

Intervention Effects, Superiority Effects and Pied-Piping: Evidence from Tlingit¹

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1. Introduction and Overview

(1) Illustrative Examples of Wh-Questions in Tlingit (Na-Dene; Alaska, BC, Yukon)

a. Wáa sá sh tudinookw i éesh?
how Q feels your father
How is your father feeling? (D&D 2000; p. 138)²

b. Daa sáwé i éesh al'óon?
what Q.FOC your father hunts
What is your father hunting? (D&D 2000; p. 186)

(2) General Form of a Wh-Question in Tlingit

[s ... [[... wh-word ...] sá] (focus particle) ... Main-Predicate]

- Wh-word precedes the main predicate (and is typically initial in the clause).
- Wh-word is followed by the Q-particle *sá*, which either directly follows the wh-word or directly follows a phrase containing the wh-word.
- Remaining material typically follows wh-word, with a strong tendency to follow the verb.

(3) Broader Research Project (Cable 2007, to appear)

Study of the compositional semantics of Tlingit wh-constructions can shed new light on old puzzles surrounding wh-construction in other (more well-studied) languages.

(4) The Focus of This Talk

The relationship between Superiority Effects, Intervention Effects and pied-piping

¹ Special thanks are due first and foremost to David Katzeek, Anita Lafferty, John Marks and Fred White, the Tlingit language consultants for this project. Their generosity, patience and energy are truly exceptional, and I thank them for all the time and help they have provided me in my study of their language. Most of the Tlingit data presented here were gathered from interviews conducted at the Sealaska Heritage Institute (SHI) in 2005, 2006 and 2007. Special thanks are owed to Richard Dauenhauer, Nora Marks Dauenhauer, Keri Edwards, Yarrow Vaara, Rosita Worl, and everyone else at SHI. Special thanks are also due Roby Littlefield, James Crippen and all the other members of the Tlingit Language and Culture Discussion List. *Aatlein gunalchéesh!*

Finally, I thank the following persons for their helpful comments upon earlier versions of this work: Kai von Fintel, Danny Fox, Irene Heim, Angelika Kratzer, David Pesetsky, Lisa Matthewson, Shigeru Miyagawa, and Norvin Richards. I would also like to thank audiences at SULA 5 (MIT, May 2009) and at McGill (November 2009). This material is based upon work supported under an NSF Graduate Research Fellowship and an NSF Dissertation Improvement Grant (BCS-0632431).

² For reasons of space, I will henceforth abbreviate the names 'Dauenhauer & Dauenhauer' to 'D&D'.

(5) **Overview of the Talk**

Section 2: The central puzzle circumscribed by (4)

Section 3: Required background regarding the syntax of Tlingit wh-questions

Section 4: A compositional semantics for Tlingit wh-questions

Section 5: How this semantics addresses the puzzle in (4) / Section 2

2. Intervention, Superiority and Pied-Piping

(6) **Two Contrasts Between German and English**

- a. Intervention Effects in Multiple Wh-Questions
- b. Superiority Effects in Multiple Wh-Questions

(7) **Intervention Effect**

In many languages, an *in-situ* wh-word can't be c-commanded by any of a set of 'offending operators'. The ill-formedness of such configurations is referred to as an *Intervention Effect*.

(8) **Intervention Effects with *In-Situ* Wh-words in German**

- a. Wer hat Hans **wo** angetroffen?
who has Hans where met
Who met Hans where?
- b. ?? Wer hat niemanden **wo** angetroffen?
who has nobody where met
Who met nobody where?

(9) **No Intervention Effects with *In-Situ* Wh-words in English**

- a. Who didn't read **what**?
- b. Which children wanted to show nobody **which pictures**?

(10) **Superiority Effect**

In many wh-fronting languages, the structurally highest wh-word must undergo fronting 'first'. The ill-formedness that results from fronting a lower wh-word 'first' is called a *Superiority Effect*

(11) **Superiority Effects in English Multiple Wh-Questions**

- a. Who bought what?
- b. * What did who buy?

(12) **No Superiority Effects in German Multiple Wh-Questions**

- a. Wer hat was gekauft?
who has what bought?
Who bought what?
- b. Was hat wer gekauft?
what has who bought
Who bought what?

(13) **Generalization (Pesetsky 2000)**

A multiple wh-question will exhibit Intervention Effects *iff* that multiple wh-question *does not* exhibit Superiority Effects.

(14) **Central Claim of the Talk**

The wh-questions of Tlingit independently motivate a compositional semantics for wh-questions that predicts the generalization in (13).

Another Interesting Result:

When combined with its analysis of wh-questions with pied-piping, our Tlingit-based theory predicts the generalization in (15):

(15) **Intervention Effects in Pied-Piped Constituents**

In all languages, an Intervention Effect will arise if a “pied-piping” wh-word is c-commanded by an ‘offending operator’ inside the pied-piped constituent.

This prediction is born out for German, as demonstrated by Sauerland & Heck (2003).

(16) **Intervention Effects in German Pied-Piping**

- a. Fritz möchte wissen [ein **wie** schnelles Motorrad] du fahren darfst.
Fritz wants to.know a how fast motorbike you drive may
Fritz would like to know how fast a motorbike you are allowed to drive.
- b. * Fritz möchte wissen [kein **wie** schnelles Motorrad] du fahren darfst.
Fritz wants to.know no how fast motorbike you drive may

Furthermore, I demonstrate that this prediction is also born out for English.

(17) **Intervention Effects in English Pied-Piping**

- a. (?) [A picture of **which** president] does Jim own?
- b. * [No picture of **which** president] does Jim own?

Final Interesting Point to Note:

Unlike what we saw for *in-situ* wh-words in (8) and (9), the Intervention Effects associated with *pied-piping* wh-words hold both in German and in English!

The proposed account uniquely predicts this difference between the two Intervention Effects environments (cf. Sauerland & Heck 2003).

3. The Syntax of Tlingit Wh-Questions: Fundamental Background

The core innovations of the semantics proposed here for Tlingit wh-questions are motivated by certain syntactic properties of Tlingit wh-questions, and so these will be reviewed here.

3.1 Summary of the Core Syntactic Proposals

(18) Illustrative Examples of Wh-Questions in Tlingit (Na-Dene; Alaska, BC, Yukon)

- a. Wáa sá sh tudinookw i éesh?
 how Q feels your father
How is your father feeling? (D&D 2000; p. 138)

- b. Daa sáwé i éesh al'óon?
 what Q.FOC your father hunts
What is your father hunting? (D&D 2000; p. 186)

(19) General Form of a Wh-Question in Tlingit

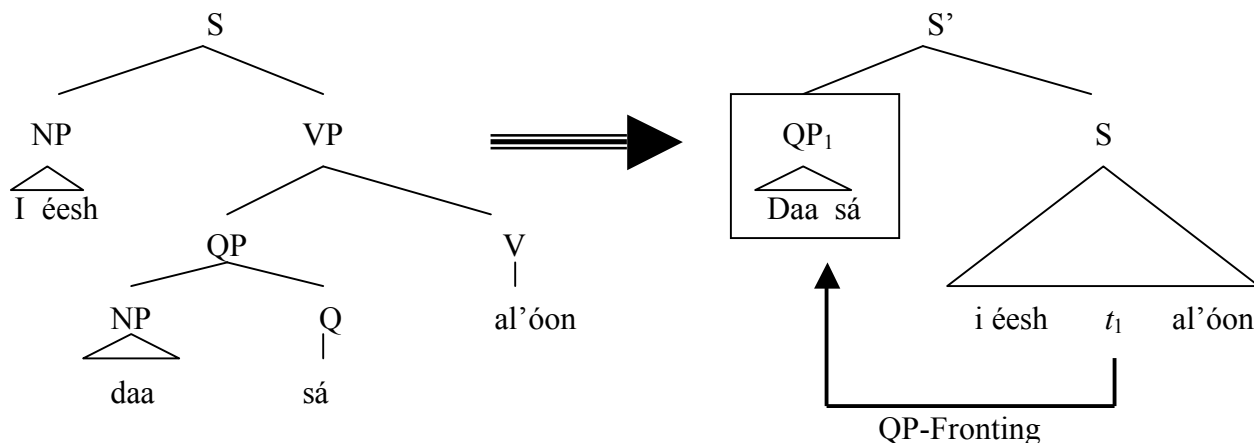
[s ... [[... wh-word ...] sá] (focus particle) ... Main-Predicate]

- Wh-word precedes the main predicate (and is typically initial in the clause).
- Wh-word is followed by the Q-particle *sá*, which either directly follows the wh-word or directly follows a phrase containing the wh-word.
- Remaining material typically follows wh-word, with a strong tendency to follow the verb.

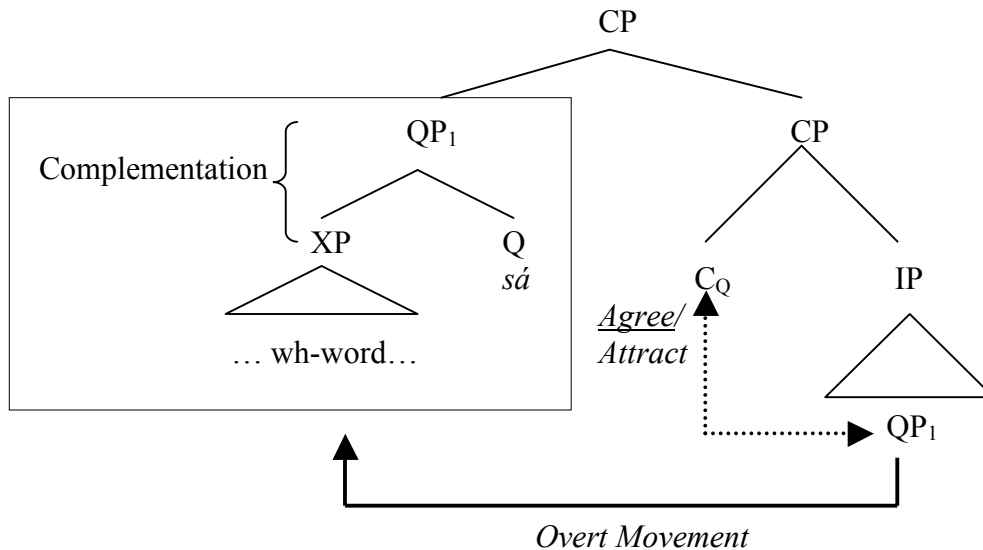
(20) The Central Claim Regarding the Syntax of Tlingit Wh-Questions

- a. In a Tlingit wh-question, a phrase containing the wh-word and the Q-particle *sá* undergoes **movement** to a left-peripheral position.
- b. **This movement in a Tlingit wh-question targets/is triggered by the features of the Q-particle *alone*, and not any features of the wh-word itself.**

Brief Sketch of the Analysis:



(21) A More Detailed Picture of the Syntax



- In Tlingit, a wh-word is associated with an obligatory Q-particle (*sá*), which c-commands the wh-word. The Q-particle *sá* takes as complement the phrase it combines with.
- The interrogative C in Tlingit probes for and Agrees with the [Q]-feature of this Q-particle – *not any feature of the wh-word itself*.
- The first node C encounters with [Q] is the QP projected by Q. Therefore, C Agrees with this QP.
- This QP is therefore subsequently attracted into the projection of C. *Since the QP necessarily contains the wh-word, the wh-word is also moved into the left periphery as a result.*

In Cable (2007, to appear), I discuss at length the close similarity between (21) and the analyses of Sinhala and Japanese wh-questions put forth in Hagstrom (1998) and Kishimoto (2005).

3.2 Some Evidence Supporting This Syntax

(22) Tlingit Wh-Indefinites Reveal the Base Position of Q

The Q-particle *sá* in sentences like (18) cannot be analyzed as a left-peripheral C head. As can be seen by sentences like the following, it occurs with wh-words functioning as *indefinites* in *declarative* sentences, where it occupies a base-position low in the clause.

- a. Yá x'úx' akwɣwatóow [QP aadóoch **sá**]?
 this book will.read who.ERG Q
People will read this book.
- b. Tléil [QP **aadóo** teen **sá**] xwagoot.
 not who with Q I.went
I didn't go with anyone.

(23) **Q-Particles Must be Fronted in Tlingit Wh-Questions**

As is shown by the contrast below, the Q-particle in a Tlingit wh-question must appear fronted in the wh-question. The wh-word can *never* front alone.

- a. [[**Goodéi** wugoot_x **sá**]₁ [has oowajée t₁ i shagóonich]]?
 where.to he.went Q think your parents.ERG
 Where do your parents think he went?
- b. * [**Goodéi**₁ [has oowajée [t₁ wugoot_x **sá**] i shagóonich]]?
 where.to think he.went Q your parents.ERG

As is shown contrasts like the following, the Q-particle in a Tlingit wh-question must always appear at the *right edge* of whatever phrase is fronted in the wh-question

- c. [_{DP} **Aadóo** yaagú] **sá** ysiteen?
 who boat Q you.saw
 Whose boat did you see?
- d. * [_{DP} **Aadóo** **sá** yaagú] ysiteen?
 who Q boat you.saw

These facts best fit an analysis where *at least* the Q-particle (and its features) are targeted by the movement in a Tlingit wh-question.

(24) **Only the ‘Locality’ of the Q-Particle Matters**

As is shown by the contrast below, in a Tlingit wh-question, a wh-word can be located inside an island *if and only if* the Q-particle **sá** is located *outside* the island.

- a. [[**Wáa** kwligeyi CP] **xáat** NP] **sá** i tuwáa sigóo?
 how it.is.big.REL fish Q you.want
 How big a fish do you want?
 (Lit. ‘A fish that is how big do you want?’)
- b. * [[**Waa** **sá** kwligeyi CP] **xáat** NP] i tuwáa sigóo?
 how Q it.is.big.REL fish you want

These facts prompt the following generalization.

- c. Generalization:
 The well-formedness of a Tlingit wh-question only depends upon the locality of the *Q-particle* to the matrix C. The locality of the wh-word is irrelevant.

These facts best fit an analysis where *only* the Q-particle (and its features) are targeted by the movement in a Tlingit wh-question.

3.3 An Important Aside on Pied-Piping Structures

Following the analysis in (21), pied-piping structures in Tlingit (illustrated below) possess no special properties that significantly distinguish them from non-pied-piping structures.

(25) Pied-Piping Structures in Tlingit

- a. [QP [PP Aadóo teen] sá] yigoot?
 who with Q you.went
Who did you go with?
- b. [QP [DP Aadóo yaagú] sá] ysiteen?
 who boat Q you.saw
Whose boat did you see?
- c. [QP [DP X'oon keitl] sá] ysiteen?
 how.many dog Q you.saw
How many dogs did you see?

The derivation of these structures proceeds exactly as the derivation of non-pied-piping structures like those in (18), with the attraction of the QP projected by the Q-particle *sá*.

Under the analysis in (21), a pied-piping structure is simply a case where the complement of Q is a phrase that strictly contains the projections of the wh-word...

(26) Schematic of Pied-Piping Structure, Under the Analysis in (21)

[[QP [XP ... WH-PHRASE ...] Q]_I [... t_I ...]]

*Complement to Q is a phrase XP that properly
contains the projections of the wh-word*

4. A Compositional Semantics for Tlingit Wh-Questions

With the syntactic background provided in the previous section, we can now provide a compositional semantics for Tlingit wh-questions.

Side-Note

Much of the machinery introduced below is independently required/motivated by structures like those in (22) above, where the wh-word and Q-particle together function as an indefinite in declarative clauses.

For reasons of space, I won't review here how these sentences are treated in the system proposed here. The interested reader is referred to Cable (2007, 2008, to appear).

(27) **Background Assumption Regarding the Semantics of Wh-Questions**

Following Hamblin (1973) and Karttunen (1977), I assume that the meaning of a wh-question is a set of propositions, those that constitute its possible answers.

- a. Wh-Question: Who did Dave see?
- b. Meaning of Wh-Question
 - (i) { Dave saw Kate, Dave saw Frank, Dave saw Jim, ... }
 - (ii) { $p_{\langle st \rangle} : \exists x \in \text{human. } p = \text{Dave saw } x$ }

(28) **What Our Compositional Semantics Must Deliver**

In our syntactic analysis of Tlingit wh-questions in (21), there are three key ‘characters’:

- The wh-word
- The Q-particle
- The Interrogative C head

Thus, what we need in order to obtain a compositional semantics for Tlingit wh-questions is...

- a. A semantics for the wh-word
- b. A semantics for the Q-particle
- c. A semantics for the C-head

... which together yield the correct set of propositions as the meaning of the wh-question.

Side Note:

The ideas that follow are based upon work by Beck (2006), Hagstrom (1998) and Shimoyama (2001).

(29) **Background Assumption Regarding the Semantics of Focus (Rooth 1985, 1992)**

- a. In addition to whatever ‘normal’ semantic value a phrase has, it also possesses a ‘focus semantic’ value.
- b. The function from phrases to focus-semantic values is $[[\]]^F$
- c. The focus semantic value of a non F-marked (‘non-focused’) head is the set consisting of its normal-semantic value.
 - (i) $[[X]]^F = \{ [X] \}$
 - (ii) $[[\text{Dave}]]^F = \{ \text{Dave} \}$
- d. The focus-semantic value of an F-marked (‘focused’) phrase is a set of alternatives, assumed to be all entities of the same type as the normal semantic value of the phrase.
 - (i) $[[\text{XP}_F]]^F = \{ x : x \text{ is the same type as } [X P] \}$
 - (ii) $[[\text{Dave}_F]]^F = \{ x : x \in D_e \} = \{ \text{Frank, Jim, Sue, Larry, ...} \}$

(30) **The Core Assumptions Regarding Wh-Words (Beck 2006)**

Wh-words are semantically deficient in a particular way...

Wh-words have only a focus-semantic value; their normal-semantic value is undefined.

- Wh-words are not listed as having a normal-semantic value.
- However, they nevertheless have a lexically assigned semantic type and value for animacy.
- Thus, the focus-semantic value of an F-marked wh-word is a set of ‘alternatives’, each of the same logical type and animacy as the wh-word.

(31) **Semantics of WHAT**

normal-semantics: $[[\text{what} / \text{daa}]] = \text{undefined}$

focus-semantics: $[[\text{what}_F / \text{daa}_F]]^F = \{ x_e : x \notin \text{human} \}$

(32) **Semantics of WHO**

normal-semantics: $[[\text{who} / \text{aadóo}]] = \text{undefined}$

focus-semantics: $[[\text{who}_F / \text{aadóo}_F]]^F = \{ x_e : x \in \text{human} \}$

(33) **First Core Assumption Regarding Q-Particles (Hagstrom 1998)**

Q-particles are variables over choice-functions.

- Q-particles are assignment-dependent, and thus bear indices.
- Relative to any variable assignment, a given Q-particle denotes some *choice-function*.
- A choice-function is a function that, given any set as its argument, returns a member of that set as its value.

a. Semantics of Q

$$[[Q_i]]^g = g(i) \in D_{cf}$$

b. Illustrative Examples of Choice-Functions

$f(\{ \text{Dave, John, Larry, Phil} \})$	=	Larry
$g(\{ \text{the Bible, the phonebook, } LSLT \})$	=	the Bible
$h(\{ [\lambda x.x \text{ dances}], [\lambda y.y \text{ runs}], [\lambda z.z \text{ sings}] \})$	=	$[\lambda y.y \text{ runs}]$

(34) **Second Core Assumption Regarding Q-Particles (Beck 2006)**

Q-particles (qua choice-functions) are focus-sensitive operators.

- Q-particles semantically compose with their sisters via a syncategorematic rule specific to Q-particles.
- The normal-semantic value of a Q-particle and its sister is stipulated to be the normal semantic value of the Q-particle applied to the *focus* semantic value of its sister.

a. Special Composition Rule for Q-Particles

$$[[Q_i XP]] = [[Q_i]]([[XP]]^F)$$

Crucial Observation:

- Note that according to the semantics in (34), the Q-particle *only* cares about (*i.e.* takes as argument) the focus-semantic value of its sister (Beck 2006).
- This is quite unlike other well-known focus-sensitive operators, whose meaning requires one to also compute the normal-semantic value of its argument (e.g. “only”)...
- This is actually crucial, since wh-words are assumed *not* to have *any* normal-semantic value. Thus, if the Q-particle *did* require one to compute the normal-semantic value of its sister (containing the wh-word), a semantic crash would result...
- ... this is a crucial fact we will return to, as it underlies the system’s treatment of intervention effects...

(35) **Illustration: the Semantics of a ‘Simple’ QP**

- a. $[[[_{QP} daa_F sá_1]]]^g =$ (by (34a))
- b. $[[sá_1]]^g ([[daa_F]]^g{}^F) =$ (by (33a))
- c. $g(1)([[daa_F]]^g{}^F) =$ (by (31), (33))
- c. $f(\{ x_e : x \notin \text{human} \}) =$ *Some particular human (whose identity depends upon the identity of ‘f’)*

(36) **Crucial Question**

How do we interpret QPs where the Q is *not* directly adjacent to the wh-word?

- a. $[_{QP} [_{DP} \text{ Aadóo } yaagú] sá] \text{ ysiteen?}$
 who boat Q you.saw
Whose boat did you see?

(37) **Answer: Point-wise Semantic Composition**

If A is a singleton set containing the function f of type $\langle \sigma, \tau \rangle$, and a set B is of type $\langle \sigma, \tau \rangle$ (contains only elements of type σ), then the *point-wise semantic composition* of A and B is the type $\langle \tau, \tau \rangle$ set obtained by applying f to every element in B.

$$\{ f \} (\{ a, b, c, d, e \}) = \{ f(a), f(b), f(c), f(d), f(e) \}$$

(38) **Illustration: Point-wise Semantic Composition**

- a. Phrase: *Aadóo yaagú*
who boat
'whose boat'
- b. Abstract Structure: $[Aadóo_F [POSS [yaagú]]]$
- c. Semantics of POSS: $[[POSS]] = \lambda P_{\langle e, t \rangle} \lambda x. \text{ the } P \text{ owned by } x$

d. Illustration of Semantic Composition

- (i) $[[[Aadóo_F [POSS [yaagú]]]]]^F = \text{(by (37))}$
- (ii) $[[POSS]]^F ([[yaagú]]^F) ([[aadóo_F]]^F) = \text{(by (29c))}$
- (iii) $\{ [\lambda P. \lambda x. \text{ the } P \text{ owned by } x] \} (\{ [\lambda x. \text{ boat}(x)] \}) ([[aadóo_F]]^F) = \text{(by (32))}$
- (iv) $\{ [\lambda P. \lambda x. \text{ the } P \text{ owned by } x] \} (\{ [\lambda x. \text{ boat}(x)] \}) (\{ x_e : x \in \text{human} \}) = \text{(by (37))}$
- (v) $\{ \lambda x. \text{ the boat owned by } x \} (\{ x_e : x \in \text{human} \}) = \text{(by (37))}$
- (vi) $\{ y : \exists x \in \text{human} \ \& \ y = \text{the boat owned by } x \}$
The set of all boats owned by people.

With this rule in place, we can easily interpret QPs such as that in (36a))

Note that the ability to interpret such phrases amounts to a semantics for Tlingit pied-piped phrases

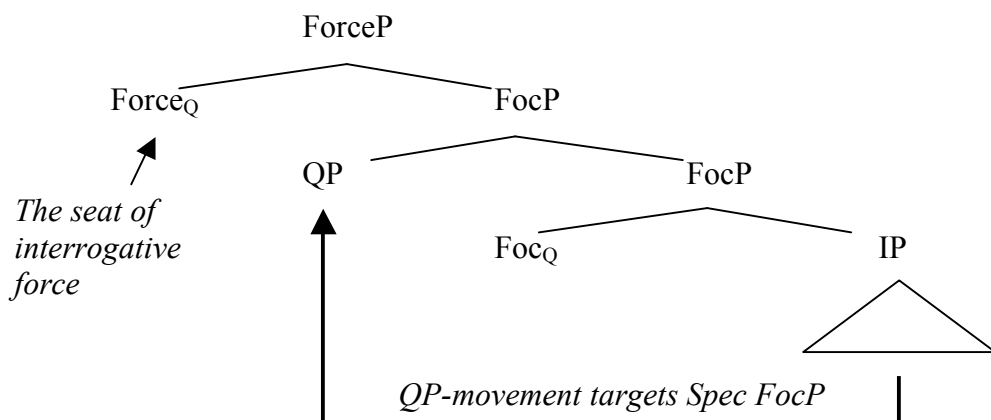
(39) **Illustration: Semantics of Tlingit Pied-Piped Phrase**

- a. $[[[_{QP} [_{DP} Aadóo_F [POSS [yaagú]]]] sá]]^g = \text{(by (34a))}$
- b. $[[sá_1]]^g ([[[Aadóo_F [POSS [yaagú]]]]]^g) = \text{(by (33a))}$
- c. $g(1) ([[[Aadóo_F [POSS [yaagú]]]]]^g) = \text{(by (38), (33))}$
- d. $f(\{ y : \exists x \in \text{human} \ \& \ y = \text{the boat owned by } x \}) =$
Some particular boat owned by a person (whose identity depends upon the identity of 'f')

- We now have sufficient machinery in place to interpret the QPs of Tlingit wh-questions.
- What remains is a semantics for the interrogative C head, which will combine with our previous assumptions to deliver the correct interpretation of the wh-question.

(40) **The Core Assumption Regarding QP-Movement to the Left Periphery**

QP-movement targets a position just below an interrogative Force head.



(41) **The Core Assumption Regarding the Semantics of ‘Force_Q’**

The head ‘Force_Q’ is an interrogative operator that binds the choice function variables introduced by the Q-particles.

- The head ‘Force_Q’ semantically composes with its sister via a syncategorematic rule.
- This special interpretation rule effectuates selective binding of the choice-function variables in the scope of the Force_Q head.

a. The Semantics of ‘Force_Q’ $[[\text{Force}_{Q_i} \text{XP}]]^g = \{ p : [\exists f . p = [[\text{XP}]]^{g(i/f)}] \}$

Side-Note 1:

- Note that given the semantics in (33a), the interrogative C head is *not* a focus-sensitive operator.
- Rather, it’s a regular old normal semantic operator, which binds the choice-function variables which are the normal-semantic values of the Q-particle.

Side-Note 2:

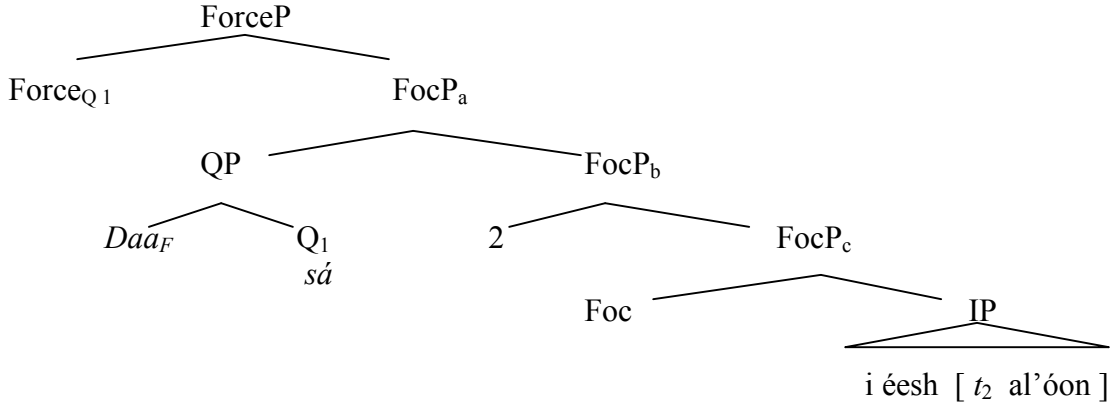
- Note that the semantics in (33a) assumes that there is only one choice-function variable in the scope of ‘Force_Q’.
- This immediately raises the question of how the system interprets *multiple* wh-question, and issue that we will return to shortly...

These are all the ingredients necessary to provide a semantics for wh-question structures

(42) **The Compositional Semantics of Tlingit Wh-Questions**

- a. Sentence: Daa sá i éesh al'óon?
 what Q your father hunts
 What is your father hunting?

- b. Structure:



- c. Interpretation:

- (i) $[[[_{\text{ForceP}} \text{ ForceQ}_1 \text{ FocP}_a]]]^g = \text{ (by (41a))}$
- (ii) $\{ p : [\exists f . p = [[\text{FocP}_a]]^{g(1/f)}] \} = \text{ (by FA)}$
- (iii) $\{ p : [\exists f . p = [[\text{FocP}_b]]^{g(1/f)} ([[\text{QP}]]^{g(1/f)}) \} =$
- (iv) $\{ p : [\exists f . p = [\lambda x . \text{ your father is hunting } x] ([[\text{QP}]]^{g(1/f)}) \} = \text{ (by LC)}$
- (v) $\{ p : [\exists f . p = \text{ your father is hunting } [[[_{\text{QP}} \text{ daa}_F \text{ sá}_1]]]^{g(1/f)} \} = \text{ (by (31), (33), (34))}$
- (vi) $\{ p : [\exists f . p = \text{ your father is hunting } f (\{ x_e : x \notin \text{human} \}) \}$

Adequacy of the Semantics (see Cable (2007, to appear) for more details)

- *The meaning computed for (42a) is “the set of propositions p such that there is some choice function f such that p is the proposition ‘your father is hunting f({ x : x is non-human })’.”*
- *Given the nature of choice functions, this is equivalent to the set of propositions p such that **there is some non-human entity** x such that p is equal to the proposition ‘your father is hunting x’.*
- *Thus, the computed semantic value is equal to the semantic value commonly assigned to such a wh-question:*

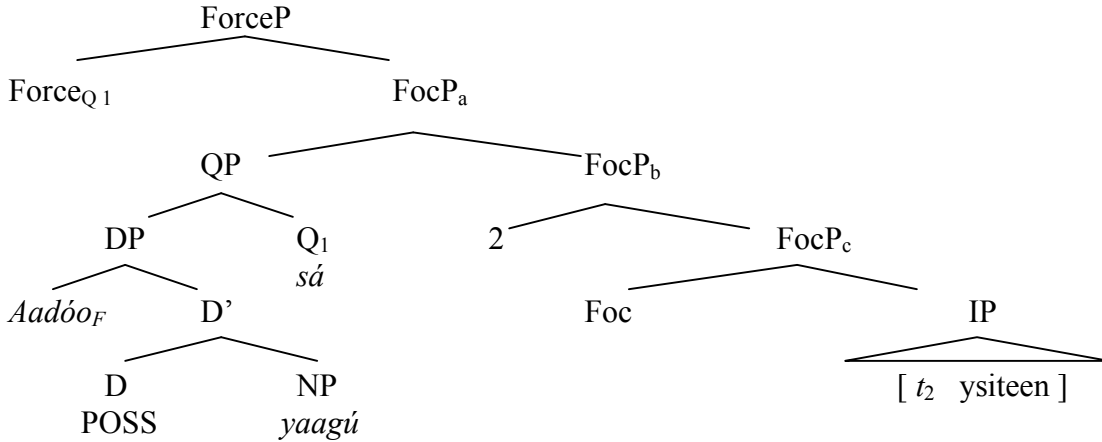
$$\{ p : \exists x \notin \text{human} \ \& \ p = \text{ your father is hunting } x \}$$

This system also works when Q is not directly adjacent to the wh-word (i.e. pied-piping structures

(43) **The Compositional Semantics of Tlingit Pied-Piping Structures**

- a. Sentence: [QP [DP **Aadóo** yaagú] **sá**] ysiteen?
 who boat Q you.saw
 Whose boat did you see?

- b. Structure:



- c. Interpretation:

- (i) [[[ForceP ForceQ1 FocPa]]]^g = (by proof parallel to (42c))
- (ii) { p : [∃f . p = [λx. you saw x]([[QP]]^{g(1/f)}) } = (by LC)
- (iii) { p : [∃f . p = you saw [[[QP [DP AadóoF [POSS [yaagú]]]]]]^{g(1/f)}] } = (by (39))
- (iv) { p : [∃f . p = you saw f ({ y : ∃x ∈ human & y = the boat owned by x }) }

Adequacy of the Semantics (see Cable (2007, to appear) for more details)

- The meaning computed for (43a) is “the propositions p such that there is some choice function f such that p is the proposition “you saw f applied to the boats owned by people”
- Given the nature of choice functions, this is equivalent to the set of propositions p such that **there is some person x** such that p is equal to the proposition ‘you saw x’s boat’ (Cable 2007, to appear)
- Thus, the computed semantic value is equal to the semantic value commonly assigned to such a wh-question:

$$\{ p : \exists x \in \text{human} \ \& \ p = \text{you saw the boat owned by } x \}$$

Side-Note: As discussed in more detail by Cable (2007, to appear), the result sketched above demonstrates that our semantics for wh-questions is able to interpret pied-piping structures *without having to appeal to reconstruction*.

(45) **The Proposed Solution (for Tlingit)**

In addition to the force head in (44a) above, there is also a special force head for (binary) multiple wh-questions.

a. The Head $Force_{Q_2}$

(i) Bears *two* indices: $Force_{Q_2\ i,j}$

(ii) Is interpreted via a rule that effectuates binding to *two* choice-function variables.

$$[[Force_{Q_2\ i,j} \text{ XP }]]^g = \{ p : [\exists f . \exists h . p = [[XP]]^{g(i/f)(j/h)}] \}$$

An Immediate Objection:

This ' $Force_{Q_2}$ ' isn't sufficient to handle multiple wh-questions with *more than two* wh-words!

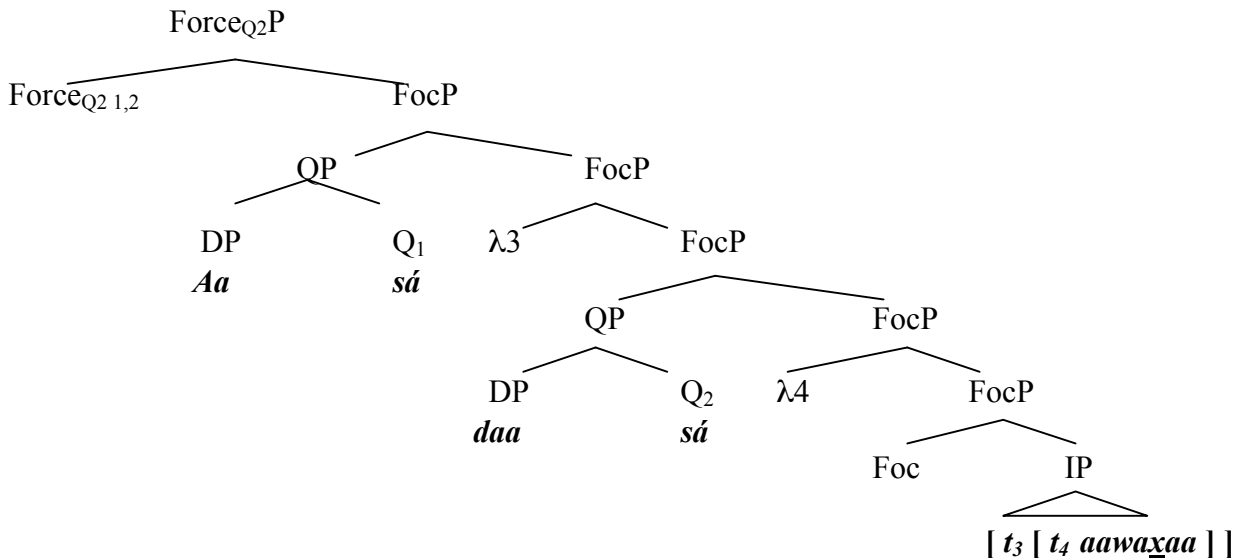
A Reply:

See Cable (2007, to appear) for a discussion of such 'ternary wh-questions'.

- As discussed by Pesetsky (2000), such wh-questions have properties that distinguish them from 'binary wh-questions'.
- Cable (2007, to appear) proposes a separate treatment of 'ternary wh-questions' which captures their unique properties.

(46) **A Quick Sketch of the Semantics of Tlingit Multiple Wh-Questions**

a. Structure (of (44c))



b. Computed Interpretation: $\{ p : \exists f . \exists h . p = f(\{x : x \in \text{human}\}) \text{ ate } h(\{y : y \notin \text{human}\}) \}$

(47) A CRUCIAL PREDICTION

The syntax/semantics proposed above for Tlingit multiple wh-questions accurately predicts that such questions should exhibit Superiority effects.

a. Superiority Effects in Tlingit Multiple Wh-Questions

- (i) Aa sá daa sá aawa_xaa?
who Q what Q ate
Who ate what?
- (ii) (??) Daa sá aa sá aawa_xaa?
what Q who Q ate
(??) *What ate who?*
* *Who ate what?*

b. Prediction of Tlingit Superiority Effects (cf. Richards 2001)

- Given the semantics of Force_{Q2}, it follows that a multiple wh-question in Tlingit must contain multiple Q-particles (one for each wh-word)
- Under the Q-based syntax in (21), the interrogative C head attracts/probes for a Q-particle.
- **Given the standard algorithm for probing, the first Q-particle the interrogative C will encounter will be that associated with the structurally highest wh-word.**
- **Consequently, in a multiple wh-question, the structurally highest wh-word must be the one attracted (first) into the left-periphery of the wh-question...**

4.1.2 Intervention Effects (in Beck 2006)

Since one of the key data we seek to understand relates to the distribution of so-called ‘Intervention effects’, I will here lay out the approach to Intervention effects that we will assume here (Beck 2006)

Recall the following ‘Crucial Observation’, made above in Section 4:

(48) Crucial Observation

- Note that according to the semantics in (34), the Q-particle *only* cares about (*i.e.* takes as argument) the focus-semantic value of its sister (Beck 2006).
- This is quite unlike other well-known focus-sensitive operators, whose meaning requires one to also compute the normal-semantic value of its argument (e.g. “only”)...

Crude, but Illustrative Semantics for *Only*

$$[[\text{only } S]] = [[S]] \ \& \ \forall p \in [[S]]^F : p \neq [[S]] \rightarrow \neg p$$

(49) **Key Stipulation**

- The Q-particle is the *only* focus-sensitive operator not to require computation of the *normal* semantic value of its sister.
- Thus, all focus-sensitive operators *other than Q* require their sisters to have a defined *normal semantic value*.

Combined with our earlier assumption (in (30)) that wh-words do not have normal semantic values (only focus-semantic values), we derive the following crucial prediction:

(50) **The Existence (and Nature) of Intervention Effects (Beck 2006)**

“...the system I have introduced requires a wh-phrase to have as its first c-commanding operator a Q operator.” (Beck 2006; p. 16)

a. Configuration Resulting in an Intervention Effect

[... Q [... Focus-Sensitive Operator [... [wh-word] ...]]]
no Q-particle

- In configurations like (50a), computing the semantic value of the structure requires that one compute the normal-semantic value of the sister to the ‘offending operator’ (see (49))
- However, since there is no Q-particle c-commanding the wh-word in the sister to the offending operator, it follows that one must compute the normal-semantic value of the wh-word itself.
- However, wh-words are assumed not to have normal-semantic values, and therefore the semantic computation fails (crashes).

(51) **Summary of Core Idea**

An ‘Intervention effect’ arises whenever (i) a wh-word W is c-commanded by a focus-sensitive operator OP, and (ii) there is no Q-particle such that OP c-commands Q and Q c-commands W.

Such configurations are ill-formed due to their being uninterpretable.

- OP requires that its sister have a defined normal-semantic value (49)
- The absence of any Q between OP and W entails that OP’s sister *doesn’t* have a normal-semantic value.

Beck (2006) (and Cable (2007, to appear) demonstrate how the prediction in (50)/(51) is able to capture the existence / distribution of Intervention Effects in *wh-in-situ* languages like Korean

We will see presently how this system can also capture Intervention Effects in *wh-fronting* languages like German.

5. Application of the Q-based Semantics to Languages Beyond Tlingit

Thus far, we have developed a compositional semantics for Tlingit wh-questions, one which conforms to the following general picture

(52) General Picture of Tlingit Wh-Questions

Daa sá i éesh al'óon?
 what Q your father hunts
What is your father hunting?

a. Structural Analysis:

[Force_{Q1} [[QP [Daa] sá₁] [2 [i éesh [t₂ al'óon]]]]]

- The wh-word is c-commanded by the Q-particle *sá*, which projects a QP (containing the wh-word)
- The QP projected by *sá* is attracted into the left periphery, where it is c-commanded by the interrogative Force head.

b. Semantic Analysis

[**Force**_{Q1} [[QP [**Daa**] sá₁] [2 [i éesh [t₂ al'óon]]]]] →

{ **p** : ∃**f**. **p** = your father is hunting **f** ({**x**: **x** ∉ **human**}) }

- The sister of the Q-particle (the phrase containing the wh-word) is interpreted as a set. (*i.e.*, the set of focus-alternatives ‘percolated’ up from the F-marked wh-word via ‘point-wise semantic composition’)
- The Q-particle itself is a variable over choice functions, which then takes that set as its argument.
- In a wh-question, the Q-particle *qua variable* is bound by an existential operator introduced by the interrogative Force head.

In this section, we will see:

- (i) How we might extend this semantics of wh-questions to those of English and German.
- (ii) How this semantics might shed new light on the key puzzles surrounding Superiority, Intervention and pied-piping.

5.1 Superiority and Intervention in English

(53) Key, Overarching Question

How can we extend the syntax/semantics of wh-questions in Tlingit to English?

(54) The Solution (Cable 2007, to appear)

We assume that wh-questions in English have *exactly* the structure of their Tlingit counterparts.

The only difference between the two is that the Q-particle pronounced as *sá* in Tlingit is **phonologically empty** in English.

a. Proposed Structure of English Wh-Questions

(i) [Force_{Q1} [[QP [**What**] Ø₁] [2 [did you eat *t*₂]]]] ?

(ii) [Force_{Q1} [[QP [**Whose book**] Ø₁] [2 [did you read *t*₂]]]] ?

(55) Crucial Consequence 1: No Intervention Effects

If we assume that English wh-questions have exactly the structure of their Tlingit counterparts, our system makes the following crucial prediction:

In-situ wh-words in English are not subject to Intervention effects.

- a. Following our semantics for multiple wh-questions in (45)/(46), it follows that in an English multiple wh-question, every wh-word is associated with its own Q-particle.

Structure of English Multiple Wh-Question

(i) Who bought what?

(ii) [Force_{Q2 1,2} [[QP [**Who**] Ø₁] [3 [*t*₃ bought [QP [**what**] Ø₂]]]]] ?

- b. Consequently, since even the *in-situ* wh-word is associated with its own Q-particle, the Intervention effect configuration in (50a) needn't obtain when it is c-commanded by an offending operator.

Structure Illustrating Absence of Intervention Effects in English

(i) Who didn't buy what?

(ii) [Force_{Q2 1,2} [[QP [**Who**] Ø₁] [3 [[*t*₃ didn't buy [QP [**what**] Ø₂]]]]]] ?

*The first operator c-commanding wh-word is Q-particle!
No Intervention Effect Configuration!!*

Generally speaking, the fact that in-situ wh-words in English are locally associated with Q-particles guarantees that the first focus-sensitive operator c-commanding them will always be a Q-particle. Therefore, Intervention Effects will never arise for them!

(56) **Crucial Consequence 2: Superiority Effects**

If we assume that English wh-questions have exactly the structure of their Tlingit counterparts, our system also predicts that multiple wh-questions in English *will* be subject to Superiority effects.

- Such an analysis would entail that English multiple wh-questions always contain multiple Q-particles, one for each wh-word.
- As explained under (47), the necessity of multiple Q-particles in a multiple wh-question entails the existence of Superiority effects (in our Q-based system).

(57) **Summary for English**

If we directly extend our Q-based syntax/semantics for Tlingit wh-questions to English, we correctly predict the following properties of English multiple wh-questions:

- They will exhibit Superiority effects
- *In-situ* wh-words will not be subject to Intervention effects

But what about the complementary set of properties observed to hold in German?...

5.2 Superiority and Intervention in German

(58) **The Core Data to Capture**

We wish to have a unified account of the following two properties of German, both of which distinguish German from English:

a. Intervention Effects for *In-Situ* Wh-Words

- (i) Wer hat Hans **wo** angetroffen?
 who has Hans where met
Who met Hans where?
- (ii) ?? Wer hat niemanden **wo** angetroffen?
 who has nobody where met
Who met nobody where?

b. No Superiority Effects in Multiple Wh-Questions

- | | |
|---|---|
| (i) Wer hat was gekauft?
who has what bought?
<i>Who bought what?</i> | (ii) Was hat wer gekauft?
what has who bought
<i>Who bought what?</i> |
|---|---|

(59) **Observation**

Although multiple wh-questions in Tlingit have multiple Q-particles, in some languages (e.g. Navajo) multiple wh-questions *cannot* have multiple Q-particles.

a. Multiple Wh-Questions in Navajo (cf. (44c))

- (i) * Háí-lá ha'át'íí-lá nayiisnii'?
who-Q what-Q bought
- (ii) Háí-lá ha'át'íí nayiisnii'?
who-Q what bought
Who bought what?

(60) **Core Idea**

The typological difference observed in (59) between Tlingit and Navajo is *exactly* that which distinguishes English from German with respect to their Intervention Effects...

Maybe German is like Navajo: neither allows multiple Q-particles in their multiple wh-questions!!

But, *how* could our Q-based theory allow for such languages, where multiple wh-questions can – and indeed *must* – contain only a single Q-particle?...

... well, it must be some difference in their inventory of interrogative C heads...

(61) **Proposal: The ' $Force_{Q+}$ ' Head**

German (Navajo) lacks the ' $Force_{Q_2}$ ' head of English (Tlingit)
Instead, it has a separate head for multiple wh-questions: $Force_{Q+}$

a. Key Properties of $Force_{Q+}$

- (i) Unlike $Force_{Q_2}$, $Force_{Q+}$ only bears a single index
- (ii) Consequently, following the explicit semantics below, $Force_{Q+}$ is only able to bind a *single* choice-function variable.

b. Semantics of $Force_{Q+}$

$$[[Force_{Q+i} \text{ XP}]]^g = \{ p : \exists f. \exists h . p = h ([XP]]^{f \circ g(i/f)} \}$$

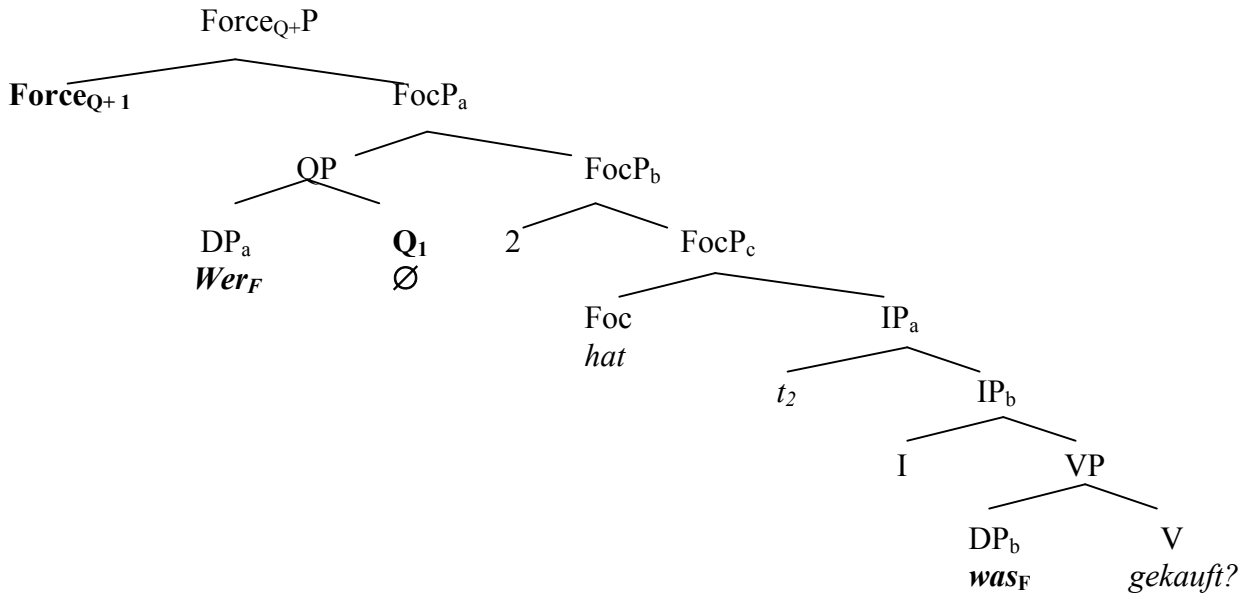
- (i) Although $Force_{Q+}$ only binds a single choice-function variable, its lexical entry exhibits quantification over *two* choice function variables, ***one of which is contributed by the $Force_{Q+}$ head itself!***

The following illustrates how this system analyzes German multiple wh-questions.

(62) **Multiple Wh-Questions in German (with Force_{Q+})**

- a. Sentence: Wer hat was gekauft?
 who has what bought?
Who bought what?

- b. Structure:



- c. Computed Interpretation (see Cable (2007, to appear) for derivation):

$$\{ p : \exists f . \exists h . p = h (\{ q : \exists y \notin \text{human} \ \& \ q = f (\{ x : x \in \text{human} \}) \text{ bought } y \}) \}$$

*The set of propositions p such that there are some choice functions f and h such that:
 p is the proposition you get by applying h to the following set of propositions:
 those propositions q such that there is some non-human y such that
 q is the proposition that f applied to the set of humans bought y.*

The formula in (62c) is comparatively ‘complex’, but Cable (2007, to appear) demonstrates that it is equivalent to the following formula, which is commonly taken to represent the meaning of (62a).

(63) **Formula Equivalent to (62c)**

$$\{ p : \exists x \in \text{human} . \exists y \notin \text{human} . p = x \text{ bought } y \}$$

Thus, we find that this treatment of German multiple wh-questions will correctly assign such structures the correct interpretation.

(63) **Notable Result**

As per the ‘Core Idea’ in (60), multiple wh-questions in German will never have multiple QPs!

- The semantics in (61b) entails that ‘Force_{Q+}’ can only ever bind one choice function variable.
- Therefore, only one Q-particle can ever be bound by ‘Force_{Q+}’.
- Therefore, in a *German* multiple wh-question, there will *never* be multiple QPs.

(64) **Critical Result**

Given the ‘Notable Result’ in (63), our Q-based semantics for German multiple wh-questions predicts both the following properties of such questions:

- a. In-situ wh-words in German multiple wh-questions are subject to Intervention Effects
- b. Multiple wh-questions in German are not subject to Superiority Effects

(65) **Single QPs in Multiple Wh-Questions Predicts No Superiority Effects**

Assuming that there are no constraints regarding *which* wh-word its sole Q-particle c-commands, a German multiple wh-question should be able to exhibit both ‘Superiority-satisfying’ and ‘Superiority-violating’ orders!

a. Derivation of Superiority-Satisfying Order

- (i) *Sentence:* Wer hat was gekauft?
who has what bought?
Who bought what?

- (ii) *Structure:* [Force_{Q+}_i [wer Q_i]_i hat [t_i was gekauft]]

b. Derivation of Superiority-Violating Order

- (i) *Sentence:* Was hat wer gekauft?
what has who bought
Who bought what?

- (ii) *Structure:* [Force_{Q+}_i [was Q_i]_i hat [wer t_i gekauft]]

Note that, under this analysis, neither structure truly violates ‘Superiority’ (i.e. ‘Attract Closest’), since both contain only a single Q-particle!

Recall the following central assumption regarding Intervention effects:

(66) **Configuration Resulting in an Intervention Effect (Beck 2006)**

An ‘Intervention effect’ arises whenever (i) a wh-word W is c-commanded by a focus-sensitive operator OP, and (ii) there is no Q-particle such that OP c-commands Q and Q c-commands W.

[... Q [... Focus-Sensitive Operator [... [wh-word] ...]]]
no Q-particle

(67) **Single QPs in Multiple Wh-Questions Predicts Intervention Effects with *In-Situ* Wh-Words**

As the structures in (62) and (65) illustrate, under our analysis, the *in-situ* wh-word of a German wh-question *does not* have its own, associated Q-particle.

This means, then, that in a sentence where the in-situ wh-word is c-commanded by an ‘offending operator’, a configuration of the form in (66) results!

a. Structure of an Intervention Effect in German³

[_{QP} Wer Ø]_i hat niemanden _{t_i} wo angetroffen?
who Q has nobody where met

Intervention Effect Configuration

In short, because German multiple wh-questions can only have one Q-particle, *in-situ* wh-words in German do not have associated Q-particles.

For this reason, if they are *ever* c-commanded by ‘offending operators’, a configuration of the kind in (66) is created, and an ‘Intervention Effect’ results.

(68) **Summary for German**

If we assume that the basic difference between German and English is that *multiple wh-questions in German can contain only a single Q-particle* (cf. Tlingit vs. Navajo), then we predict the following properties of those German questions:

- They will not exhibit Superiority effects
- *In-situ* wh-words will be subject to Intervention effects

³ Note that our account of Intervention effects in German shares with Beck (2006) the assumption that negation (and other ‘offending operators’) are in some way focus-sensitive.

(69) **General Summary**

If we assume that ‘Force_Q’, ‘Force_{Q2}’ and ‘Force_{Q+}’ are the only three interrogative force heads that human languages can have, then we predict the following relationship between Superiority effects and Intervention effects:

a. Targeted Generalization (Pesetsky 2000)

A multiple wh-question will exhibit Intervention Effects *iff* that multiple wh-question *does not* exhibit Superiority Effects.

In the final section of this talk, we will turn our attention to an additional result concerning Intervention effects and ‘pied-piping’...

5.3 Intervention Effects in Pied-Piping

First, recall that in our proposed Q-based syntax, a structure with “pied-piping” is simply one where the Q-particle takes as sister a phrase properly containing the wh-word.

(70) **‘Pied-Piping’ Structures as Cases Where the Sister of Q Properly Contains the Wh-Word**

- a. *Sentence:* Whose father’s cousin’s uncle did you meet?
- b. *Structure:* [QP [[[**Whose**] father’s] cousin’s] uncle] **Q**] did you meet?

(71) **Key Consequence: Intervention Effects in Pied-Piped Phrases**

If we combine the Q-based theory of pied-piping structures in (69) *with the theory of Intervention effects from Beck (2006)*, we make the following prediction:

a. Intervention Effects in Pied-Piped Phrases

An Intervention Effect arises if a “pied-piping” wh-word is c-commanded by an offending operator *inside* the pied-piped constituent

[[QP [... Offending Operator ... [wh-word] ...] Q]₁ [... t_I ...]]

Intervention Effect Configuration!

- Internal to the pied-piped phrase, there is no Q-particle c-commanding the wh-word
- Consequently, if ever an ‘offending operator’ were to c-command a ‘pied-piping’ wh-word *internal* to the pied-piped phrase, an ‘Intervention effect’ configuration of the type in (66) would result.

But is this prediction true?...

Sauerland & Heck (2003) independently report that this prediction holds for wh-questions in German.

(72) **Intervention Effects in German Pied-Piping**

- a. Fritz möchte wissen [ein **wie** schnelles Motorrad] du fahren darfst.
Fritz wants to.know a how fast motorbike you drive may
Fritz would like to know how fast a motorbike you are allowed to drive.
- b. * Fritz möchte wissen [kein **wie** schnelles Motorrad] du fahren darfst.
Fritz wants to.know no how fast motorbike you drive may

In Cable (2007, to appear), I demonstrate that this prediction is also born out for English.

(73) **Intervention Effects in English Pied-Piping**

- a. (?) [A picture of which president] does Jim own?
- b. [Which president] does Jim own a picture of?
- c. * [No picture of which president] does Jim own?
- d. [Which president]₁ does Jim own [no pictures of *t*₁]?
- e. * [Only PICTURES of which president] does Jim own?
- f. [Which president]₁ does Jim own [only PICTURES of *t*₁]?

(74) **Further Key Prediction**

- The prediction in (71) that “pied-piping” wh-words should be subject to Intervention Effects does not depend on any properties of the language’s multiple wh-questions.
- Consequently, this fact is predicted to be independent of whether *in-situ* wh-words are subject to Intervention Effects. **Thus, it is a fact (correctly) predicted to hold *both* for German and English.**

6. **Conclusion**

(75) **What We’ve Seen**

- The form of wh-questions in Tlingit motivates a novel semantics for its wh-questions, one in which the meaning of the wh-question arises from the interplay between *three* key characters:
 - (a) The wh-word (denotes a set of alternatives)
 - (b) The interrogative C head (introduces existential force)
 - (c) **The Q-particle** (variable over choice functions, bound by C)
- **This semantics for wh-questions is not necessarily peculiar to Tlingit!**

When extended to other, more widely studied languages, it can provide a new perspective on long-standing puzzles surrounding wh-constructions in those languages.

A Concluding Observation:

When linguists are asked to explain the importance of research into endangered and understudied languages, it is often recognized that the study of these languages advances linguistic theory by providing novel evidence to help adjudicate between competing analyses that may otherwise be difficult to empirically distinguish.

In this way, careful documentation of endangered languages serves to ‘broaden the empirical database’ that theories of language must cover, and thereby shrinks the field of competing analyses.

However, it is often overlooked that the study of these languages can also serve to introduce new analyses, ones that may offer entirely new approaches and perspectives to older, seemingly settled issues.

That is, rather than shrink ‘the marketplace of analyses’, careful study of these languages can reveal that the current marketplace is *too narrow*, and fails to include hypotheses that would have otherwise never been imagined for more well-studied languages.

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