

# The scope of alternatives: Indefinites and islands

Simon Charlow (Rutgers)

UCSD Semantics Babble      June 1, 2017

# Overview

## Alternatives

**Alternatives** are useful for many things semanticists like to think about:

- ▶ Questions denote sets of their possible answers:

$$\llbracket \text{who left?} \rrbracket = \{ \mathbf{left} x \mid \mathbf{human} x \}$$

- ▶ Prosodic focus invokes things the speaker could have said:

$$\llbracket \text{BOB left} \rrbracket_f = \{ \mathbf{left} x \mid x \in \llbracket \text{BOB} \rrbracket_f \}$$

- ▶ And scalar items conjure up alternative utterances:

$$\llbracket \text{someone left} \rrbracket_s = \{ f \mathbf{left} \mid f \in \llbracket \text{someone} \rrbracket_s \}$$

## Alternative semantics

Alternative *semantics* (Hamblin 1973, Rooth 1985) is useful, too:

- ▶ It's one way (among others) to derive alternatives.
- ▶ Principally, though, it's a *pseudo-scope mechanism*, used to get semantic action at a distance without island-violating movement.

# This talk

A couple approaches to alternatives:

- ▶ Scope-based (Karttunen 1977)
- ▶ Alternative-semantic (Hamblin 1973, Rooth 1985)

I'll sketch a scope-based theory that (unlike the above) explains:

- ▶ Island insensitivity
- ▶ Selectivity outside islands
- ▶ Interactions of alternatives and binding

Maybe the most satisfying bit: the theory uses tools that were under our noses the whole time (i.e., in the questions lit post-Karttunen 1977).

Alternatives via scope

## Two key ingredients (Karttunen 1977)

**First ingredient:** a way to conjure alternative-typed things from the æther.

$$\eta :: \mathbf{t} \rightarrow \mathbf{S t}$$
$$\eta := \lambda p. \{p\}$$

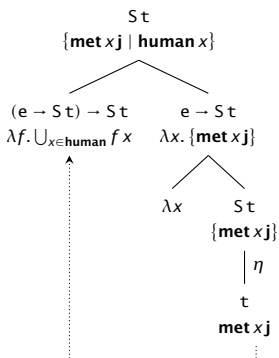
**Second ingredient:** meanings that can scope over alternatives.

$$\text{who} :: (\mathbf{e} \rightarrow \mathbf{S t}) \rightarrow \mathbf{S t}$$
$$\llbracket \text{who} \rrbracket = \lambda f. \bigcup_{x \in \text{human}} f x$$

[I write ‘ $\mathbf{t}$ ’ for the type of propositions, and ‘ $\mathbf{S}a$ ’ for the type of (the characteristic function of) a set of  $a$ ’s. I’ll only make explicit reference to worlds and assignments when absolutely necessary.]

## A basic Karttunen-esque derivation

Here, we derive a meaning for *John met who?*



As with quantification, *scope-taking* is a crucial part of the story.



## Generalizing the approach

Some like alternatives for indefinites (e.g., Kratzer & Shimoyama 2002):

$$\llbracket \text{John saw a linguist} \rrbracket = \{\mathbf{saw} \ x \mathbf{j} \mid \mathbf{ling} \ x\}$$

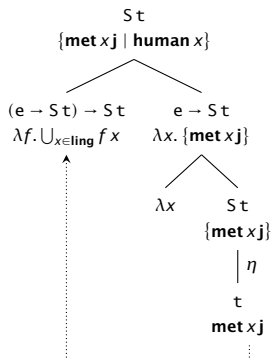
No problem! We can generalize the scopal account (Heim 2000):

$$\begin{array}{ll} \eta \ :: \ a \rightarrow S a & \text{a linguist} \ :: \ (e \rightarrow S a) \rightarrow S a \\ \llbracket \eta \rrbracket = \lambda x. \{x\} & \llbracket \text{a linguist} \rrbracket = \lambda f. \bigcup_{x \in \mathbf{ling}} f \ x \end{array}$$

[I've also generalized the types here, which will allow *a linguist* to induce sets of alternative individuals, alternative VP meanings, etc.]

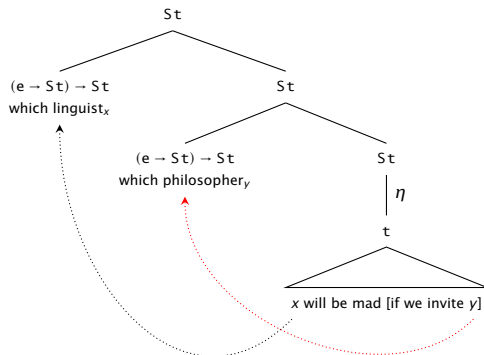
## Indefinites inducing alternatives

Here, we derive a meaning for *John met a linguist*.



[Notice that we don't want to commit ourselves to thinking of declarative sentences with indefinites and questions as *precisely* the same sort of object.]

## Issue #1: islands

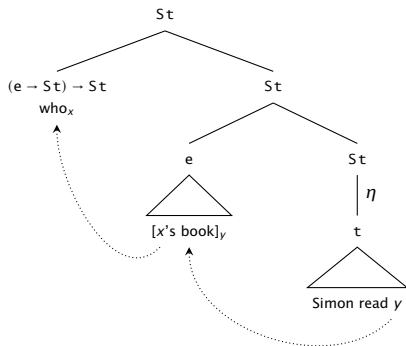


Composes (and gets the right meaning), but has [island]-violating scoping of *which philosopher* (e.g., Huang 1982, Dayal 1996, Reinhart 1998).

## Island-insubordination, more generally:

- 1. Exceptionally scoping indefinites:** (Our focus today)  
If [a rich relative of mine dies] I'll inherit a house.
- 2. Indeterminate pronouns:**  
[[Dono hon-o yonda] kodomo]-mo yoku nemutta.  
which book-acc read child mo well slept  
'For every book x, the child who read x slept well.'
- 3. Association with focus:**  
John only gripes when [MARY leaves the lights on].
- 4. Supplemental content:**  
John gripes when [Mary, a talented linguist, leaves the lights on].
- 5. Presupposition projection:**  
John gripes when [the King of France leaves the lights on].

## Issue #2: pied piping



This composes just fine, but allows only answers like *I read 'Emma'* (e.g., von Stechow 1996, Hagstrom 1998, Sternefeld 2001, Cable 2010):

$$\{\lambda w. \text{read}_w(\text{the-book-of}_@x) s \mid x \in \text{human}_@\}$$

↑  
should be w!

## Alternative semantics

# Basics

First ingredient: all meanings are sets.

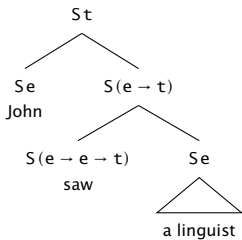
John :: Se            met :: S(e → e → t)  
[[John]] = {**j**}        [[met]] = {**met**}

a linguist :: Se  
[[a linguist]] = {x | **ling** x}

Second ingredient: meaning combination is *pointwise* application.

$[[A B]] = \{f x \mid f \in [[A], x \in [[B]]\}$

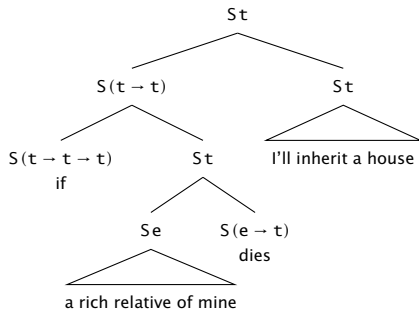
## A simple example: alternatives without movement



= {**saw** xj | **ling** x}



## Island-escaping behavior, without movement



= { **if (dies x) house | relative x** }

## Issue #1: selectivity outside islands

When two alternative-inducing expressions live on island, they can take scope in different ways outside the island:

1. If [a phenomenal lawyer<sub>l</sub> visits a filthy rich relative of mine<sub>r</sub>], I'll inherit a fortune.  $(\exists_{l,r} \gg \text{if}, \exists_l \gg \text{if} \gg \exists_r, \exists_r \gg \text{if} \gg \exists_l)$

No go in alternative semantics! The meaning for the [island] (below) doesn't have enough structure to distinguish lawyers and relatives. So there's no way to percolate one, but not the other, over the conditional.

{**visits**  $x y$  | **lawyer**  $y$ , **relative**  $x$ }

[Because scope-based approaches have trouble with islands, they *a fortiori* have a hard time with selectivity outside islands.]

## Selectivity, more generally

Like exceptional scope behavior, selective exceptional scope is at least somewhat general:

1. [JOHN only gripes when [MARY leaves the lights on]]<sub>C</sub>, and  
[MARY **only** gripes when [JOHN leaves the lights on]] ~**C**.  
(see Rooth 1996, Wold 1996, Krifka 1991, 2006, Charlow 2014)

[Interestingly, there's some data that seems to go against selectivity, as discussed by, e.g., Kratzer & Shimoyama (2002) (see also Beck 2006). Feel free to ask me about it.]

## Issue #2: binding

Binding in a standard semantics, *sans* alternatives:

$$\llbracket A_i B \rrbracket^g = \llbracket A \rrbracket^g (\lambda x. \llbracket B \rrbracket^{g^{i-x}})$$

Binding in alternative semantics is problematic (Poesio 1996, Shan 2004):

$$\llbracket A_i B \rrbracket^g = \{fg \mid f \in \llbracket A \rrbracket^g, g \in \underbrace{???}\}$$

Needs to be a set of functions:  $\{\lambda x. \dots \underbrace{\llbracket B \rrbracket^{g^{i-x}}}_{\text{Already a set!}}\}$

[Both of these “rules” should have a symmetric alternative that treats  $A$  as the argument.]

A theory

## Predicative uses of indefinites

One of the basic uses of indefinites is in predicative position:

1. I'm a linguist.
2. Mary considers John a linguist.

Two possibilities for the basic meaning of indefinites — on the left, as a set of individuals (i.e., a predicate); on the right, as a GQ:

$$\llbracket \text{a linguist} \rrbracket = \{x \mid \mathbf{ling} x\}$$

type:  $S_e$

$$\llbracket \text{a linguist} \rrbracket = \lambda f. \exists x \in \mathbf{ling} : f x$$

type:  $(e \rightarrow t) \rightarrow t$

No matter which you choose, you need a mapping from one to the other!

## The predicative use as basic

Let's suppose for concreteness that the predicative use of indefinites is basic (nothing much turns on this). What's the mapping into GQs?

## The predicative use as basic

Let's suppose for concreteness that the predicative use of indefinites is basic (nothing much turns on this). What's the mapping into GQs?

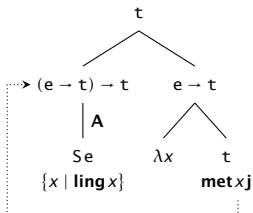
$$\mathbf{A}m := \lambda f. \exists x \in m : f x$$

[If treating the GQ use as basic, the relevant mapping is  $\mathbf{BE}Q := \{x \mid \{x\} \in Q\}$ .]



## A basic derivation

Here, we derive *John met a linguist*:



The result, as expected:  $\exists x \in \mathbf{ling} : \mathbf{met} x j$ .

## An observation

There is an interesting interaction between  $\mathbf{A}$  and the  $\eta$  operation for alternative sets (i.e., such that  $\eta x = \{x\}$ ).

$$\mathbf{A}(\eta x)$$

## An observation

There is an interesting interaction between **A** and the  $\eta$  operation for alternative sets (i.e., such that  $\eta x = \{x\}$ ).

$$\mathbf{A}(\eta x) = \lambda f. \exists y \in \{x\} : f y$$

## An observation

There is an interesting interaction between **A** and the  $\eta$  operation for alternative sets (i.e., such that  $\eta x = \{x\}$ ).

$$\begin{aligned}\mathbf{A}(\eta x) &= \lambda f. \exists y \in \{x\} : f y \\ &= \lambda f. f x\end{aligned}$$

Do you recognize this?

## An observation

There is an interesting interaction between **A** and the  $\eta$  operation for alternative sets (i.e., such that  $\eta x = \{x\}$ ).

$$\begin{aligned}\mathbf{A}(\eta x) &= \lambda f. \exists y \in \{x\} : f y \\ &= \lambda f. f x\end{aligned}$$

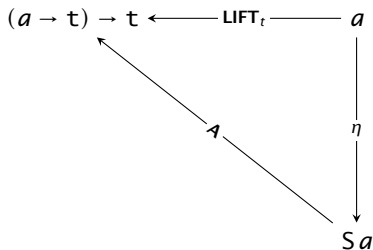
Do you recognize this? Sure, it's just Partee's (1986) **LIFT** operation, applied to  $x$ ! In other words, **A** and  $\eta$  amount to a *decomposition* of **LIFT**!

$$\mathbf{A} \circ \eta = \mathbf{LIFT}$$

$$[f \circ g := \lambda x. f(gx)]$$

## Partee (1986) triangle

This can all be summed up with the famous Partee triangle:



This diagram **commutes**: where there exist multiple paths between two nodes, those paths are *equivalent* (which just amounts to  $A \circ \eta = \text{LIFT}$ ).

## A modular vignette

Cresti (1995: 96), fn17 mentions an interesting possibility:

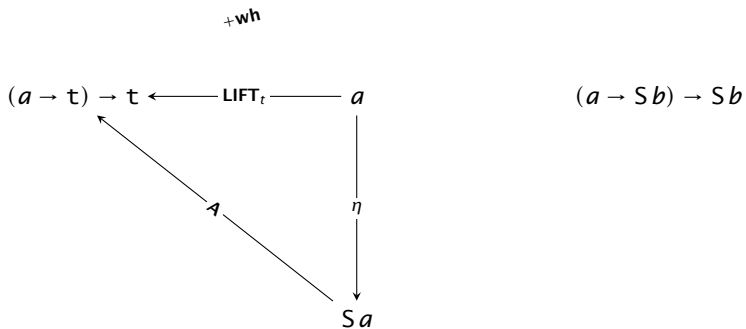
<sup>17</sup> To be more explicit, we can imagine a *wh*-phrase as composed of an indefinite and a [+WH] component. So for instance, the meaning of *who* would be “some person *x* has property **P**” with [+WH] applied to it. In other words: ‘ $\lambda P \exists x[\text{person}(x) \wedge P(x)]$ ’, and ‘[+WH]  $\leadsto \lambda U \lambda W \lambda p[U(\lambda u.W(u)(p))]$ ’. So [+WH] applied to “some person . . .” is ‘ $\lambda U \lambda W \lambda p[U(\lambda u.W(u)(p))] (\lambda P \exists x[\text{person}(x) \wedge P(x)])$ ’ = ‘ $\lambda W \lambda p \exists x[\text{person}(x) \wedge W(x)(p)]$ ’, as in (39).

In more familiar set-theoretic terms:

$$\begin{aligned} +wh &:: ((e \rightarrow t) \rightarrow t) \rightarrow (e \rightarrow St) \rightarrow St \\ +wh &:= \lambda Q. \lambda f. \{y \mid Q(\lambda x. y \in f x)\} \end{aligned}$$

[In fact, this mapping from GQs into things that can scope over sets was already in Karttunen, but as a composition rule.]

## Adding to the Partee (1986) triangle



[The diagram still commutes! Exercise: verify this.]



## My proposal: shift sets instead of GQs

That is, replace [+WH] with  $\gg$ , defined as follows ( $\eta$  is unchanged!):

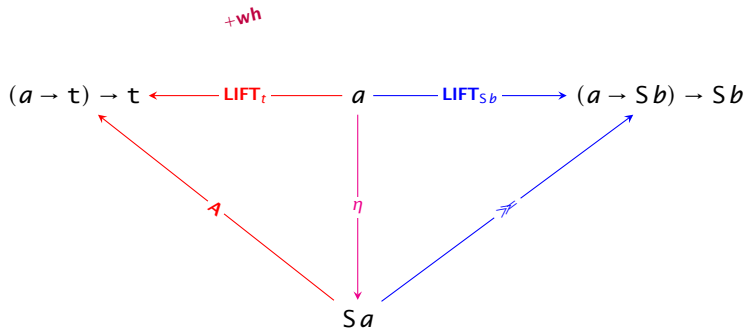
$$\begin{array}{ll} \eta :: a \rightarrow Sa & \gg :: Sa \rightarrow (a \rightarrow Sb) \rightarrow Sb \\ \llbracket \eta \rrbracket = \lambda x. \{x\} & \llbracket \gg \rrbracket = \lambda m. \lambda f. \bigcup_{x \in m} f x \end{array}$$

The  $\gg$  shifter just maps sets into Karttunen's scopal meanings:

$$\{x \mid \mathbf{ling} x\}^{\gg} = \lambda f. \bigcup_{\mathbf{ling} x} f x$$

[Notice that Cresti's [+WH] analysis actually allows us to generate strange denotations like  $\lambda p. \neg \exists x. \mathbf{human} x \wedge p = \mathbf{saw} x j$ . This is a (weak) argument that applying  $\gg$  to sets rather than GQs might be preferable. Stronger arguments TK.]

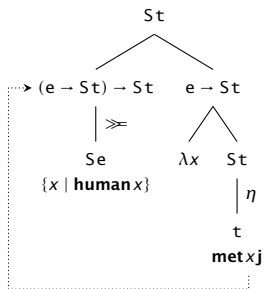
## The Partee (1986) triangle++



## A simple case, with a familiar derivation

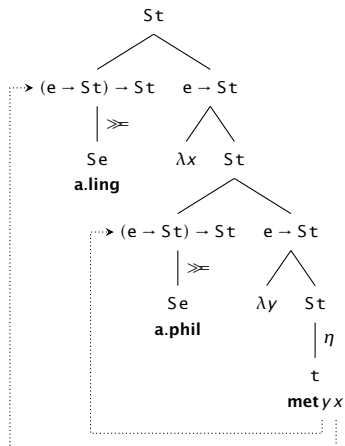
$$\eta :: a \rightarrow Sa \quad \ggg :: Sa \rightarrow (a \rightarrow Sb) \rightarrow Sb$$

$$[[\eta]] = \lambda x. \{x\} \quad [[\ggg]] = \lambda m. \lambda f. \bigcup_{x \in m} mx$$



$$= \{\mathbf{see} xj \mid \mathbf{ling} x\}$$

## Two sources of alternatives



$$= \{ \mathbf{met y x} \mid x \in \mathbf{ling}, y \in \mathbf{phil} \}$$

## Some more facts about these operations

Like  $\eta$  and  $\mathbf{A}$ ,  $\eta$  and  $\gg$  form a decomposition of LIFT (e.g., Partee 1986):

$$(\eta x)^{\gg} \equiv \lambda f. f x$$

More generally, together they comprise something known as a monad (e.g., Shan 2002, Giorgolo & Asudeh 2012, Unger 2012, Charlow 2014).

- ▶ Monads are *really* useful when you want “fancy” things (like sets of alternatives) to interact with the function-argument Fregean bread-and-butter of compositional semantics.

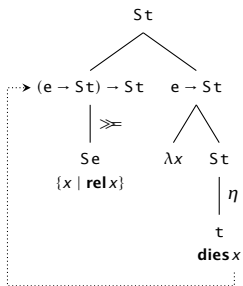
# Islands

## Islands?

Because the theory is oriented around scope, islands seem problematic.

*But they're not!* We can apply  $\gg$  to *any* set of alternatives!

## Scoping the island



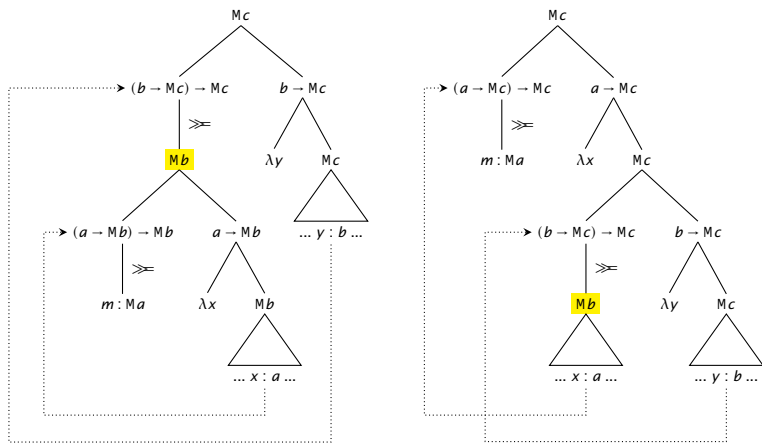
$$= \{\mathbf{dies} x \mid \mathbf{rel} x\}$$





## Islands more generally:

For any monadic type constructor  $M$ , Left  $\equiv$  Right.



It's as if  $m$  had scoped out of the **island**, without actually doing so!

## Pied-piping the island: Bavarian German

Heck (2008), citing Felix (1983):

1. Das ist die Frau, [die<sub>i</sub> wenn du t<sub>i</sub> heiratest] bist du verrückt.  
this is the woman who if you marry are you crazy  
'This is the woman that you are crazy if you marry her.'
2. \*Das ist die Frau, die<sub>i</sub> du verrückt bist [wenn du t<sub>i</sub> heiratest].  
this is the woman who you crazy are if you marry

[Is this contrast replicated in English?]

## Finnish

The situation is even more striking in Finnish (Huhmarniemi 2012). Here is the canonical word order when you modify a VP with a PP (V-P-Obj):

1. Pekka näki Merjan [kävellessään [kohti puistoa]].  
Pekka saw Merjan walk towards park  
'Pekka saw Merja when he was walking towards a/the park.'

But here is how it looks when you try to form a with the Obj:

2. [[Mitä<sub>i</sub> kohti t<sub>i</sub>]<sub>j</sub> kävellessään t<sub>j</sub>]<sub>k</sub> Pekka näki Merjan t<sub>k</sub>?  
What towards walk Pekka saw Merjan  
'What was Pekka walking towards when he saw Merja?'

You get the mirror-image word order!

## This kind of movement, generally

Is called **roll-up** or (even better) **snowballing** pied-piping.

Overt and scopal (covert) forms of it are appealed for a variety of languages. We've already seen Bavarian German and Finnish.

Other examples include Gbe (overt, Aboh 2004), French (covert, Moritz & Valois 1994), and DP-internal word order (overt, Cinque 2005).

## Higher-order meanings and selectivity

## Data: selectivity

Indefinites on an island take scope **in different ways** outside the island:

1. If [a persuasive lawyer visits a relative of mine], I'll inherit a house.

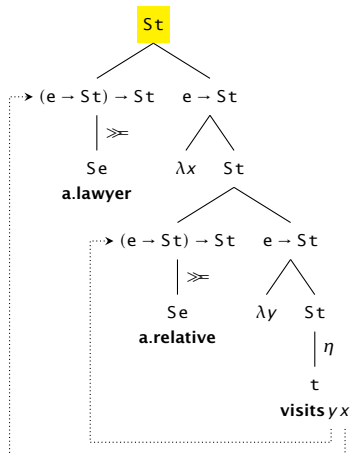
$\checkmark \exists_{\text{lawyer}} \gg \mathbf{if} \gg \exists_{\text{relative}}, \checkmark \exists_{\text{relative}} \gg \mathbf{if} \gg \exists_{\text{lawyer}},$   
 $\checkmark \exists_{\text{lawyer}} \gg \exists_{\text{relative}} \gg \mathbf{if}$

2. Every grad would be overjoyed if [some paper on indefinites was discussed in a popular grad seminar being offered this term].

$\checkmark \exists_{\text{seminar}} \gg \forall \gg \exists_{\text{paper}} \gg \mathbf{if}$

Indeed, such behavior seems to be essentially presupposed (if not directly argued for) by the dominant accounts of exceptionally scoping indefinites (cf. Reinhart 1997, Brasoveanu & Farkas 2011).

## Building the island...



$$= \{\mathbf{visits } yx \mid \mathbf{lawyer } x, \mathbf{relative } y\}$$



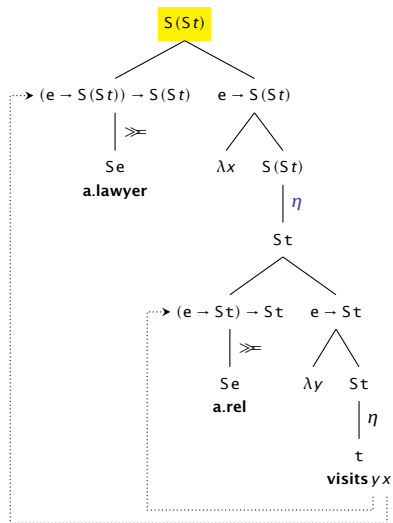
## Executing our old exceptional scope trick. . .

$$\begin{aligned}\{\mathbf{visits} \ yx \mid \mathbf{lawyer} \ x, \mathbf{relative} \ y\}^{\gg} &= \lambda f. \bigcup_{p \in \{\mathbf{visits} \ yx \mid \mathbf{lawyer} \ x, \mathbf{relative} \ y\}} f \ p \\ &= \lambda f. \bigcup_{\mathbf{lawyer} \ x, \mathbf{relative} \ y} f (\mathbf{visits} \ yx)\end{aligned}$$

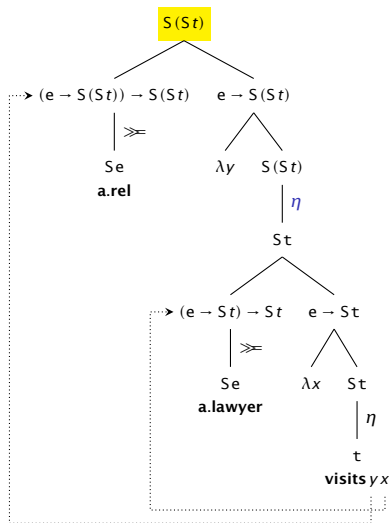
Oops. . . Looks like we've given *both* indefinites scope out of the island.

- ▶ Certainly, this is a possible reading (so, no over-generation)
- ▶ But it's not the *only* reading (so, under-generation)

# Building higher-order meanings



$$= \{ \{ \text{visits } yx \mid \text{rel } y \} \mid \text{lawyer } x \}$$



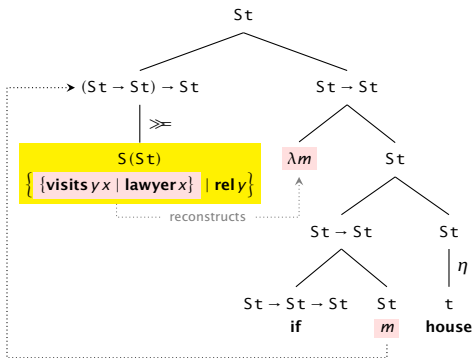
$$= \{ \{ \text{visits } yx \mid \text{lawyer } x \} \mid \text{rel } y \}$$

## Higher-order meanings

If the lawyers are  $L_1$  and  $L_2$  and the relatives are  $R_1$  and  $R_2$ , these higher-order sets amount to the following:

$$\left\{ \left\{ \mathbf{visits} R_1 L_1, \mathbf{visits} R_2 L_1 \right\}, \left\{ \mathbf{visits} R_1 L_2, \mathbf{visits} R_2 L_2 \right\} \right\} \quad \left\{ \left\{ \mathbf{visits} R_1 L_1, \mathbf{visits} R_1 L_2 \right\}, \left\{ \mathbf{visits} R_2 L_1, \mathbf{visits} R_2 L_2 \right\} \right\}$$

## An exceptional scope derivation



$$= \{\mathbf{if} (\exists x \in \mathbf{lawyer} : \mathbf{visits} \ yx) \mathbf{house} \mid \mathbf{rel} \ y\}$$

## Generalized selectivity

Reminder: selectivity is also characteristic of association w/focus:

1. [JOHN only gripes when [MARY leaves the lights on]]<sub>C</sub>, and  
[MARY **only** gripes when [JOHN leaves the lights on]] ~<sub>C</sub>.  
(see Rooth 1996, Wold 1996, Krifka 1991, 2006, Charlow 2014)

Our theory generalizes to such cases (focus can be treated monadically).

## Summing up

We've learned that using  $\eta$  and  $\gg$  lets us exert a lot of control over which pieces of the island are evaluated where.

Using higher-order meanings (which come for free!) we can distinguish different layers of indefinite-ness, in a way that allows different indefinites on an island to be distinguished outside the island.

# Binding

## Basic data

Consider the wide-scope indefinite reading of the following:

1. Every linguist<sub>*i*</sub> is overjoyed [whenever a world-famous expert on indefinites cites her<sub>*i*</sub>]. ( $\exists \gg \forall$ )

There's a puzzle here: if the [island] scopes over *every linguist*, how can the quantifier bind *her*?



## A slight tweak

Simply moving explicit reference to assignments into the semantics allows for *binding reconstruction* (Sternefeld 1998):

$$\begin{array}{ll} \eta \quad :: \quad a \rightarrow \mathbb{M}a & \gg \quad :: \quad \mathbb{M}a \rightarrow (a \rightarrow \mathbb{M}b) \rightarrow \mathbb{M}b \\ \llbracket \eta \rrbracket = \lambda x. \lambda g. \{x\} & \llbracket \gg \rrbracket = \lambda m. \lambda f. \lambda g. \bigcup_{x \in mg} mxg \end{array}$$

$$\mathbb{M}a ::= g \rightarrow Sa$$

[See Kobele 2010, Kennedy 2014, and indeed the entire the dynamic-semantics literature (e.g., Barwise 1987, Groenendijk & Stokhof 1991, Muskens 1996) for independent motivation for assignment-sensitivity as a first-class part of semantic denotations.]

## Rounding out the picture

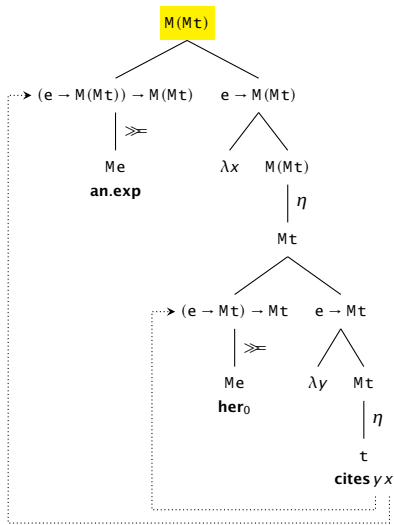
Meanings for indefinites:

$$\mathbf{a.ling} := \lambda g. \{x \mid \mathbf{ling} x\}$$

Meanings for pronouns:

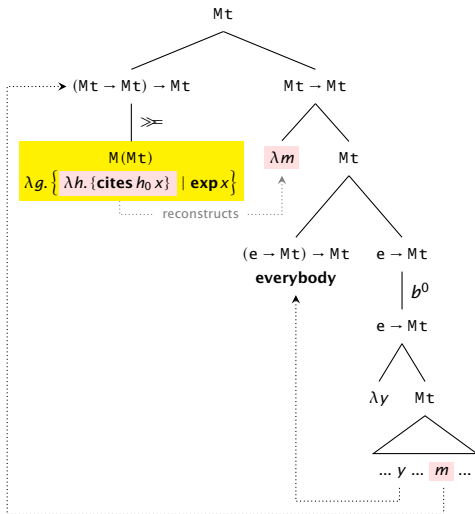
$$\mathbf{she}_0 := \lambda g. \{g_0\}$$

# An example



$\rightsquigarrow \lambda g. \{ \lambda h. \{ \mathbf{cites} \ h_0 \ x \} \mid \mathbf{expert} \ x \}$

# Higher-order derivations



## A general account of pied piping!

So we've got a fully general account of covert pied-piping, one which allows a fine degree of control over where different things on an island are evaluated, within a restrictive theory of syntax-semantics interface.

Extends immediately to *overt* pied-piping, as well.

## Binding

Because everything is put together with functional application (like any scopal theory of alternatives), there's no need to say anything special about binding (cf. problems for alternative semantics).

At the same time, we have a full account of island-escaping readings.

Concluding

## Summing up

Semantics with alternatives and alternative semantics are different things.

- ▶ While we understand very well how to use scope to do composition with alternatives (and have for some time), what's been missing is an account that explains **island-insensitivity**, too.
- ▶ The current best theory of island-escaping readings, alternative semantics, has some lacunae (principally, **selectivity and binding**).

I tried to show that we don't have to make any compromises.

- ▶ If we begin with our gold-standard theory of questions and then simply **break off**  $\gg$  **from** **[[who]]**, we have a complete theory!
- ▶ A more general (and independently motivated) treatment of assignment-sensitivity completes the picture, allowing **binding reconstruction and (c)overt pied-piping**.



## Something I didn't discuss

On the last slide, I called alternative semantics “our current best theory of island-escaping readings”.

Proponents of *choice-functional* analyses (e.g., Reinhart 1997, Winter 1997, Kratzer 1998, Chierchia 2001, a.o.) might be surprised by this.

In fact, we improve on choice-functional analyses. Feel free to ask more.

- Aboh, Enoch O. 2004. Snowballing movement and generalized pied-piping. In Anne Breitbarth & Henk van Riemsdijk (eds.), *Triggers*. Berlin, Boston: Mouton de Gruyter.  
<http://dx.doi.org/10.1515/9783110197433.15>.
- Barwise, Jon. 1987. Noun phrases, generalized quantifiers, and anaphora. In Peter Gärdenfors (ed.), *Generalized Quantifiers*, 1-29. Dordrecht: Reidel.  
[http://dx.doi.org/10.1007/978-94-009-3381-1\\_1](http://dx.doi.org/10.1007/978-94-009-3381-1_1).
- Beck, Sigrid. 2006. Intervention effects follow from focus interpretation. *Natural Language Semantics* 14(1). 1-56. <http://dx.doi.org/10.1007/s11050-005-4532-y>.
- Brasoveanu, Adrian & Donka F. Farkas. 2011. How indefinites choose their scope. *Linguistics and Philosophy* 34(1). 1-55. <http://dx.doi.org/10.1007/s10988-011-9092-7>.
- Cable, Seth. 2010. *The grammar of Q: Q-particles, wh-movement, and pied piping*. Oxford: Oxford University Press. <http://dx.doi.org/10.1093/acprof:oso/9780195392265.001.0001>.
- Charlow, Simon. 2014. *On the semantics of exceptional scope*. New York University Ph.D. thesis.  
<http://semanticsarchive.net/Archive/2JmMWRjY/>.
- Chierchia, Gennaro. 2001. A puzzle about indefinites. In Carlo Cecchetto, Gennaro Chierchia & Maria Teresa Guasti (eds.), *Semantic Interfaces: Reference, Anaphora, and Aspect*, 51-89. Stanford: CSLI Publications.
- Cinque, Guglielmo. 2005. Deriving Greenberg's Universal 20 and its exceptions. *Linguistic Inquiry* 36(3). 315-332. <http://dx.doi.org/10.1162/0024389054396917>.

- Cresti, Diana. 1995. Extraction and reconstruction. *Natural Language Semantics* 3(1). 79–122. <http://dx.doi.org/10.1007/BF01252885>.
- Dayal, Veneeta. 1996. *Locality in wh quantification*. Dordrecht: Springer Science+Business Media. <http://dx.doi.org/10.1007/978-94-011-4808-5>.
- Felix, Sascha W. 1983. Parasitic gaps in German. *Groninger Arbeiten zur Germanistischen Linguistik* 22. 1–46.
- Giorgolo, Gianluca & Ash Asudeh. 2012.  $(M, \eta, \star)$ : Monads for conventional implicatures. In Ana Aguilar Guevara, Anna Chernilovskaya & Rick Nouwen (eds.), *Proceedings of Sinn und Bedeutung 16*, 265–278. MIT Working Papers in Linguistics. <http://mitwpl.mit.edu/open/sub16/Giorgolo.pdf>.
- Groenendijk, Jeroen & Martin Stokhof. 1991. Dynamic predicate logic. *Linguistics and Philosophy* 14(1). 39–100. <http://dx.doi.org/10.1007/BF00628304>.
- Hagstrom, Paul. 1998. *Decomposing questions*. Massachusetts Institute of Technology Ph.D. thesis.
- Hamblin, C. L. 1973. Questions in Montague English. *Foundations of Language* 10(1). 41–53.
- Heck, Fabian. 2008. *On pied-piping: Wh-movement and beyond*. Berlin, Boston: Mouton de Gruyter. <http://dx.doi.org/10.1515/9783110211467>.
- Heim, Irene. 2000. Notes on interrogative semantics. Unpublished lecture notes.
- Huang, C.-T. James. 1982. *Logical relations in Chinese and the theory of grammar*. Massachusetts Institute of Technology Ph.D. thesis.

- Huhmarniemi, Saara. 2012. *Finnish A'-movement: Edges and islands*. University of Helsinki Ph.D. thesis.
- Karttunen, Lauri. 1977. Syntax and semantics of questions. *Linguistics and Philosophy* 1(1). 3–44. <http://dx.doi.org/10.1007/BF00351935>.
- Kennedy, Chris. 2014. Predicates *and* formulas: Evidence from ellipsis. In Luka Crnić & Uli Sauerland (eds.), *The art and craft of semantics: A festschrift for Irene Heim*, vol. 1 (MIT Working Papers in Linguistics), 253–277. <http://semanticsarchive.net/Archive/jZiNmM4N/>.
- Kobele, Gregory M. 2010. Inverse linking via function composition. *Natural Language Semantics* 18(2). 183–196. <http://dx.doi.org/10.1007/s11050-009-9053-7>.
- Kratzer, Angelika. 1998. Scope or pseudoscope? Are there wide-scope indefinites?. English. In Susan Rothstein (ed.), *Events and grammar*, vol. 70 (Studies in Linguistics and Philosophy), 163–196. Springer Netherlands. [http://dx.doi.org/10.1007/978-94-011-3969-4\\_8](http://dx.doi.org/10.1007/978-94-011-3969-4_8).
- Kratzer, Angelika & Junko Shimoyama. 2002. Indeterminate pronouns: The view from Japanese. In Yukio Otsu (ed.), *Proceedings of the Third Tokyo Conference on Psycholinguistics*, 1–25. Tokyo: Hituzi Syobo.
- Krifka, Manfred. 1991. A compositional semantics for multiple focus constructions. In Steve Moore & Adam Wyner (eds.), *Proceedings of Semantics and Linguistic Theory 1*, 127–158. Ithaca, NY: Cornell University.
- Krifka, Manfred. 2006. Association with focus phrases. In Valéria Molnár & Susanne Winkler (eds.), *The Architecture of Focus*, 105–136. Mouton de Gruyter.

- Moritz, Luc & Daniel Valois. 1994. Pied-piping and specifier-head agreement. *Linguistic Inquiry* 25(4). 667-707. <http://www.jstor.org/stable/4178881>.
- Muskens, Reinhard. 1996. Combining Montague semantics and discourse representation. *Linguistics and Philosophy* 19(2). 143-186. <http://dx.doi.org/10.1007/BF00635836>.
- Partee, Barbara H. 1986. Noun phrase interpretation and type-shifting principles. In Jeroen Groenendijk, Dick de Jongh & Martin Stokhof (eds.), *Studies in Discourse Representation Theory and the Theory of Generalized Quantifiers*, 115-143. Dordrecht: Foris.
- Poesio, Massimo. 1996. Semantic ambiguity and perceived ambiguity. In Kees van Deemter & Stanley Peters (eds.), *Semantic Ambiguity and Underspecification* (CSLI Lecture Notes 55), 159-201. Stanford: CSLI Publications.
- Reinhart, Tanya. 1997. Quantifier scope: How labor is divided between QR and choice functions. *Linguistics and Philosophy* 20(4). 335-397. <http://dx.doi.org/10.1023/A:1005349801431>.
- Reinhart, Tanya. 1998. Wh-in-situ in the framework of the Minimalist Program. *Natural Language Semantics* 6(1). 29-56. <http://dx.doi.org/10.1023/A:1008240014550>.
- Rooth, Mats. 1985. *Association with focus*. University of Massachusetts, Amherst Ph.D. thesis.
- Rooth, Mats. 1996. Focus. In Shalom Lappin (ed.), *The Handbook of Contemporary Semantic Theory*, 271-298. Oxford: Blackwell.
- Shan, Chung-chieh. 2002. Monads for natural language semantics. In Kristina Striegnitz (ed.), *Proceedings of the ESSLI 2001 Student Session*, 285-298. <http://arxiv.org/abs/cs/0205026>.

- Shan, Chung-chieh. 2004. Binding alongside Hamblin alternatives calls for variable-free semantics. In Kazuha Watanabe & Robert B. Young (eds.), *Proceedings of Semantics and Linguistic Theory 14*, 289–304. Ithaca, NY: Cornell University. <http://dx.doi.org/10.3765/salt.v14i0.2901>.
- von Stechow, Arnim. 1996. Against LF pied-piping. *Natural Language Semantics* 4(1). 57–110. <http://dx.doi.org/10.1007/BF00263537>.
- Sternefeld, Wolfgang. 1998. *The semantics of reconstruction and connectivity*. Arbeitspapier 97, SFB 340. Universität Tübingen & Universität Stuttgart, Germany.
- Sternefeld, Wolfgang. 2001. Partial movement constructions, pied piping, and higher order choice functions. In Caroline Fery & Wolfgang Sternefeld (eds.), *Audiatur vox sapientiae—A festschrift for Arnim von Stechow*, 473–486. Berlin: Akademie Verlag. <http://dx.doi.org/10.1515/9783050080116.473>.
- Unger, Christina. 2012. Dynamic semantics as monadic computation. In Manabu Okumura, Daisuke Bekki & Ken Satoh (eds.), *New Frontiers in Artificial Intelligence JSAI-isAI 2011*, vol. 7258 (Lecture Notes in Artificial Intelligence), 68–81. Springer Berlin Heidelberg. [http://dx.doi.org/10.1007/978-3-642-32090-3\\_7](http://dx.doi.org/10.1007/978-3-642-32090-3_7).
- Winter, Yoad. 1997. Choice functions and the scopal semantics of indefinites. *Linguistics and Philosophy* 20(4). 399–467. <http://dx.doi.org/10.1023/A:1005354323136>.
- Wold, Dag E. 1996. Long distance selective binding: The case of focus. In Teresa Galloway & Justin Spence (eds.), *Proceedings of Semantics and Linguistic Theory 6*, 311–328. Ithaca, NY: Cornell University. <http://dx.doi.org/10.3765/salt.v6i0.2766>.