Alternatives, and alternative semantics

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NYU Semantics Group November 4, 2016

Overview

Alternatives

Alternatives are useful for many things semanticist like to think about:

- Questions denote sets of their possible answers:

$$[\![\text{Who left}]\!] = \{\textbf{left}\ x \mid \textbf{human}\ x\}$$

- Prosodic focus invokes things the speaker could have said:

$$[\![\text{BOB left}]\!]_f = \{\textbf{left}\ x \mid x \in [\![\text{BOB}]\!]_f\}$$

- And scalar items conjure up alternative utterances:

$$[\![\text{someone left}]\!]_s = \{f\ \textbf{left} \mid f \in [\![\text{someone}]\!]_s\}$$

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
- Alternative-semantic

I'll try to sketch a better theory. Unlike either of the above, accounts for:

- Islands
- Selectivity outside islands
- 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.

$$? \;::\; \mathtt{t} \to \{\mathtt{t}\}$$
$$[\![?]\!] = \lambda p.\, \lambda q.\, p = q$$

Second ingredient: meanings that can scope over alternatives.

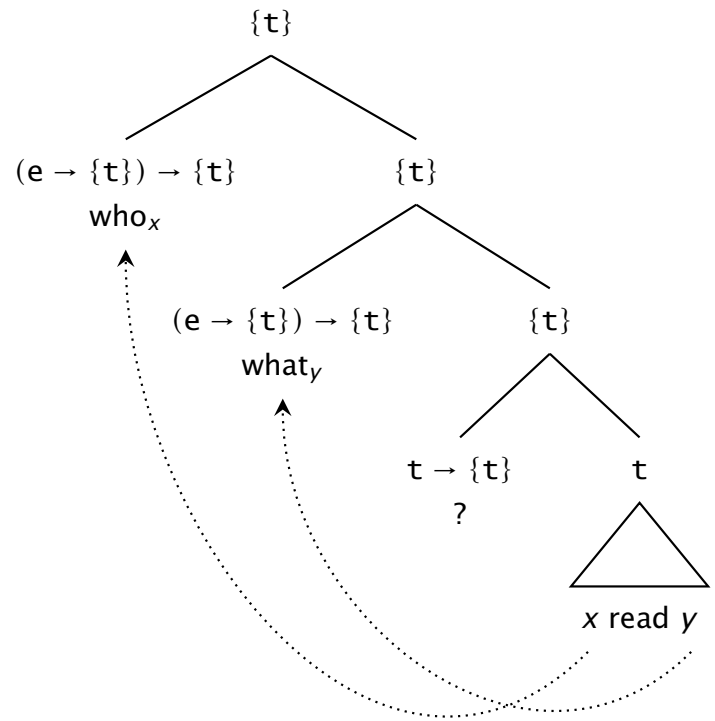
$$\mathsf{who} \;::\; (\mathtt{e} \to \{\mathtt{t}\}) \to \{\mathtt{t}\}$$
$$[\![\mathsf{who}]\!] = \lambda f.\, \lambda p.\, \exists x.\, \mathbf{human}\, x \wedge f\, x\, p$$

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

An example

$?\ ::\ \mathtt{t} \to \{\mathtt{t}\}$ $\qquad$ $\mathsf{who}\ ::\ (\mathtt{e} \to \{\mathtt{t}\}) \to \{\mathtt{t}\}$

$[\![?]\!] = \lambda p.\, \lambda q.\, p = q$ $\qquad$ $[\![\mathsf{who}]\!] = \lambda f.\, \lambda p.\, \exists x.\, \mathbf{human}\ x \wedge f\ x\ p$



$\rightsquigarrow \lambda p.\, \exists x.\, \mathbf{human}\ x \wedge \exists y.\, \mathbf{thing}\ y \wedge p = \mathbf{read}\ y\ x$

Generalizing the approach

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

$$[\![\text{John saw a linguist}]\!] = \{\mathbf{saw}\, x\, \mathbf{j} \mid \mathbf{ling}\, x\}$$

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

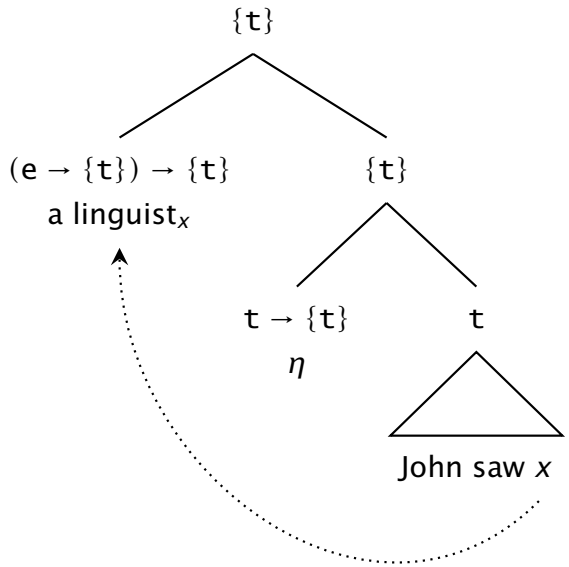
$$\eta :: \alpha \to \{\alpha\} \qquad \text{a linguist} :: (\mathsf{e} \to \{\alpha\}) \to \{\alpha\}$$
$$[\![\eta]\!] = \lambda a.\, \lambda b.\, a = b \qquad [\![\text{a linguist}]\!] = \lambda f.\, \lambda a.\, \exists x.\, \mathbf{ling}\, x \wedge f\, x\, a$$

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

An example: indefinite alternatives via scope

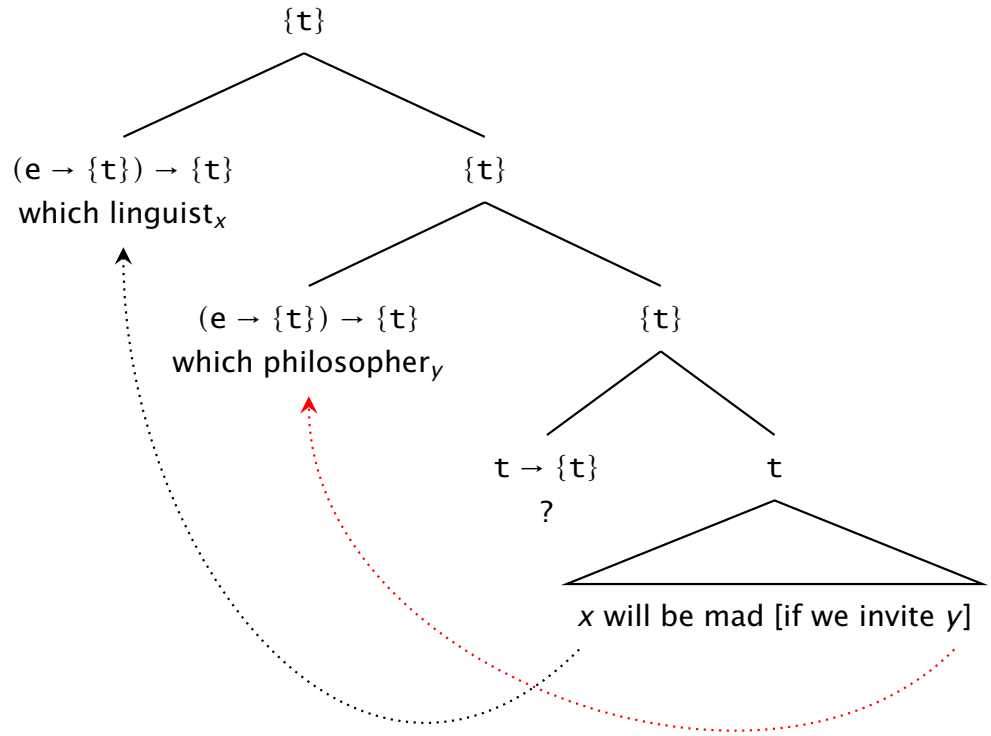
$\eta \;::\; \alpha \to \{\alpha\}$ $\qquad$ $\llbracket \eta \rrbracket = \lambda a.\, \lambda b.\, a = b$

$\text{a linguist} \;::\; (\mathsf{e} \to \{\alpha\}) \to \{\alpha\}$ $\qquad$ $\llbracket \text{a linguist} \rrbracket = \lambda f.\, \lambda a.\, \exists x.\, \mathbf{ling}\, x \wedge f\, x\, a$



$\rightsquigarrow \lambda p.\, \exists x.\, \mathbf{ling}\, x \wedge p = \mathbf{saw}\, x\, \mathbf{j}$

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-escaping behavior, generally

Characteristic of basically anything associated with alternatives:

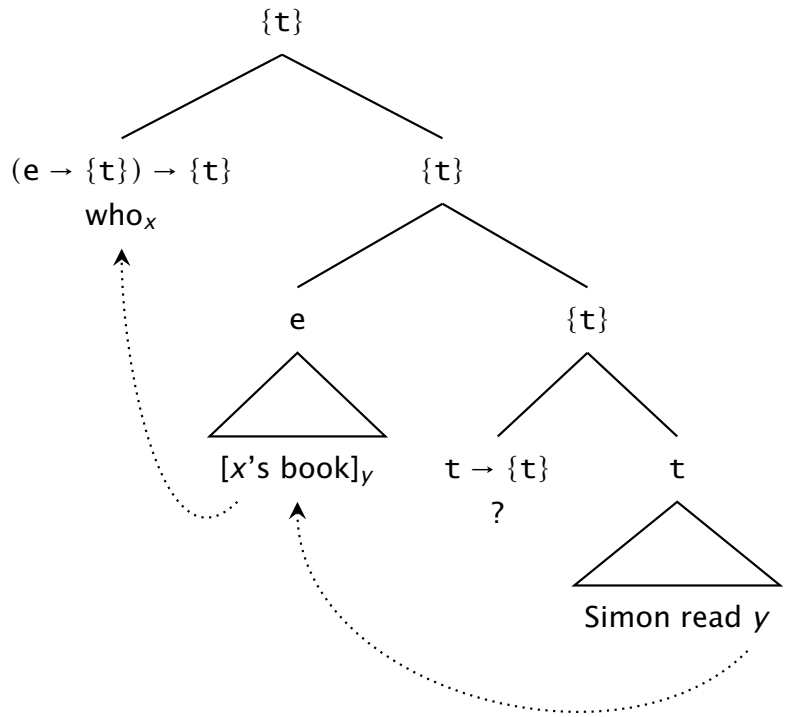
1. If [**a rich relative of mine** dies], I'll inherit a fortune. ($\exists \gg$ *if*)
   (Fodor & Sag 1982, Reinhart 1997)

2. Dr. Svenson **only** complains when [**BILL** leaves the lights on].
   (Rooth 1985, 1996, Krifka 2006)

3. [[**Dono gakusei-ga** syootaisita] sensei] **-mo** odotta.
   which student-NOM invited teacher-MO danced
   'For every student *x*, the teacher(s) *x* invited danced.'
   (Kratzer & Shimoyama 2002, Shimoyama 2006)

4. Every single passenger [who ordered fish **or** beef] (I can't remember which) got food poisoning. ($\rightsquigarrow$ *not-and*; see Charlow 2016)

Issue #2: pied piping



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

$$\lambda p.\, \exists x.\, \mathbf{human}_{@}\, x \wedge p = \lambda w.\, \mathbf{read}_{w}\, (\mathbf{the\text{-}book\text{-}of}_{@}\, x)\, \mathbf{s}$$

should be w!

Alternative semantics

Basics

First ingredient: all meanings are sets.

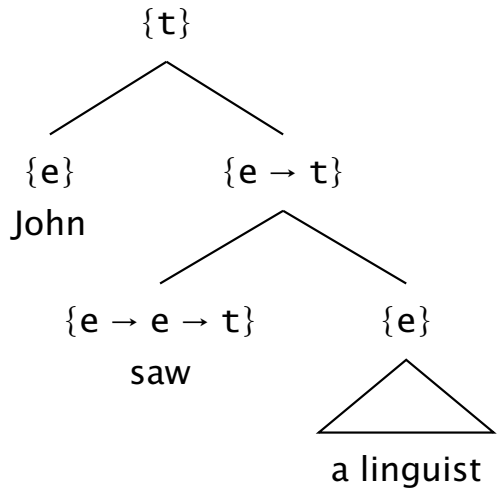
$$\begin{array}{ll} \text{John} :: \{\mathsf{e}\} & \text{met} :: \{\mathsf{e} \to \mathsf{e} \to \mathsf{t}\} \\ [\![\text{John}]\!] = \{\mathbf{j}\} & [\![\text{met}]\!] = \{\mathbf{met}\} \end{array}$$

$$\begin{array}{l} \text{a linguist} :: \{\mathsf{e}\} \\ [\![\text{a linguist}]\!] = \{x \mid \mathbf{ling}\ x\} \end{array}$$

Second ingredient: meaning combination is *pointwise* application.

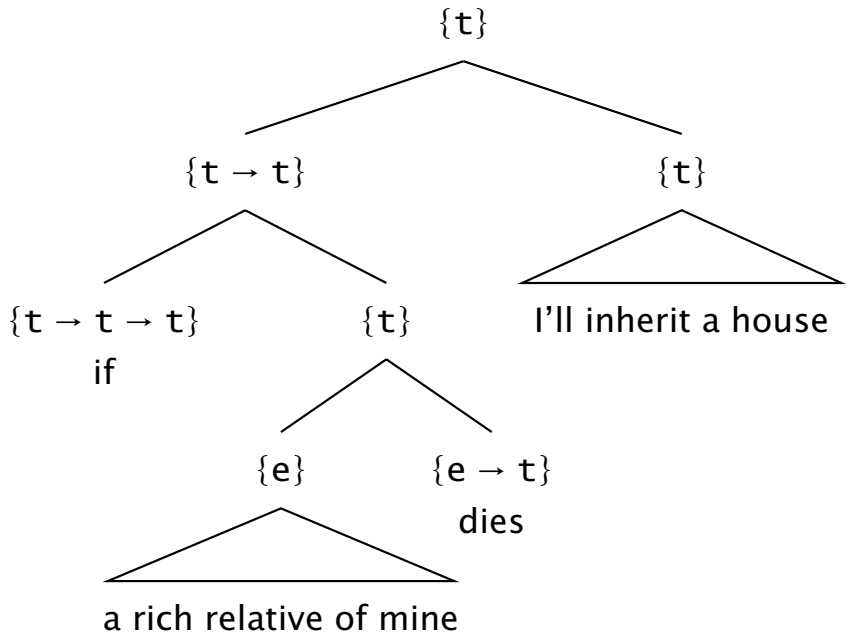
$$[\![A\ B]\!] = \{f\ x \mid f \in [\![A]\!], x \in [\![B]\!]\}$$

A simple example: alternatives without movement



$$\rightsquigarrow \{\textbf{saw}\ x\ \textbf{j} \mid \textbf{ling}\ x\}$$

Island-escaping behavior, without movement



$$\rightsquigarrow \{\textbf{if}\ (\textbf{dies}\ x)\ \textbf{house} \mid \textbf{relative}\ x\}$$

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$_l$ visits a filthy rich relative of mine$_r$], I'll inherit a fortune. ($\exists_{l,r} \gg \mathit{if}$, $\exists_l \gg \mathit{if} \gg \exists_r$, $\exists_r \gg \mathit{if} \gg \exists_l$)

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.

$$\{\textbf{visits}\ x\ y \mid \textbf{lawyer}\ y, \textbf{relative}\ x\}$$

[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]]$_C$, and
   [MARY **only** gripes when [**JOHN** leaves the lights on]] $\sim C$.
   (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:

$$[\![A_i\ B]\!]^g = [\![A]\!]^g\,(\lambda x.\,[\![B]\!]^{g^{i\to x}})$$

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

$$[\![A_i\ B]\!]^g = \{f\ g \mid f \in [\![A]\!]^g,\ g \in \underbrace{???}\}$$

Needs to be a set of functions: $\{\lambda x. \ldots \underbrace{[\![B]\!]}^{g^{i\to x}}\}$

Already a set!

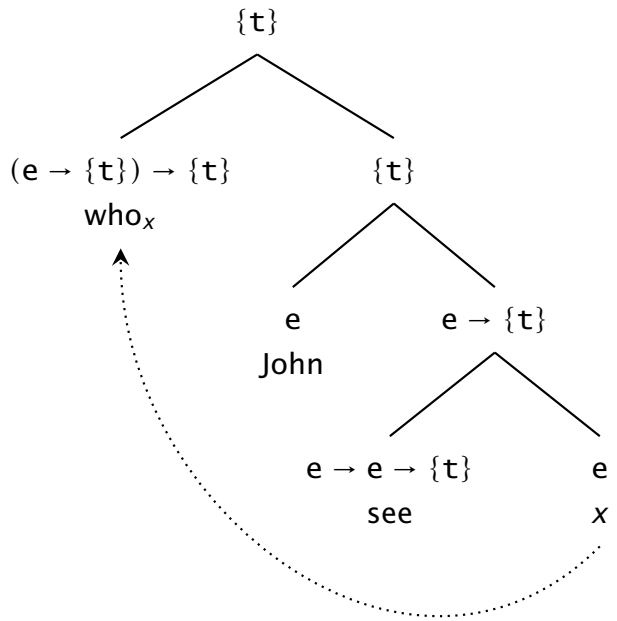
[Both of these "rules" should have a symmetric alternative that treats *A* as the argument.]

A breakthrough?

Ciardelli, Roelofsen & Theiler (2016) propose the following semantics:

$$\mathsf{who} \;::\; (\mathsf{e} \to \{\mathsf{t}\}) \to \{\mathsf{t}\} \qquad \mathsf{see} \;::\; \mathsf{e} \to \mathsf{e} \to \{\mathsf{t}\}$$

$$[\![\mathsf{who}]\!] = \lambda f. \bigcup_{x \in \mathbf{human}} f\,x \qquad [\![\mathsf{see}]\!] = \lambda x. \lambda y. \{\mathbf{see}\,x\,y\}$$



$$\rightsquigarrow \{\mathbf{see}\,x\,\mathbf{j} \mid \mathbf{human}\,x\}$$

The wide view

However, this is just a set-theoretic recasting of the type-theoretic Karttunen (1977) semantics.

$$[\![\text{who}_{\text{kart}}]\!]\, f\, p \iff p \in [\![\text{who}_{\text{crt}}]\!]\, (\lambda x.\, \{p \mid f\, x\, p\})$$

The only difference from Karttunen: Ciardelli, Roelofsen & Theiler bake $[\![?]\!]$ into the lexical semantics of (e.g.) verbs.

This is central to the success of the theory, such as it is, in dealing with binding. If you're not using alternative *semantics* for pseudo-scope, *of course* you're not going to have a problem with binding.

Taking stock

So we haven't made any progress, really. There *is* no problem of *composing* alternatives (and there hasn't been one since 1977).

The compositional problems having to do with alternatives are problems for **alternative semantics**.

A theory

A modular vignette

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

> [17] 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: 'λ**P**$\exists$x[**person**(x) $\wedge$ **P**(x)]', and '[+WH] $\rightsquigarrow$ λ**U**λ**W**λp[**U**(λu.**W**(u)(p))]'. So [+WH] applied to "some person . . ." is 'λ**U**λ**W**λp[**U**(λu.**W**(u)(p))] (λ**P**$\exists$x[**person**(x) $\wedge$ **P**(x)])' = 'λ**W**λp$\exists$x[**person**(x) $\wedge$ **W**(x) (p)]', as in (39).

In other words, given the following, we have ⟦who⟧ = ⟦someone +WH⟧:[1]

$$\text{+WH} \;::\; ((\mathsf{e} \to \mathsf{t}) \to \mathsf{t}) \to (\mathsf{e} \to \{\mathsf{t}\}) \to \{\mathsf{t}\}$$
$$[\![\text{+WH}]\!] = \lambda f.\, \lambda g.\, \lambda p.\, f\, (\lambda x.\, g\, x\, p)$$

[1] Actually, ⟦+WH⟧ turns out to be the $\gg=$ operation of the Continuation monad(!).

My proposal: shift *sets* instead of GQs

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

- Type-theoretically:

$$\eta \;\; :: \alpha \to \{\alpha\} \qquad\qquad \gg= \;\; :: \{\alpha\} \to (\alpha \to \{\beta\}) \to \{\beta\}$$
$$[\![\eta]\!] = \lambda a.\, \lambda b.\, a = b \qquad\qquad [\![\gg=]\!] = \lambda m.\, \lambda f.\, \lambda b.\, \exists a.\, m\, a \wedge f\, a\, b$$

- Set-theoretically:

$$\eta \;\; :: \alpha \to \{\alpha\} \qquad\qquad \gg= \;\; :: \{\alpha\} \to (\alpha \to \{\beta\}) \to \{\beta\}$$
$$[\![\eta]\!] = \lambda a.\, \{a\} \qquad\qquad [\![\gg=]\!] = \lambda m.\, \lambda f.\, \bigcup_{a \in m} f\, a$$

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

Nothing new under the sun

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

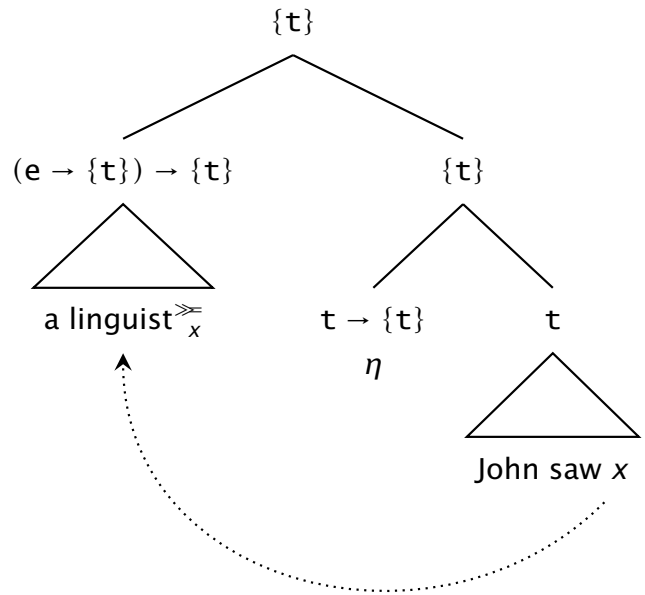
$$\{x \mid \mathbf{ling}\, x\}^{\gg\!=} \equiv \lambda f.\, \lambda b.\, \exists a.\, \mathbf{ling}\, a \wedge f\, a\, b$$

$$\equiv \lambda f.\, \bigcup_{\mathbf{ling}\, a} f\, a$$

A simple case, with a familiar derivation

$$\eta :: \alpha \to \{\alpha\} \qquad \gg\!= :: \{\alpha\} \to (\alpha \to \{\beta\}) \to \{\beta\}$$

$$[\![\eta]\!] = \lambda a.\,\{a\} \qquad [\![\gg\!=]\!] = \lambda m.\,\lambda f.\,\bigcup_{a \in m} m\,a$$



$$\rightsquigarrow \{\mathbf{see}\ x\ \mathbf{j} \mid \mathbf{ling}\ x\}$$

Some more facts

η and $\gg=$ form a decomposition of LIFT (e.g., Partee 1986):

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

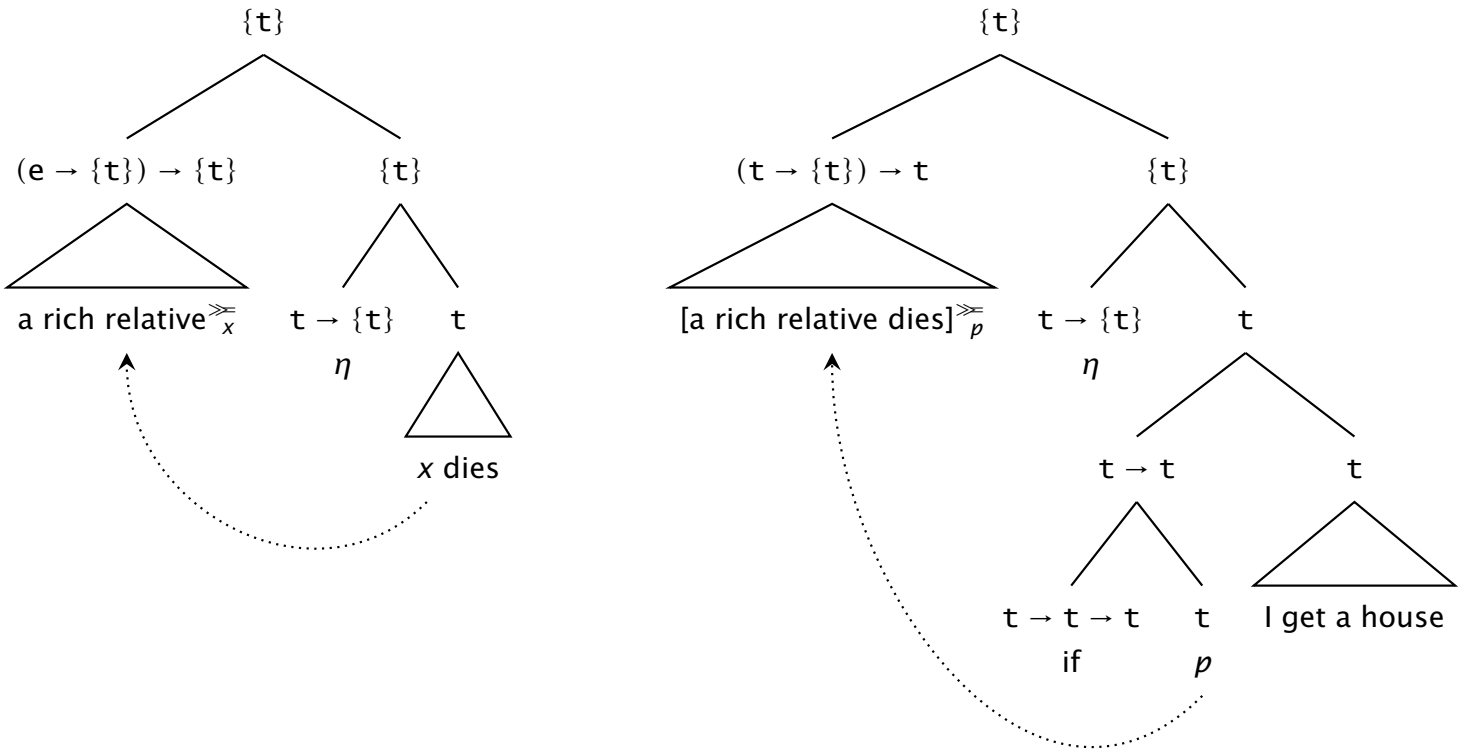
More generally, together they comprise something known as a monad (e.g., Shan 2002, Giorgolo & Asudeh 2012, Charlow 2014).

- Monads are *really* good at helping fancy things (like sets of alternatives) interact with the Fregean bread and butter of compositional semantics.

[Indeed, the analysis I'm proposing here is essentially the same as the one I put forward in my dissertation (2014), though I'm not using continuations here.]

Islands

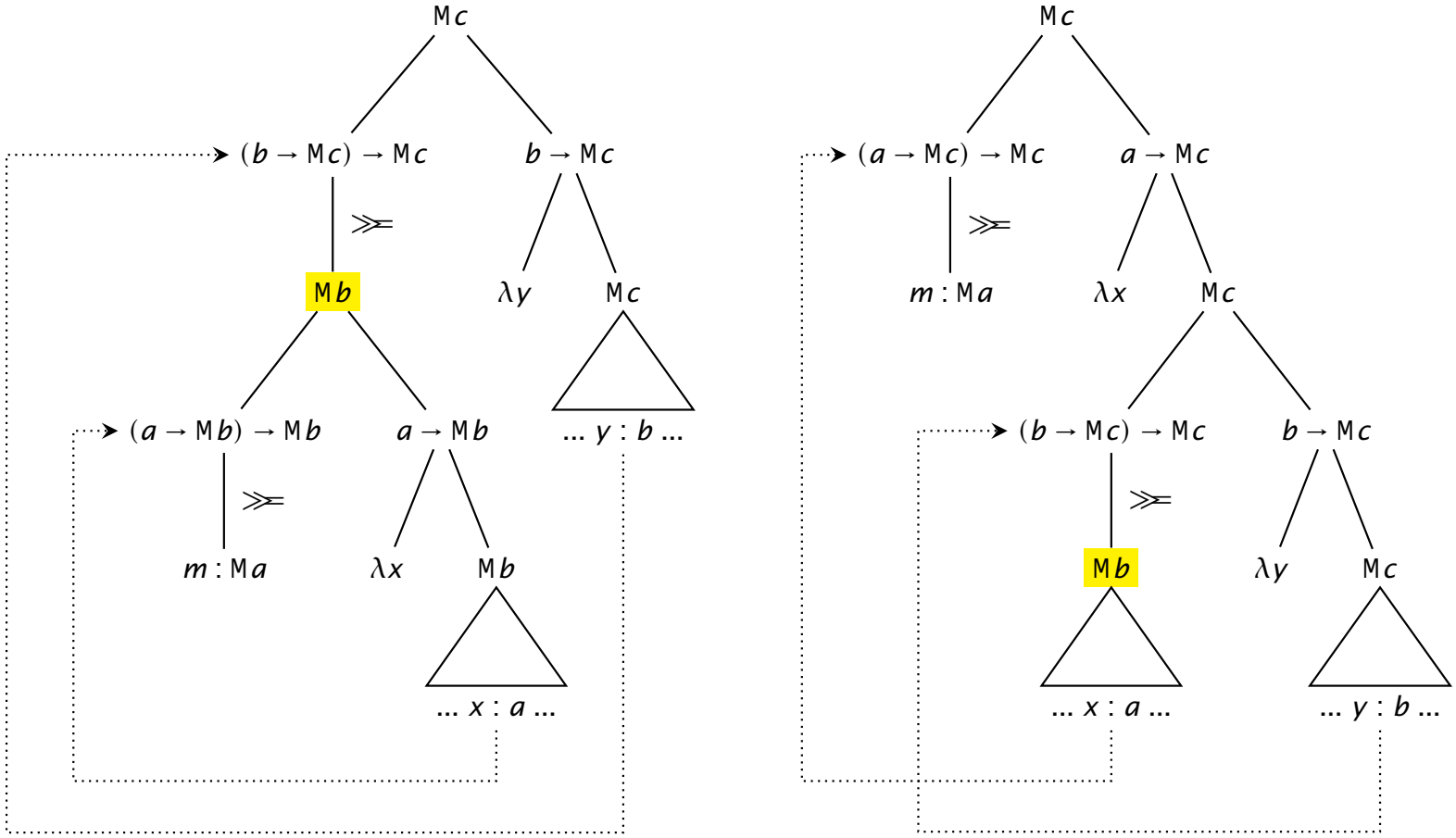
But! We can apply $\gg=$ to *anything*, not just quantifiers!



$$\rightsquigarrow \{\textbf{if}\ (\textbf{dies}\ x)\ \textbf{house} \mid \textbf{relative}\ x\}$$

Islands more generally:

For any monadic type constructor M, the tree on the left is guaranteed equivalent to the tree on the right.



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

Some antecedents

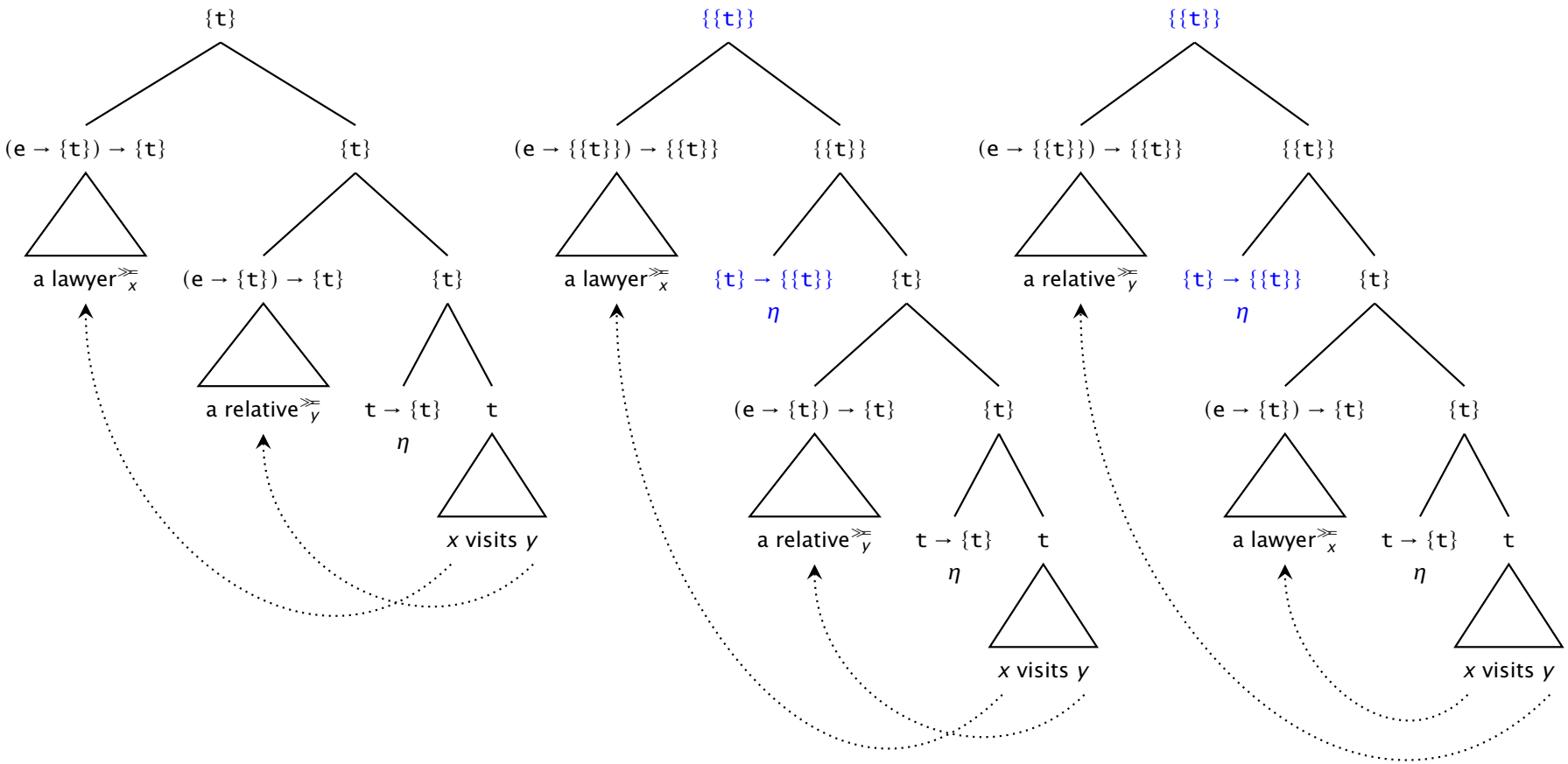
The type of movement on display here is also known as “roll-up” covert pied-piping" (or, sometimes, colorfully, “snowballing” covert pied-piping).

See Nishigauchi 1990, Moritz & Valois 1994, von Stechow 1996, Huhmarniemi 2012 for much more on both overt and covert versions of this movement.

Selectivity

Three substantively distinct derivations are available for the island in (1):

1. If [a phenomenal lawyer$_l$ visits a filthy rich relative of mine$_r$], I'll inherit a fortune.



More on selectivity

The three semantic values that result, two of them higher-order:

$$\{\textbf{visits}\ y\ x \mid \textbf{lawyer}\ x, \textbf{relative}\ y\}$$

$$\{\{\textbf{visits}\ y\ x \mid \textbf{relative}\ y\} \mid \textbf{lawyer}\ x\}$$

$$\{\{\textbf{visits}\ y\ x \mid \textbf{lawyer}\ x\} \mid \textbf{relative}\ y\}$$

Here's how they interact with the conditional:

- The first can be used to give both indefinites widest scope
- The second can be used to give *a lawyer* widest scope
- The third can he used to give *a relative* widest scope

So we have full selectivity, because we can automatically build alternative sets with *higher-order structure* (cf. Dayal 1996, 2002, Fox 2012)!

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.

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

Reconstruction

Basic data

Consider the wide-scope indefinite reading of the following:

1. Every linguist$_i$ is overjoyed [whenever a world-famous expert on indefinites cites her$_i$]. ($\exists \gg \forall$)

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, 2001b):

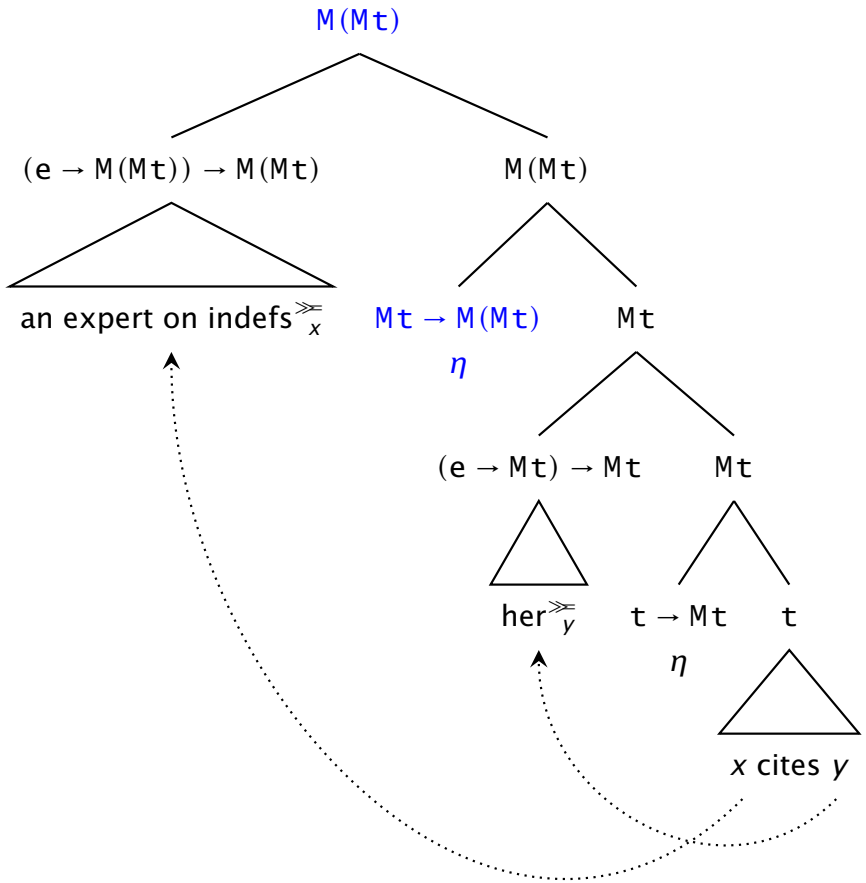
$$\eta \;::\; \alpha \to \mathsf{g} \to \{\alpha\} \qquad \gg\!= \;::\; \{\alpha\} \to (\alpha \to \mathsf{g} \to \{\beta\}) \to \mathsf{g} \to \{\beta\}$$

$$[\![\eta]\!] = \lambda a.\, \lambda g.\, \{a\} \qquad [\![\gg\!=]\!] = \lambda m.\, \lambda f.\, \lambda g.\, \bigcup_{a \in m\, g} m\, a\, g$$

I'll abbreviate '$\mathsf{g} \to \{\alpha\}$' as '$\mathtt{M}\alpha$' in what follows.

[See Kobele 2010, Kennedy 2014, and the dynamics literature (e.g., Barwise 1987, Groenendijk & Stokhof 1991, Muskens 1996) for independent motivation for this move.]

An example



Like before, the derived island meaning has enough structure to allow the pronoun to get interpreted low, even as the indefinite is interpreted high!

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.

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

Concluding

Summing up

Semantics with alternatives and alternative semantics are different things.

- While we understand very well how to get 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 $[\![\text{who}]\!]$, we have a complete theory!
- A more general (and independently motivated) treatment of assignment- (and, if you like, world-) 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 of indefinites and questions might be surprised to hear this.

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

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