!]^{w,g}) = 1$ *iff*

$\exists x_e \text{ ExClo}([\![attack]\!]^{w,g}(x)) = 1$ *iff*

$\exists x_e \exists y_e \text{ ExClo}([\![attack]\!]^{w,g}(x)(y)) = 1$ *iff*

$\exists x_e \exists y_e [\![attack]\!]^{w,g}(x)(y) = 1$

$\therefore$ For any *w*, $\text{ExClo}([\![attack]\!]^{w,g}) = 1$ *iff* someone was attacked in *w*

The next EXAMPLE presupposes with Karttunen(1977) that a Wh-interrogative denotes a function that characterizes the set consisting of its true propositional answers. For example,

$[\![who\ smiled?]\!]^{w,g} = \lambda p\ \exists x\ x$ is human in $w \wedge p = \lambda w'[x$ smiled in $w'] \wedge p(w)=1$

EXAMPLE $\quad$ ExClo($[\![who\ smiled?]\!]^{w,g}$) $= 1$ *iff*

$\quad\quad\quad\quad$ $\exists p$ ExClo($[\![who\ smiled?]\!]^{w,g}(p)$) $=1$ *iff*

$\quad\quad\quad\quad$ $\exists p\ [\![who\ smiled?]\!]^{w,g}(p) =1$ *iff*

$\quad\quad\quad\quad$ $\exists p\ \exists x\ x$ is human in $w \wedge p = \lambda w'\ [x$ smiled in $w'\ ] \wedge p(w)=1$ *iff*

$\quad\quad\quad\quad$ $\exists x\ x$ is human in $w \wedge x$ smiled in w

$\quad\quad\quad\quad$ $\therefore$ For any w, ExClo($[\![who\ smiled?]\!]^{w,g}$) $= 1$ *iff* someone smiled in w

For *Yes/No* questions, the propositional kernel, before any question operator is added, may serve as a GIVENness antecedent.

An utterance in a context c is interpreted relative to a contextually supplied assignment function, g_c, that assigns values only to plain indices and only to those that are free in the utterance. Since the **Givenness Constraint** will apply to any expression within an utterance, it will apply to expressions containing locally free pronouns and traces that are bound higher up. To take care of this, we'll make use of assignment functions g' that assign values to all plain indices. Given (68) above and our assumptions about g_c, if g' assigns values to all plain indices, then $[g'+g_c]$ is just like g_c for the indices that are free in the utterance and all other indices get the values assigned by g'.

(71) **Givenness Constraint**
For every g' such that dom(g') $= \mathcal{P}$, when β is uttered in context c, there must be an antecedent α that is salient in c and (i) or (ii) below holds:

i. $\exists h$ (dom(h) $\subseteq \mathcal{N} \wedge [\![\alpha]\!]^{w,g'+gc} = [\![\beta]\!]^{w,g'+gc+h}$) and β is type e

ii. $\forall w[$ExClo($[\![\alpha]\!]^{w,g'+gc}$)$=1 \rightarrow \exists h$ (dom(h) $\subseteq \mathcal{N} \wedge$ ExClo($[\![\beta]\!]^{w,\,g'+gc+h}$) $=1]$

EXCEPTIONS: This constraint does not apply if:

$\quad\quad\quad$ β is not assigned a meaning (β is syncategorematic – eg EXH)

$\quad\quad\quad$ β is of the form $[\alpha]_{Ni}$ (eg **[Jill]**$_{Ni}$, **[$_{VP}$ see Fred]**$_{Ni}$)

$\quad\quad\quad$ β has *Ni* as sister: (eg **[Jill]**$_{Ni}$)

The world quantifier in (ii) could be restricted to worlds compatible with salient common ground propositions. That would allow it to cover cases where an antecedent is as much as expressed (see footnote 14).

EXAMPLE

(72) {Q: Who smiled?}
    A: [Jack]$_{N\langle 1,e\rangle}$ smiled.
    A′: EXH [[Jack]$_{F\langle 2,e\rangle}$]$_{N\langle 1,e\rangle}$ smiled.

For any g', dom(g')=$\mathcal{P}$,

i. $\exists h$ (dom(h) $\subseteq \mathcal{N}$ $\wedge$ ExClo($[\![[Jack]_{N\langle 1,e\rangle}$ *smiled*$]\!]^{w,\, g'+g_c+h}$)) =1] *iff*

ii. $\exists h$ (dom(h) $\subseteq \mathcal{N}$ $\wedge$ $[\![[Jack]_{N\langle 1,e\rangle}$ *smiled*$]\!]^{w,g'+g_c+h}$) =1 *iff someone smiled in w.*

In line (ii), g' and g_c play no role. h assigns some entity to the index $N\langle 1,e\rangle$.

iii. $\exists h$ (dom(h) $\subseteq \mathcal{N}$ $\wedge$ ExClo($[\![$EXH $[[Jack]_{F\langle 2,e\rangle}]_{N\langle 1,e\rangle}$ *smiled*$]\!]^{w,\, g'+g_c+h}$)) =1] *iff*

iv. $\exists h$ (dom(h) $\subseteq \mathcal{N}$ $\wedge$ $[\![$EXH $[[Jack]_{F\langle 2,e\rangle}]_{N\langle 1,e\rangle}$ *smiled*$]\!]^{w,g'+g_c+h}$) =1 *iff someone smiled in w.*

In line (iv), g' and g_c play no role. h assigns some entity to the index $N\langle 1,e\rangle$ and that takes care of '[[Jack]$_{F\langle 2,e\rangle}$]$_{N\langle 1,e\rangle}$'. EXH is idle.

Jack is the locus of prominence in either answer in (72). In simple cases, question-answer congruence follows from givenness as well as from the pragmatics of exhaustivity. That's partly why "there does not seem to be a one-to-one mapping between particular formal features (focus marking devices) and focus, neither from a cross-linguistic perspective, nor within individual languages." Zimmermann and Onea (2011).

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