Computing pied-piping

1 *Wh*-indefinites

Since we mentioned them, here are some examples of *wh*-indefinites in Tlingit that you might be less inclined to think involve fronting of a *wh*, with sá spelling out a C head.

(1) **Tlingit *Wh*-indefinites** (Cable, 2010, reporting from literature sources)

a. Ax x'agáax'i yéi yatee ch'a *aadóoch* **sá** yawudlaagí.
my prayer thus it.is just who.ERG Q they.get.it
'My prayer is that someone learn it.' (Dauenhauer&Dauenhauer 1990. p. 206)

b. Wé éexnax.á áwé, *daa* **sá**yá aya.áxch.
that south.to.one FOC what Q.FOC he.heard.it
'The [old man] to the south heard something.' (Nyman&Leer 1993, p. 10)

c. Wáa **sá** yatee [wé [l *goodéi* **sá** wugoodi] káa]?
how Q he.is that not where.to Q he.went.REL man
'How is the man who didn't go anywhere?'

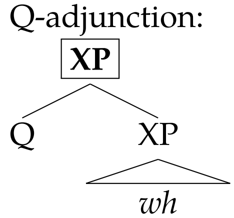
We see that sá can take another suffix, and when it's interpreted as a *wh*-indefinite it can stay inside an island (which is not possible for QPs that are interpreted as *wh*-phrases). However, this is not air-tight evidence. I couldn't find any examples of a *wh*-indefinite in a clear object position, or other structures that clearly show that sá has not fronted.

2 QP syntax redux

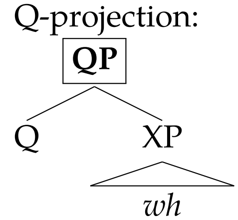
The syntax Cable assumes involves several parameters. First, a Q-particle may adjoin to a structure or it may project a QP layer.

(2) **Possible QP structures in Cable (2010):**

(a) Q-adjunction:



(b) Q-projection:



The largest Q-bearing structure is targeted for interrogative agree/attract operations.

☞ If QP contains material other than *wh*, the result is "pied-piping."

In some languages, pied-piping can be quite large and can including movement of entire islands. In English, pied-piping is much more limited.

(3) **Limited pied-piping languages (Cable, 2010, p. 147):**
If the Q-particle must Agree with the *wh*-word it c-commands, then a *wh*-word cannot be dominated in the sister of Q by islands or lexical categories. Thus limited pied-piping languages are those where Q/*wh*-Agreement must occur.

3 Kotek's (2014) semantics for Q-theory

Kotek (2014) adopts Cable's syntax for Q-theory, but proposes a different semantics. We will first look at this proposal, and then compare it with Cable's original proposal.

Wh-words denote sets of individuals as their focus-semantic value. (This is also the analysis Cable gives to *wh*-words, and the one we have been assuming throughout the semester in class.)

(4) **The meaning of *wh* is a set of individuals:**[1]
$[\![who]\!]^f = \{x \in D_e : x \text{ is human}\}$
$[\![which \text{ book}]\!]^f = [\![\text{book}]\!]^o = \{$ War & Peace, Moby Dick, Oliver Twist, ... $\}$

The interrogative complementizer, C hosts the interrogative probe, which triggers Q/QP-movement. In English, C has an EPP feature, which requires one QP must be pronounced in Spec,CP. C plays no role in the semantics of the question.

(5) **The semantics of the Complementizer:**
$[\![\text{C}]\!] = \lambda P_\tau .\ P$

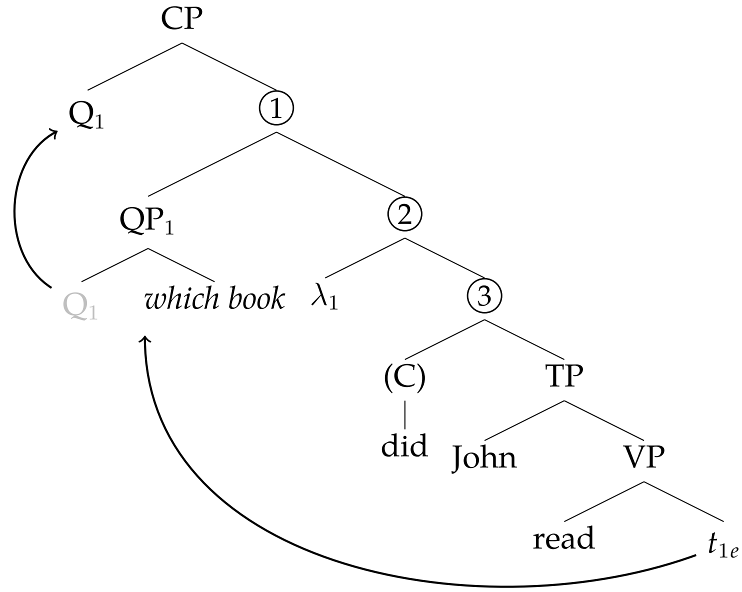
Q-particles are the elements that drives interrogative semantics. A syncategorematic semantics for Q: Q takes a set of propositions (or a set of sets of propositions...) with a focus-semantic value and returns that as the ordinary semantic value of the question (cf. Beck and Kim's (2006) semantics for C).

(6) **The semantics of the Q-particle:**
a. $[\![\text{Q}\ \alpha_\sigma]\!]^o = [\![\alpha_\sigma]\!]^f$
b. $[\![\text{Q}\ \alpha_\sigma]\!]^f = \{\ [\![\text{Q}\ \alpha_\sigma]\!]^o\ \}$ $\qquad \sigma \in \{\langle st,t\rangle, \langle\langle st,t\rangle,t\rangle, ...\}$

[1] With possible domain restriction, which we will ignore here.

☞ <u>A simplex question</u>: construct one QP, move it to Spec,CP to satisfy C's EPP feature.

(7) **The LF of a simplex question:**[2]



- Important to note:
  - At node ③: *assignment dependent* set of propositions: $\{\lambda w.$ John read x in $w\}$.
  - The meaning of node ② is $\lambda x.\ \lambda w.$ John read x in w.
  - Once QP has finished moving, Q must move out of QP to resolve a type-mismatch.[3]
  - The set denoted by *wh* point-wise composes with ②, so node ① denotes a set of propositions of the form $\{\lambda w.$ John read x in $w : x \in$ *book*$\}$.
  - Q_1 takes the focus-semantic value of node ① and returns it as the ordinary value of the question.

(8) **The derivation of a simplex question:**

a. $[\![\text{TP}]\!]^o = \lambda w.$ John read x in w

b. $[\![③]\!]^o = [\![\text{TP}]\!] = \lambda w.$ John read x in w

c. $[\![②]\!]^o = \lambda x.\ \lambda w.$ John read x in w

d. $[\![\text{QP}_1]\!]^o$ is undefined ; $[\![\text{QP}_1]\!]^f = \{x_e : x \in \text{book}\}$

e. $[\![①]\!]^o$ is undefined ; $[\![①]\!]^f = \{\lambda w.$ John read x in $w : x \in$ *book*$\}$

f. $[\![\text{CP}]\!]^o = [\![①]\!]^f = \{\lambda w.$ John read x in $w : x \in$ *book*$\}$
$= \lambda q_{\langle s,t \rangle} .\ \exists x \in book\ [q = \lambda w.\ \text{you read } x \text{ in } w]$

(9) **A set of possible answers to the question:**
{ John read Moby Dick, John read War & Peace, John read Oliver Twist, ... }

[2] Simplified tree, doesn't show successive-cyclic movement of QP, *v*P internal subject, etc.

[3] An alternative not pursued in Kotek (2014) is to allow for a pointwise functional application rule that operates on ordinary semantic values, and define Q for any type. In that case, we wouldn't need Q to move out of QP.

4 Pied-piping: movement and alternatives, combined

An important point worth stressing here is that the computation of pied-piping involves **both** movement and focus-alternatives computation.

☞ We merge Q with a *wh*-containing phrase, and front QP.

☞ Inside QP, *wh* projects focus alternatives that are only converted into ordinary values at the edge of QP.

Consider a declarative sentence, (10):

(10) **A declarative sentence with a complex object:**
Jim owns a picture of John F. Kennedy.

We could ask three types of questions about the object, corresponding to different merge positions for Q.

(11) **Different sizes of pied-piping correspond to different positions of Q-adjunction:**
Base structure: Jim owns (Q) a picture (Q) of (Q) *which* president
a. $[_{QP}$ Q *Which* president] does Jim own a picture of ___?
b. $[_{QP}$ Q Of *which* president] does Jim own a picture ___?
c. ? $[_{QP}$ Q A picture of *which* president] does Jim own ___?

In the derivation of a question like (11c), then, two processes occur: first, QP moves to the specifier of the interrogative complementizer, and second, inside QP, the *wh*-word itself is interpreted via Rooth-Hamblin alternative computation between *wh* and Q.

(12) **Interpreting (11c) through both movement and alternative computation:**
$[_{QP}$ Q A picture of *which* president] λ_x does Jim own x?
Rooth-Hamblin alternatives *QP-movement*

Movement is sensitive to islands and other $\bar{\text{A}}$-movement diagnostics, while Rooth-Hamblin alternatives are not. We will see later in the class that there may be ways to diagnose the presence of alternatives inside the pied-piping constituent.

5 Cable's semantics for Q-theory

Lets return to Cable's original semantics for Q-theory.

The first assumption Cable makes is that *wh*-words denote sets of individuals as their focus semantic value (see (4)). Where Cable's system differs from Kotek's is in the semantics of Q and of the interrogative complementizer.

The Q-particle Q_i denotes a choice function, (13).

(13) **The semantics of Q (Cable, 2010):**
$[\![Q_i]\!] = g(i) \in D_{\text{cf}}$

A choice function is any function that takes a set as argument and returns a member of that set as its value.

(14) **Some choice functions:**
a. f({Dave, John, Larry, Phil}) = Larry
b. g({the Bible, the phonebook, LSLT}) = the Bible
c. h({Amherst, Boston, Natick, Worcester}) = Worcester

Q_i operates on the focus-semantic value of its sister XP, and returns one member of the set denoted by XP, (15).

(15) **The semantics of QP (Cable, 2010):**
$[\![Q_i \text{ XP}]\!] = [\![Q_i]\!]([\![\text{XP}]\!]^f)$

So, a simple QP has the following denotation:

(16) **The denotation of QP**
$[\![\ [_{\text{QP}}\ Q_i\ \textit{which book}]\ ]\!] =$
$[\![Q_i]\!](\ [\![\textit{which}\ \text{book}]\!]^f\ ) =$
$[\![Q_i]\!](\ \{x \in D_e : x \text{ is a book}\}\ ) =$
$g(i)(\ \{x \in D_e : x \text{ is a book}\}\ ) =$
g({the Bible, the phonebook, LSLT, ...})

Our goal is to derive the meaning of the question as a set of propositions:

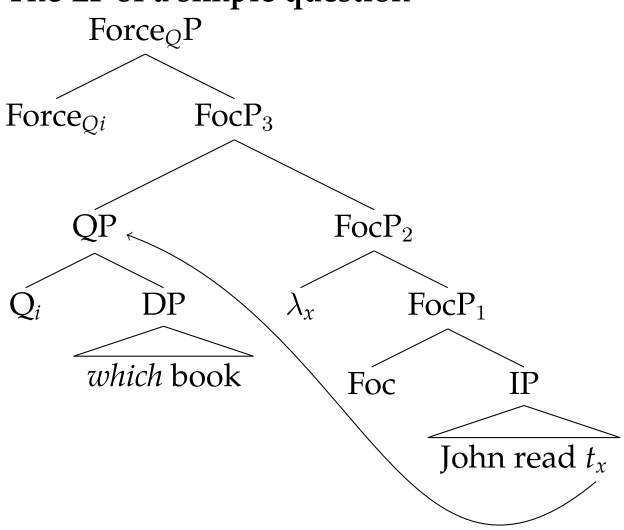
(17) **The meaning of a question is the set of possible answers to the question**
a. *Which* book did John read?
b. {John read the Bible, John read the phonebook, John read LSLT, ...}
c. $\lambda p\ .\ [\ \exists x \in \textit{book}\ .\ p = [\ \text{John read } x\ ]]$
≈ "The set of propositions p s.t. p is the proposition *John read* x for x a book."

A note on the syntax: Cable works in a Rizzi (1997) cartographic approach. The operator that is responsible for question semantics here is Force. QPs move to a Focus projection immediately below Force.

Simplex *wh*-questions that contain just one QP are interpreted using the interrogative complementizer in (18): Force_Q contributes exactly one existential quantifier to the meaning of the question, which binds the choice-function variable introduced by the Q-morpheme.

(18) **The semantics of simplex Force (Cable, 2010):**
$[\![\text{Force}_{Q_i}\ \text{XP}]\!]^g = \lambda p\ [\ \exists f.\ p = [\![\text{XP}]\!]^{g(i/f)}\ ]$

(19) **The LF of a simple question**



(20) **The interpretation of a simplex question (Cable, 2010, p. 94)**

a. $[\![\text{Force}_Q\text{P}]\!] =$
b. $[\![\text{Force}_{Qi}\ \text{FocP}_3]\!] =$ (FA)
c. $\lambda p\ [\ \exists f.\ p = [\![\text{FocP}_3]\!]^{g(i/f)}\ ] =$ (18)
d. $\lambda p\ [\ \exists f.\ p = [\![\text{QP FocP}_2]\!]^{g(i/f)}\ ] =$ (17)
e. $\lambda p\ [\ \exists f.\ p = [\![\text{FocP}_2]\!]^{g(i/f)}\big([\![\text{QP}]\!]^{g(i/f)}\big)\ ] =$ (FA)
f. $\lambda p\ [\ \exists f.\ p = [\![\text{FocP}_2]\!]^{g(i/f)}(f(\{x \in D_e : x \text{ is a book}\}))\ ] =$ (4, 15)
g. $\lambda p\ [\ \exists f.\ p =[\ \lambda x.\ \text{John read } x\ ]\ (f(\{x \in D_e : x \text{ is a book}\}))\ ] =$ (FA)
h. $\lambda p\ [\ \exists f.\ p = \text{John read } [f(\{x \in D_e : x \text{ is a book}\})]\ ] =$ (FA)

Force_Q is a finicky creature: it's set up to deal with a structure with exactly one moved QP.

To deal with other syntactic structures, we will need additional Force heads. For example, for multiple questions with two *wh*-phrases, we might imagine that the in-situ *wh* moves covertly, or alternatively remains in-situ:

(21) **LF representations for multiple questions:**

a. $[_{CP}$ QP$_1$ QP$_2$ [C $[_{TP}$ ... t_1 ... t_2]]]

b. $[_{CP}$ QP$_2$ [C $[_{TP}$ ... wh_1 ... t_2]]]

These LFs would be interpreted by different Force heads.

(22) **Force$_{Q2}$ interprets structures with two moved QPs**
$[\![\text{Force}_{Q2\ i\ j}\ \text{XP}]\!]^g = \lambda p\ [\ \exists f.\ \exists h.\ p = [\![\text{XP}]\!]^{g(i/f)(j/h)}\ ]$

(23) **C_{Q+} interprets structures with one moved QP and one in-situ *wh*:**
$[\![C_{Q+\ i}\ \text{XP}]\!]^g = \lambda p\ [\ \exists f.\ \exists h.\ p = h\ (\ [\![\text{XP}]\!]^{F\ g(i/f)}\ )\ ]$

☞ Note: in (21) we see something we haven't seen before, but is possible in Cable's system: *wh* can remain in-situ without being merged with a Q-particle at all.

- A special Force head has to interpret each of these structures, and more would be necessary if we want to handle questions with three *wh*s as well.
- The semantics for Q-theory given in Kotek (2014) doesn't have this problem: it can use the same Q defined for simplex questions for any type of multiple question syntax (for details on how multiple questions work, come to the syntax-semantics reading group on November 21!).

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