# Generalized exceptional scope

*April 29, 2015*

## 1 The basic account

- Alternatives may take scope via $\boxed{\cdot}$ and $\Uparrow$:

$$\boxed{x} = \{x\} \qquad m^{\Uparrow} = \lambda\kappa.\bigcup_{a\in m}\kappa\, a \tag{1}$$

These two type-shifters allow "fancy things" — i.e. here things of type $\mathtt{F}a ::= \{a\}$, for any type $a$ — to be folded into contexts that expect "boring things". They are decompositions of LIFT, in the sense that for any $x$, $\boxed{x}^{\Uparrow} = \lambda\kappa.\,\kappa\, x$.

- We've seen a bunch of examples of how this works. Here, is a slightly different example, *whose book did you read?* — a case of garden-variety (i.e. overt) pied-piping with an alternative generator in a possessor position (see Figure 1 for a tree):

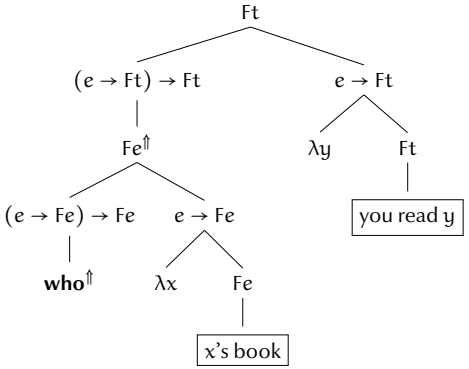


**Figure 1:** Overt pied-piping: *whose book did you read?*

$$\begin{aligned}(\mathbf{who}^{\Uparrow}\,(\lambda x.\,\boxed{x\text{'s book}}))^{\Uparrow}\,(\lambda y.\,\boxed{\text{you read } y}) \\ = \{\text{you read } x\text{'s book} \mid \text{person}\, x\}\end{aligned} \tag{2}$$

One neat thing about this derivation: the alternative generator takes scope over a *DP*, not a sentence. You may remember that a similar move allowed Heim 2000 to give a Karttunen 1977-style account of Japanese indeterminate pronouns.[1]

- That's an example of overt pied-piping. Covert pied-piping (à la Nishigauchi 1990; von Stechow 1996) — already a consequence of not restricting the application of $\boxed{\cdot}$ and $\Uparrow$ — gives us an account of exceptional scope-taking (see Figure 2 for a tree):

[1] NB: I would not really consider this a *serious* account of overt pied-piping until we fold intensionality into the mix. Nevertheless, you can see how the broad outlines of how such an account would go.



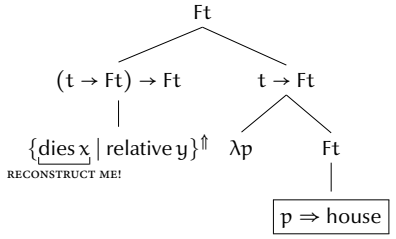


**Figure 2:** Covert pied-piping: *if* ⟨*a rich relative of mine dies*⟩, *I'll inherit a house*.

$$\begin{aligned}\{\text{dies}\, x \mid \text{relative}\, x\}^{\Uparrow}\,(\lambda p.\,\boxed{p \Rightarrow \text{house}}) \\ = \{\text{dies}\, x \Rightarrow \text{house} \mid \text{relative}\, x\}\end{aligned} \tag{3}$$

When a set takes scope, as in $\{\Phi \mid \Psi\}^{\Uparrow}$, everything to the left of the pipe (i.e. $\Phi$) reconstructs, while everything to the right of the pipe (i.e. $\Psi$) stays upstairs.

## 2 Addressing our challenges

### 2.1 Abstraction

- We cannot adopt "naïve" Predicate Abstraction if we are assuming PWFA, since doing so leads to a type-clash in cases involving QR'd quantifiers. Here, e.g., is what happens if we try to derive *everyone met a woman* (where '×' stands in for PWFA):

$$\underbrace{\{\lambda P.\,\forall x.\,P\, x\}}_{\{(e\to t)\to t\}} \times \underbrace{(\lambda x.\,\{x \text{ met } y \mid \text{woman}\, y\})}_{e\to\{t\}} = \# \tag{4}$$

- One possibility, as we saw, is to roll a new abstraction operation, one which yields a set of properties as desired (cf. e.g. Kratzer & Shimoyama 2002):

$$[\![n\ X]\!]^{g}_{\text{PWFA}} = \{f \mid \forall x.\, f\, x \in [\![X]\!]^{g[n\mapsto x]}\} \tag{5}$$

While this allows us to give a defined result for *everyone met a woman*, it both (i) fails to generate a wide-scope reading for the indefinite in that case (and therefore will under-generate in exceptional scope configurations involving an island-external quantifier), and (ii) over-generates "functional" readings when the quantifier in question is non-increasing (e.g. *nobody*, *exactly one linguist*, &c).

- We might just say SO WHAT and adopt a new interpretation rule (or family of rules) for quantifiers that avoids this problem. This is essentially the approach adopted in Ciardelli & Roelofsen to appear:

$$[\![\text{everyone}_n\ X]\!]^{g} = \{\text{everyone}\,(\lambda x.\,\exists p \in [\![X]\!]^{g[n\mapsto x]}.\,p)\} \tag{6}$$

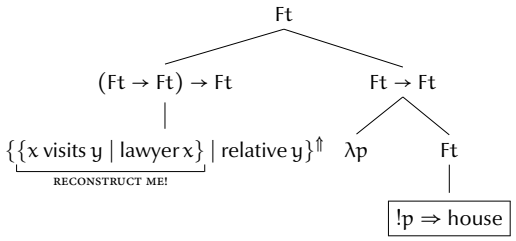


**Figure 3:** Selective exceptional scope: *if* ⟨*a lawyer visits a relative of mine*⟩, *I'll inherit a house*.

But going this route means losing an account of exceptional scope-taking. Suppose that e.g. an indefinite is separated by an island from a scope position above *everyone*. We would like to be able to derive exceptional scope in such configurations, but we are only able to derive narrow scope.

- So exceptional scope-taking via alternatives and a well-behaved abstraction operation seem to be at cross-purposes. But that turns out not to hold on the present account! We can use naïve abstraction, and give higher-types entries to quantifiers. Since we have a way of giving things *exceptional* scope over quantifiers (LF pied-piping), we do not under-generate exceptional scope configurations.

## 2.2 Selectivity

- PWFA seems like an awkward fit with selectivity. We only ever seem to derive flat alternative sets, which conflate different sources of alternatives:

$$\{x \text{ met } y \mid \text{linguist } x \wedge \text{philosopher } y\} \tag{7}$$

- Thus, it seems exceptional scope-taking and selectivity are at cross-purposes. Again, appearances are deceiving. We can form a higher-order alternative set like so:

$$\begin{aligned} &\textbf{a.relative}^{\Uparrow}\,(\lambda y.\,\boxed{\textbf{a.lawyer}^{\Uparrow}\,(\lambda x.\,\boxed{x \text{ visits } y}\,)}\,) \\ &= \{\{x \text{ visits } y \mid \text{lawyer } x\} \mid \text{relative } y\} \end{aligned} \tag{8}$$

Selective exceptional scope-taking is secured by LF pied-piping this higher-order meaning (call it **S**) outside the conditional (see also Figure 3):

$$\begin{aligned} &\mathbf{S}^{\Uparrow}\,(\lambda p.\,\boxed{!p \Rightarrow \text{house}}\,) \\ &= \{\exists x.\,\text{lawyer } x \wedge x \text{ visits } y \Rightarrow \text{house} \mid \text{relative } y\} \end{aligned} \tag{9}$$

The "outer" layer of alternatives scopes above the conditional, while the "inner" layer of alternatives reconstructs to within the scope of the conditional, where its alternatives are discharged by the closure operator !.



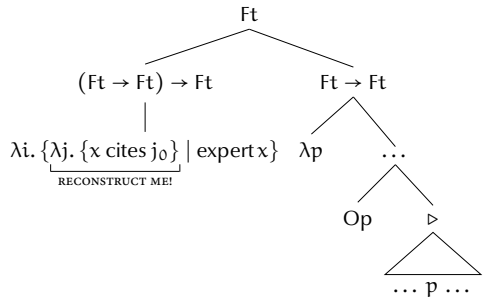


**Figure 4:** Binding reconstruction: *every ling*$_i$ *is happy if* ⟨*a famous expert on indefinites cites her*$_i$⟩.

- Adding (independently motivated, see e.g. Sternefeld 1998, 2001; Kobele 2010; Kennedy 2014) explicit state-sensitivity into the mix allows for binding reconstruction, so that examples like (1) below can be analyzed as entirely parallel to examples of selective reconstruction.

(1) Every linguist$_i$ is happy if ⟨a famous expert on indefinites cites her$_i$⟩.

- Implementing this perspective simply means tweaking our notion of what a "fancy" meaning is. We now take fancy $\alpha$'s to be functions from assignments into sets of $\alpha$'s (where $s$ is the type of assignments or, more generally, states):

$$F\alpha = s \to \{\alpha\} \tag{10}$$

- Along with some new shifters, we have everything we need to give an account of binding reconstruction entirely parallel to the account of selective exceptional scope.

$$\boxed{x} = \lambda i.\, x \qquad\qquad m^{\Uparrow} = \lambda \kappa.\, \lambda i.\, \bigcup_{x \,\in\, m\, i} \kappa\, x\, i \tag{11}$$

- An example of how this works is given in Figure 4. The derivation is entirely parallel to Figure 3. We rely on higher-order LF pied-piping, which allows the pronoun to semantically reconstruct into the scope of the binder Op.
- Note for interested folks: the tree in Figure 4 invokes ▷, which is just a device that allows Op to bind things within its scope (interested folks may also consult Table 1 for more details about the semantics):

$$\kappa^{\triangleright} = \lambda x.\, \lambda i.\, \kappa\, x\, (i \cdot x) \tag{12}$$

## 2.3 Scope

- We should not be able to assign the indefinite wide scope in roofing constructions like the following:

(2) No candidate$_i$ submitted a paper he$_i$ wrote.

- Here's how we'd have to analyze this reading. Recall that everything to the right of the pipe scopes high. This means that there is no way to give the indefinite *a paper he$_0$ wrote* scope over *no candidate* without unbinding the pronoun!

$$(\lambda i.\,\{y \mid i_0 \text{ wrote } y\})^{\Uparrow}\,(\lambda y.\,\textbf{no.candidate}\,(\lambda x.\,\boxed{x \text{ submitted } y})) \tag{13}$$

- This improves on choice-functional accounts, which are able to assign the indefinite a kind of wide scope in examples like these:[2]

$$\begin{aligned}&\exists f.\,\textbf{no.candidate}\,(\lambda x.\,x \text{ submitted } (f\,\{y \mid x \text{ wrote } y\}))\\ &\quad\approx \text{no candidate submitted } \textit{every} \text{ paper he wrote}\end{aligned} \tag{14}$$

- All told, we seem to cut the pie in just the right way. An indefinite's restrictor cannot reconstruct, but anything else on the island with the indefinite can, freely.

## 2.4 Dynamics

- Finally, supposing that meanings to not simply sometimes *depend* on states, but also sometimes *modify* states, upgrades us into a dynamic semantics.
- Dynamic semantics relies on the ability to take in states, modify them, and output them. One way to think of this is in terms of a new "fancy" type:

$$\mathsf{F}a ::= s \to \{\langle a, s\rangle\} \tag{15}$$

- The basic form of the shifters essentially follows from the types. As ever, these two shifters are decompositions of LIFT!

$$\boxed{x} = \lambda i.\,\{\langle x, i\rangle\} \qquad\qquad m^{\Uparrow} = \lambda\kappa.\,\lambda i.\,\bigcup_{\langle x,j\rangle \in m\,i} \kappa\,x\,j \tag{16}$$

- Remarkably, rejiggering the semantics in this way predicts that dynamic binding *also* arises via a kind of LF pied-piping. See Figure 5 for a derivation.[3]
- In contrast with standard dynamic approaches, this derivation does not require any notion of *dynamic conjunction*. In keeping with the general spirit I've been advocating, conjunction is boring and interacts with fancy things via $\boxed{\cdot}$ and $\cdot^{\Uparrow}$.
- In sum, one simple shift in perspective on the role of states in the grammar turns an alternative semantics into an alternative semantics that countenances dynamic binding.

[2] It also improves on Romero & Novel 2013's proposed fix to the PWFA abstraction issue, which is likewise able able to assign the indefinite a kind of wide scope in these sorts of examples.

[3] I have suppressed the derivations of the individual conjuncts, but interested parties should be able to reconstruct them from Table 1, along with the binding operator given in (12).



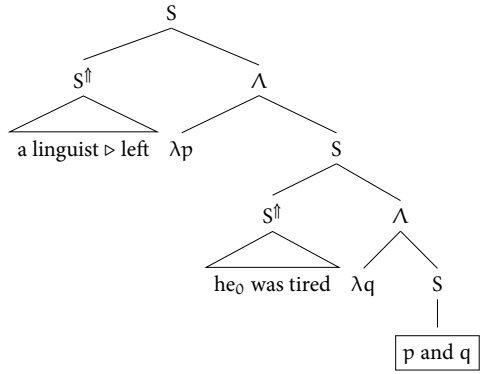


**Figure 5:** Cross sentential anaphora via LF pied-piping: *a linguist$_i$ left; he$_i$ was tired.*

| $\mathsf{F}a$ | $\boxed{x}$ | $m^{\Uparrow}$ | $[\![\text{a linguist}]\!]_{\mathsf{F}e}$ | $[\![\text{she}_0]\!]_{\mathsf{F}e}$ |
|---|---|---|---|---|
| $a$ | $x$ | $\lambda\kappa.\,\kappa\,m$ | N/A | $i_0$ |
| $\{a\}$ | $\{x\}$ | $\lambda\kappa.\,\bigcup_{x\in m}\kappa\,x$ | $\{x \mid \text{linguist}\,x\}$ | $\{i_0\}$ |
| $s \to \{a\}$ | $\lambda i.\,\{x\}$ | $\lambda\kappa.\,\bigcup_{x\in m\,i}\kappa\,x\,i$ | $\lambda i.\,\{x \mid \text{linguist}\,x\}$ | $\lambda i.\,\{i_0\}$ |
| $s \to \{\langle a, s\rangle\}$ | $\lambda i.\,\{\langle x, i\rangle\}$ | $\lambda\kappa.\,\bigcup_{\langle x,j\rangle\in m\,i}\kappa\,x\,j$ | $\lambda i.\,\{\langle x, i\rangle \mid \text{linguist}\,x\}$ | $\lambda i.\,\{\langle i_0, i\rangle\}$ |

**Table 1:** Progressively enriching a grammar to handle alternatives, alternatives with state-sensitivity, and alternatives with state modification.

# 3 Taking stock

- See Table 1 for comparison of the various paradigms for dealing with alternatives. We begin without any fanciness. We progressively incorporate alternatives, state-sensitivity, and state modification.
- Each progressive enrichment reflects a different decomposition of LIFT into into two type-shifters (in addition, these type-shifters need to relate in a couple more ways that I have not spelled out here; see Shan 2002; Charlow 2014 for further discussion). This places substantive constraints on our theory.
- Notice that we can now see even Partee 1986's original type-shifting approach as a version of the same strategy, but one that inhabits a semantics in which even "fancy" things are "boring" (similar comments apply to other extant type-shifting approaches to scope-taking, e.g. Hendriks 1993; Barker & Shan 2014).

- So there's strong evidence that we need *one* of the bottom two rows. But which? The dynamic extension is a neat trick, but is there any reason to adopt it? I think so.

# 4 Arguing for dynamics

## 4.1 Feeding anaphora

- We begin with a datum: *exceptional scope-taking feeds anaphora*. The indicated reading of (3) is only licit when the indefinite takes exceptional scope over *if*:

  (3) If ⟨a relative of mine$_i$ dies⟩ I'll inherit a house. I only wish I knew her$_i$ name.

- This argues for our dynamic characterization of fanciness. Compare how the static alternatives-based framework renders the island in this case — in (17) — with how the dynamic approach handles the island — in (18):

$$\lambda i.\, \{\text{dies}\, x \Rightarrow \text{house} \mid \text{relative}\, x\} \tag{17}$$

$$\lambda i.\, \{\langle \text{dies}\, x \Rightarrow \text{house}, i \cdot x\rangle \mid \text{relative}\, x\} \tag{18}$$

- LF pied-piping (18) but not (17) via ⇑ over the second conjunct will allow the indefinite to bind into the latter. This makes all the difference in the world. Since there is (we are assuming) no way for the indefinite to actually scope over the pronoun in such configurations, the binding must be *indirect*, mediated by the scope island in which the indefinite is embedded. Only the dynamic approach secures this result.

- Thus, to the extent that we wish to tie together exceptional scope-taking and anaphora (and the data seems to argue that they should be closely related), it seems that the dynamic version of the semantics does a better job.

## 4.2 The variety of exceptionally scoping drefs

- Though ellipsis seems to require *identity of meaning* — i.e. ex. (4) is 2- rather than 4- ways ambiguous — the meaning of pronominal elements can shift between antecedent and ellipsis site — i.e. the indicated reading of ex. (5) is grammatical, despite the fact that the antecedent and elided pronouns do not seem to corefer:

  (4) John went to the bank, and then BILL did ~~go to the bank~~.

  (5) John$_i$ did his$_i$ homework, but BILL$_j$ didn't ~~do his$_j$ homework~~.

- The indicated reading of (5) is called the *sloppy* reading. Now, a well-motivated assumption about sloppy ellipsis is that it requires **binding** (e.g. Sag 1976; Evans 1988; Rooth 1992, &c). More specifically, for ellipsis to be licensed, it must be the case that there is a way to replace *focused* (i.e. CAPITALIZED) expressions in the elliptical clause $\mathcal{E}$ that yields a new clause $\mathcal{E}'$ which means the same thing as the antecedent sentence (Rooth 1992).



- This can only be so if a sloppy pronoun *covaries* with its focused antecedent, which requires binding — perhaps dynamic binding (Tomioka 1999; Wescoat 1989):

  (6) Every farmer who owns a donkey$_i$ beats it$_i$.
  But NO farmer who owns a SHEEP$_j$ does ~~beat it$_j$~~.

- But in some cases even dynamic binding is impossible to secure without a bit of exceptional scope. Though dynamic theories standardly expand the range of possible binding configurations, they rule out binding in examples like the following:

  (7) If everyone ⟨who meets John$_i$⟩ complains, we'll tell him$_i$.
  If everyone ⟨who meets BILL$_j$⟩ complains, we WON'T ~~tell him$_j$~~.

- This seems to provide some more motivation for the idea that exceptional scope-taking should feed anaphora. Here, the thing taking exceptional scope is the (discourse referent contributed by the) proper name *BILL*!

- Notice that the phenomena in question is cross-categorial. This would seem to suggest that many things besides proper names make discourse referents, and that these should be the sorts of things that can take exceptional scope.

  (8) If everyone ⟨who drinks coffee$_i$⟩ comes, we'll need to buy more$_i$.
  If everyone ⟨drinks TEA$_j$⟩ comes, we WON'T ~~need to buy more$_j$~~.

- Last, we haven't talked all that much about discourse referents besides those induced by indefinites (and, now, proper names). But quantifiers make drefs too!

  (9) At least six senators$_i$ [supported Cruz's filibuster]$_j$. They$_{i\cap j}$ hate Obama.

- The foregoing discussion seems to suggest that we should expect such discourse referents to take exceptional scope. Do they? It seems so:[4]

  (10) Everyone heard the rumor that ⟨at least six senators$_i$ [supported Cruz's filibuster]$_j$⟩. It turned out to be erroneous: they$_{i\cap j}$ numbered at most three.

[4] One might object that this sort of anaphora is not binding. It could just be a bit of serendipitous "accidental coreference". However, the possibility of sloppily construing this dref suggests otherwise:

(i) If everyone hears the rumor that ⟨at least six senators$_i$ [support Cruz's filibuster]$_j$⟩, we'll need to find out how many of them$_{i\cap j}$ there actually are.
If everyone hears the rumor that ⟨at least six CONGRESSMEN$_k$ [support Cruz's filibuster]$_l$⟩, we WON'T ~~need to find out how many of them$_{k\cap l}$ there actually are.~~

## 5 Onward: other notions of fanciness

- Focus shares some of the same properties as indefinites — namely, island-insensitivity and selectivity:

  (11) John will only be offended if ⟨we invite BILL⟩.

  (12) The farmer who GROWS rice only likes [the farmer who SELLS rice].

- Unlike indefinites, with focus there is a highlighted or distinguished member of the alternative set — the one corresponding to the "actual" meaning of the focused expression. This suggests the following "fancy" type:

$$\mathsf{F}\alpha ::= \langle \alpha, \{\alpha\} \rangle \tag{19}$$

  [**Exercise:** work out $\boxed{\cdot}$ and $\Uparrow$ for this type; determine what predictions it makes *vis à vis* exceptional scope and selectivity.]

- Other fancy types are conceivable. E.g. for a second dimension of content à la Potts on implicature, we might imagine something like the following (see Giorgolo & Asudeh 2012 for something along these lines):

$$\mathsf{F}\alpha ::= \langle \alpha, t \rangle \tag{20}$$

  Or, perhaps, we may want a second dimension that interacts with dynamic binding:

$$\mathsf{F}\alpha ::= s \to \{\langle \langle \alpha, t \rangle, s \rangle\} \tag{21}$$

- On *any* of these approaches, fancy things interact with their context by **taking scope**. $\boxed{\cdot}$ + $\Uparrow$ + scope thus turns out to be quite a robust way to add widgets to a grammar.

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