1   Formalizing focus

The idea here will be to try to get at the basic ideas in Beck's (2006) paper, even though it is a complicated paper about formal semantics. To do that, I'll basically have us work through a couple of examples—so this is part homework and part reading aid.

First, just some terms that I noticed in the reading.

In situ: This comes up when talking about *wh*-phrases like *who* or *what*. In English, to ask an object *wh*-question, you need to put the *wh*-word first: *What did you buy?* Even though in a statement, the object comes after the verb: *You bought an iPhone 4S*. In other languages, the *wh*-word does not need to "move" to the front of the sentence—in these languages, the *wh*-word "remains in place," or **in situ**. They are sometimes refered to as **wh-in-situ languages** (as opposed to **wh-movement languages**). In English, too, a *wh*-word can be **in situ** if it doesn't have to move to the front of the question—this happens in multiple *wh*-questions like *Who persuaded John to buy what?* Here, *what* is **in situ** because it is where objects usually appear.

Compositional interpretation: The idea that you can define a meaning for, essentially, each word and then compute the meaning for the combinations based on them, up to the whole sentence. So, you compute the semantic interpretation of a whole sentence by computing it from the bottom of the tree to the top.

Scope: This can mean a couple of things. In terms of the syntactic structure of a sentence, a word/phrase *A* has "scope over" a word/phrase *B* if *B* is inside something that was combined with *A*. This often translates to *B* being further to the right in a sentence (particularly in an SVO language) then *A*. **Scope** can also be used to describe the semantic meaning, and is more or less like "influence." The sentence *Someone loves everyone* has two "scope interpretations," one where *someone* has influence over *everyone* (there is someone *x* such that *x* loves everyone), and the other where *everyone* has influence over *someone* (for every person *y*, there is someone that loves *y*). These two notions of **scope** may amount to the same thing, although in a way that is not immediately transparent.

NPI-licensing: The characteristic a sentence must have in order for **Negative Polarity Items** like *ever*, *anyone*, *yet* to be allowed. The basic case is that they are allowed in negative sentence (hence the name, **negative polarity items**), but they also appear in a few other contexts as well.

Alternative questions: Questions posing options: *Do you want coffee or tea?*

c-command: This is a version of the (syntactic) notion of **scope**. *A* **c-commands** *B* when *B* is inside the part of the tree that *A* combined with (and, accordingly, *A* has **scope**

over *B*). Again, a lot of the time, when *A* **c-commands** *B*, *A* comes earlier in the sentence than *B*.

Licensing complementizer (of a *wh*-phrase): The basic idea here is that the C (complementizer) at the top of the tree holds the information in a sentence about whether it is a question or statement. It is usually assumed that it is something about the relationship of an **interrogative C** and *wh*-words that causes *wh*-words (in some languages) to move to the front of questions. More basically, there is assumed to be a *connection* semantically between the **interrogative C** and the *wh*-word. Since you can't have *wh*-words in non-questions, the presence of the *wh*-word is **licensed** by the existence of the **interrogative C**. So, more concretely, (9) in Beck's (2006) paper is saying that an intervenor cannot come between a *wh*-phrase and the **interrogative C** that it is connected to. An intervenor does something to break that connection.

Echo question: A question that doesn't ask for new information but rather expresses surprise, or asks for clarification of a statement. Often, even in languages where *wh*-words need to move to the front, they need not do so in **echo questions**: *You bought WHAT!?* So, in (17), what Beck (2006) is observing (based on others' observations) is that (17b) can't be a regular question (the negation has ruined it somehow).

Superiority violation: In multiple *wh*-questions, it is usually necessary for the *wh*-word that was closest to the licensing complementizer originally to be the one that moves. Thus: *Who did John persuade to buy what?* is fine, and **What did John persuade who to buy?* is decidedly weird. **Superiority** is the name of the constraint that enforces this (the "superior" *wh*-word must move), so moving a lower *wh*-word is called a **Superiority violation**. Superiority violations are a lot more acceptable when you use *which*-phrases, particularly in cases where they are interpreted to mean something like *which of these things that we've been talking about*.

Logical Form: This is essentially the name for the final semantic interpretation of a sentence, which is often conceptualized as essentially a syntactic tree with meanings assigned to each of the terminal ("leaf") nodes and computed for every nonterminal (internal) nodes.

2   Focus interpretation

Now on to the technology. (32) shows two different ways of writing what the sentence *John left* means. (32b) is the simpler to grasp: it is the statement that John left. As for (32a), we can think of it as expressing the set of "possible worlds" in which *John left* is true. The idea is that any sentence that can be true or false will be true in some "universes" and false in others—it depends on the facts (more specifically, whether John left in a given universe or not). In English prose, (32a) says "those worlds where John

left" or "containing any *w* such that John left in *w*."

Focus evokes a "set of alternatives" (even intuitively this is fairly clear), which can be spelled out for (31) like (32′a). (32′b) is a more abstract way to write it: the set of sentences of the form *that x left* for any *x* that *is an individual*. (32′c) is the most formalized version of this: in prose it is "those propositions (sets of worlds) where there is an individual (*x*) such that the proposition (set of worlds) contains any *w* such that *x* left in *w*." Being able to read (32′c) isn't crucial, but it's also not as hard as it might at first appear.

Hamblin and **Karttunen** both worked on the idea that the best way to characterize the meaning of a question (like *Who left?*) is as being a specification of the sorts of statements that serve as an answer. So, the kinds of answers there are to *Who left?* are statements like *x left* where *x* is an individual. The point being made here is that the set of possible answers to *Who left* are actually the same as the set of alternatives evoked by the sentence [*John*]$_F$ *left*.

One might even say it is **obivious**.

The crucial thing at this point is recognizing that (31) [*John*]$_F$ *left* has **two** parts to its meaning. It has an **ordinary semantic value** (which is just the sentence without focus: *John left*), and it also has a **focus semantic value** (which is a set of alternative sentences/propositions against which the ordinary semantic value is being compared). Both components are important to the semantics of focus interpretation.

Skipping down to (36–40), the derivation of the two-word sentence [*John*]$_F$ *left* is worked out. The **ordinary semantic value** is represented in the (a) lines and the **focus semantic value** is represented in the (b) lines. (37–38) show the basic meaning of *John* and of *left*, (36) shows the meaning of *John* when it is focused. (40) shows what we get when we combine focused *John* with *left*, using the rule ("Function Application") in (39).

Understanding what happened in (40) will be useful, so let's work on that.

3   The intervention effect

In (38), we have the meaning of the verb *left* all by itself—this is supposed to be the semantic contribution to the sentence made by the verb alone. The question is: what is all that math saying? I said above that (32a) was "those worlds *w* such that John left in *w*." This wasn't quite an accurate translation. Closer is this: "Given a world *w*, John left in *w*." Depending on which *w* you give it, the statement is either true or false. The "set" is described by considering all the possible *w*s you could give it, and collecting together those that make the statement true. So, it is *effectively* as I said "those worlds *w* such that John left in *w*." (In math, this is called a "characteristic function" of a set—a function

that is true for anything in the set and false for anything not in the set, it "characterizes" the set.)

The verb. Now, using this more accurate phrasing (where λ is translated as 'given', and "x" is translated as 'an individual (person) x,' and "w" is translated as "a possible world w"), what does (38) say? (Just write it out in prose using the translations I just gave.)

The combination. In (40a), what has happened is that (38a) has been combined with (36a)—in (36a) we have the individual (person) *John*. Given what you said (38a) meant above, and given that *John* is an individual (person), briefly describe how combining (38a) and (36a) leads to (40a). If you like, you can also look at what happened when (38b) and (36b) were combined to get (40b) for comparison—basically the same thing happened in both cases.

The rule in (39) ("Function Application") is supposed to describe how the combination in (40) was arrived at, but it's easier to see how one gets from (36) and (38) to (40) first, before trying to see what is meant in (39). In looking at (39), think about functions from high school—e.g., $f(x) = 2x$, which doubles any number you give it. In the notation used in this paper, that function would be written as $\lambda x.2x$.

Now, looking at (36b) and (40b), the idea is that the meaning of $[John]_F$ is h. H? Who is h? This is exactly what makes (40b) wind up being a set of different statements like *x left*. Depending on who you say h is, you get a different statement. *John left*, *Mary left*, *Bill left*, and so on. The set of statements depends on the set of hs. The way we're supposed to think of h is as something like an individual you can point at. We point at *Bill* with h, and then the statement is *Bill left*.

We won't work through all of the math here, but in (42), the $\sim$ operator is defined, and what it says is essentially that the ordinary semantic value (42a) is defined so long as some of the statements in the focus semantic value are in the salient context (C), and focus semantic value (42b) is the same as the ordinary semantic value. When everything is put together in (45), we essentially have the statement that the only true statement of the form *x left* in the salient context is *John left*, which is pretty much what *Only* $[John]_F$ *left* means.

Getting the ordinary semantic value after $\sim$. In (42a), the definition of the ordinary semantic value of $[\sim C\ Y]$ is defined. There is one crucial point to notice here. Both $[[Y]]^g$ and $[[Y]]^{g,h}$ are on the right side of the equals sign. What does that mean? In particular, what do we need to know about the meaning of Y in order to know the ordinary semantic value of $[\sim C\ Y]$? (You don't need to work out the math, what I mean is: What do $[[Y]]^g$ and $[[Y]]^{g,h}$) refer to?

One of the most central parts of Beck's (2006) proposal is really (46). The meaning of *who* (a *wh*-word, as opposed to a name like *John*) has no ordinary semantic value—it is undefined. It has *only* a focus semantic value. A *wh*-question is interpreted very much like focus is, except instead of using $\sim$ to interpret it, there is a Q ("question") operator. This is probably the meaning we would attribute to the interrogative complementizer, that's at least the idea.

> **Getting the ordinary semantic value after Q.** In (49), the definition of the ordinary and focus semantic values of [Q Y] is defined. Very parallel to the definition in (42a). But take a look at what is on the right side of the equals sign. Same question as for $\sim$ above. What do we need to know about the meaning of Y in order to know the ordinary semantic value of [Q Y]?

> **Interpreting a question.** Suppose you have the semantic values given in (47), with an undefined ordinary semantic value and a set of propositions like *x left* for the focus semantic value. Let's take "who$_1$ left" and call it "Y" and then look at (49) again. State briefly why it isn't a problem that the ordinary semantic value in (47) is undefined—why [Q Y] can be interpreted anyway. (This really just follows from the previous question.)

> **Messing it up.** Now, suppose you have the semantic values in (47), with an undefined ordinary semantic value and a set of propositions like *x left* for the focus semantic value. Let's take "who$_1$ left" and call it "Y." Now, go back up to (42a) and figure out what the ordinary semantic value would be of [$\sim$C Y] for this Y (that is, what the ordinary semantic value of [$\sim$C who$_1$ left]) is. You won't have to do any math—look at the previous questions again if you're tempted to do math. (What do we need in order to figure the ordinary semantic value? And what do we have?)

That's why focus messes up questions if focus gets between the *wh*-word and the associated interrogative complementizer (Q). That is what Beck (2006) claims the "intervention effect" is all about.

> **Explaining (2).** As a last step, go back to (2) and try to describe why (2a) is bad and why (2c) is ok, based on the generalization "**G**" on p. 17, or the version in English prose at the top of the last paragraph on p. 16. Keep in mind that the assumption is that (2c) started in SOV order, and then O is moved leftward (and thus higher) in the tree, before we start trying to compute the semantics. Also, keep in mind that the interrogative complementizer is assumed to be way at the top of the syntactic tree.

That's as far as we'll go in this paper at least in reading it so closely, but having done that much, you'll have understood the basic proposal Beck (2006) is making—most of

the rest of it is just details. We'll talk more about the implications and potential problems, though.

References

Beck, Sigrid. 2006. Intervention effects follow from focus interpretation. *Natural Language Semantics* 14(1): 1–56.