Wide Scope Indefinites

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PLIN0056 Semantic Research Seminar 2022: Week 3

Week 1 ~~7 October: Referential indefinites and wide scope~~

Week 2 ~~14 October: Choice functions~~

Week 3 21 October: Pied-piping and scope

- Reading: Charlow 2020
- Optional reading: Charlow 2014, Demirok 2019: Ch. 4

Week 4 28 October: Indefinites and presuppositions

- Reading: Geurts 2010
- Optional reading: Van Geenhoven 1998, Onea 2015

Week 5 4 November: A neo-Heimian theory of indefinites with exceptional scope

- Reading: von Fintel 1998, Heim 2011
- Optional reading: Heim 1982

1 Background: quantifier scope in compositional semantics

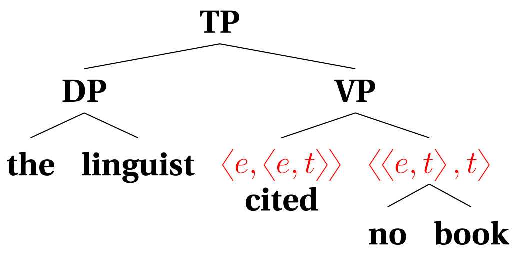
According to Generalised Quantifier Theory, quantificational DPs denote Generalised Quantifiers (GQs), which are functions of type $\langle\langle e,t\rangle, t\rangle$.

(1) a. $[\![$**every student**$]\!]^g = \lambda P_{\langle e,t\rangle}$. for every student x, $P(x) = 1$
b. $[\![$**no book**$]\!]^g = \lambda P_{\langle e,t\rangle}$. for every book x, $P(x) = 0$

1.1 Object quantifiers

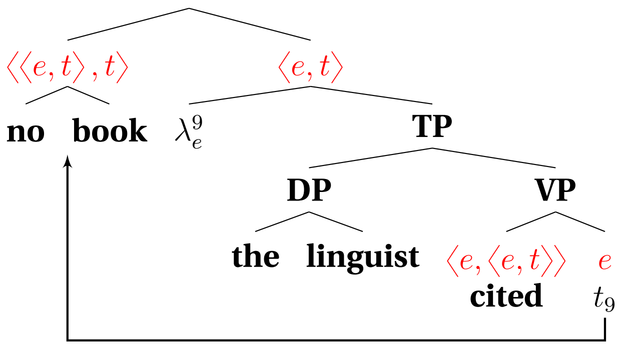
Quantificational subjects can combine with VPs, but quantificational objects will give rise to a type-mismatch (e.g., Heim & Kratzer 1998, Jacobson 2014 for more details).

(2) a. $[\![$**cited Charlow 2020**$]\!]^g = \lambda x_e$. x cited Charlow 2020.
b. $[\![$**cited**$]\!]^g = \lambda y_e.\lambda x_e$. x cited y



There are three ways to resolve the type-mismatch (which are mutually compatible).

- Quantifier Raising (QR)



The surface scope reading can be derived either by QRing the subject quantifier above the object quantifier, or by assuming the VP-internal subject position and QRing the object quantifier above it.

- Type-shifting the transitive verb ('Semantic QR')

(3) $[\![\textbf{cited}]\!]^g = \lambda Q_{\langle\langle e,t\rangle,t\rangle}.\lambda x_e.\ Q(\lambda y_e.\ x \text{ cited } y)$

This can be used with referring objects of type-e, thanks to the isomorphism between individuals and their 'lifted' counterparts:

(4) If $a \in D_e$, $\mathsf{LIFT}(a) := \lambda P_{\langle e,t\rangle}.\ P(a) = 1$.

Montague 1973 proposes an intensional version of (3) (in part to account for intensional transitive verbs like *seek*). This is known as 'generalisation to the worst case'.

We could even make the subject slot quantificational:

(5) $[\![\textbf{cited}]\!]^g = \lambda Q_{\langle\langle e,t\rangle,t\rangle}.\lambda R_{\langle\langle e,t\rangle,t\rangle}.\ R(\lambda x_e.\ Q(\lambda y_e.\ x \text{ cited } y))$

This is overkill, but a version of this could be used to account for inverse scope:

(6) $[\![\textbf{cited}_{\textbf{inv}}]\!]^g = \lambda Q_{\langle\langle e,t\rangle,t\rangle}.\lambda R_{\langle\langle e,t\rangle,t\rangle}.\ Q(\lambda y_e.\ R(\lambda x_e.\ x \text{ cited } y))$

- Type-flexible quantifiers

(7) a. $[\![\textbf{every student}_{\textbf{subj}}]\!]^g = \lambda P_{\langle e,t\rangle}.$ for every student x, $P(x) = 1$

b. $[\![\textbf{every student}_{\textbf{obj}}]\!]^g = \lambda R_{\langle e,\langle e,t\rangle\rangle}.\lambda y_e.$ for every student x, $R(x)(y) = 1$

We can type-shift (7b) further to get inverse scope.

(8) $[\![\textbf{every student}_{\textbf{obj.inv}}]\!]^g$
$= \lambda R_{\langle e,\langle e,t\rangle\rangle}.\lambda Q_{\langle\langle e,t\rangle,t\rangle}.$ for every student x, $Q(\lambda y_e.\ R(x)(y) = 1)$

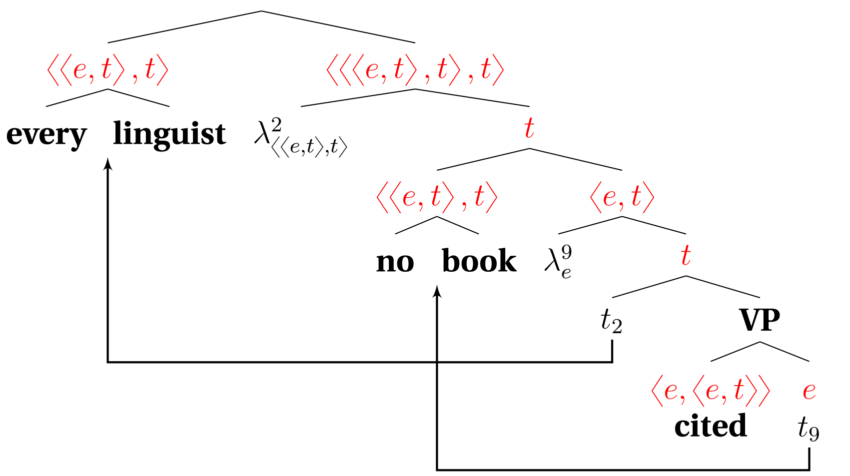
We'll adopt the first strategy, but as Charlow 2020 remarks, we don't need to.

1.2 Semantic reconstruction

Movement doesn't entail wide scope. It also depends on the semantic type of the trace: If the moved phrase and the trace have the same semantic type, the moved phrase semantically reconstructs.
Let us type-generalise Predicate Abstraction:

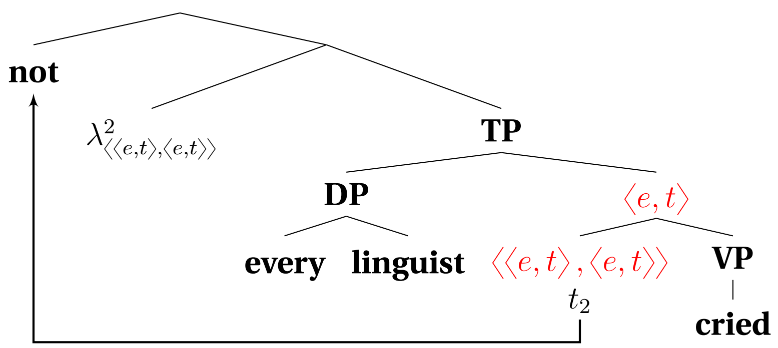
(9) *Predicate Abstraction*

$$\left[\!\!\left[\begin{array}{c} \wedge \\ \lambda^i_\tau \quad \alpha \end{array} \right]\!\!\right]^g = \lambda x_\tau.\ [\![\alpha]\!]^{g[i\mapsto x]}$$



This is still the inverse scope reading. The surface scope is derived if the trace is of type e.
This is true for other operators:

(10) $[\![\textbf{not}]\!]^g = \lambda P_{\langle e,t\rangle}.\lambda x_e.\ P(x) = 0$



This will be true iff no linguist cried, which is the surface scope reading.
To derive wide scope reading of the negation by moving it, we need to give it a type that can take scope, e.g.

(11) $[\![\textbf{not}_{\textbf{scopal}}]\!]^g = \lambda P_{\langle\langle\langle e,t\rangle,\langle e,t\rangle\rangle,t\rangle}.P(\lambda Q_{\langle e,t\rangle}.\,Q) = 0$

1.3 Pied-piping and scope

Charlow's 2014, 2020: Wide scope doesn't require movement to the target scope position.
Quantifiers, including indefinites, never leave scope islands, but scope islands take scope. When an indefinite takes scope at the edge of a scope island, it behaves as if it's outside the scope island (see also Demirok 2019).

2 Extensional Charlow

2.1 Types

(12) *Types*

a. e and t are types. (We'll later add a)
b. If σ and τ are types, then $\langle\sigma,\tau\rangle$ is a type.
c. If τ is a type, then $\hat{\tau}$ is a type.
d. Nothing else is a type.

(13) *Domains*

a. $D_e = D$, the set of entities. We assume D to be ordered by the usual part-whole relation $\sqsubseteq$.
b. $D_t = \{0,1\}$.
c. (D_a is the set of assignments.)
d. $D_{\langle\sigma,\tau\rangle} = D_\tau^{D_\sigma}$.
e. $D_{\hat{\tau}} = \wp(D_\tau)$.

2.2 Compositional Rules

Let us assume the usual compositional rules from Heim & Kratzer 1998 (except that Predicate Abstraction is type-generalised).

(14) *Functional Application*
If α is a branching node with β and γ as its daughters such that $[\![\beta]\!]^g \in D_{\langle\sigma,\tau\rangle}$ and $[\![\gamma]\!]^g \in D_\sigma$, then $[\![\alpha]\!]^g = [\![\beta]\!]^g([\![\gamma]\!]^g)$.

(15) *Predicate Abstraction*

$$\left[\!\!\left[\begin{array}{c} \wedge \\ \lambda^i_\tau \quad \alpha \end{array}\right]\!\!\right]^g = \lambda x_\tau.\,[\![\alpha]\!]^{g[i\mapsto x]}$$

Unlike Charlow 2020 we follow Heim & Kratzer 1998 and let the compositional rule pass g to the next level.

Charlow points out that (15) can be defined as an operator, instead of a syncategorematic rule, but that's obvious and not so important. He also uses the β-operator from Büring 2004 but we are not dealing with Weak Crossover so we won't need it.

2.3 Indefinites

Indefinites are of type $\widehat{e}$, so the indefinite article is of type $\langle\langle e,t\rangle, \widehat{e}\rangle$.[1]

(16) $[\![\textbf{a cat}]\!]^g = \{\, x \mid x \text{ is a cat} \,\}$

(17)
a. $[\![\textbf{cat}]\!]^g = \lambda x_e.\, x \text{ is a cat}$
b. $[\![\textbf{a}]\!]^g = \lambda P_{\langle e,t\rangle}.\ \{\, x \mid P(x) = 1 \,\}$

In the end, the indefininte gets an existential meaning via an operation that corresponds to Existential Closure. We implement it as a closure operator:

(18) $[\![\Downarrow]\!]^g = \lambda T_{\widehat{t}}.\, 1 \in T$

There are two type-shifters in the system. These are also treated as operators here.

(19)
a. $[\![\eta]\!]^g = \lambda x_\tau.\ \{\, x \,\}$
b. $[\![\gg=]\!]^g = \lambda X_{\widehat{\sigma}}.\lambda f_{\langle \sigma,\widehat{\tau}\rangle}.\ \bigcup_{x\in X} f(x)$

$\gg=$ will combine with an indefinite and yield a kind of quantifier that can take scope.

(20) $$\left[\!\!\left[\ [\ \gg=\ [\ \textbf{a}\ \ \textbf{cat}\ ]\ ]\ \right]\!\!\right]^g = \lambda f_{\langle e,\widehat{\tau}\rangle}.\ \bigcup_{x\in\{\, x \mid x \text{ is a cat} \,\}} f(x)$$

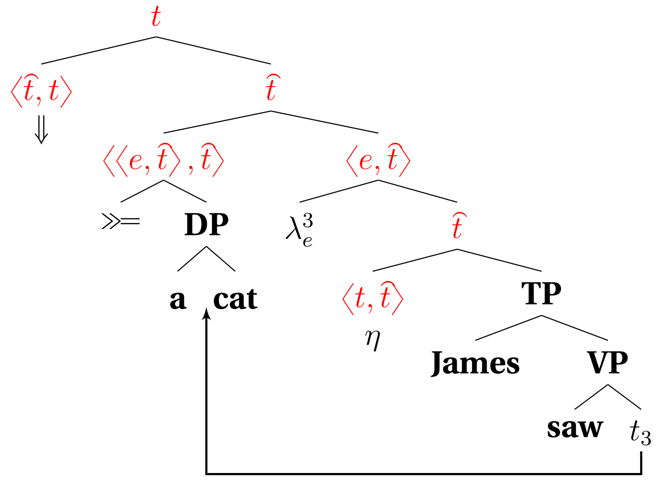
This is of type $\langle\langle e,\widehat{\tau}\rangle, \widehat{\tau}\rangle$. In the simplest case, it will be $\langle\langle e,\widehat{t}\rangle, \widehat{t}\rangle$.
We could assume that $\gg=$ is part of the meaning of an indefinite, but crucially, this operator will be used for other constituents as well.

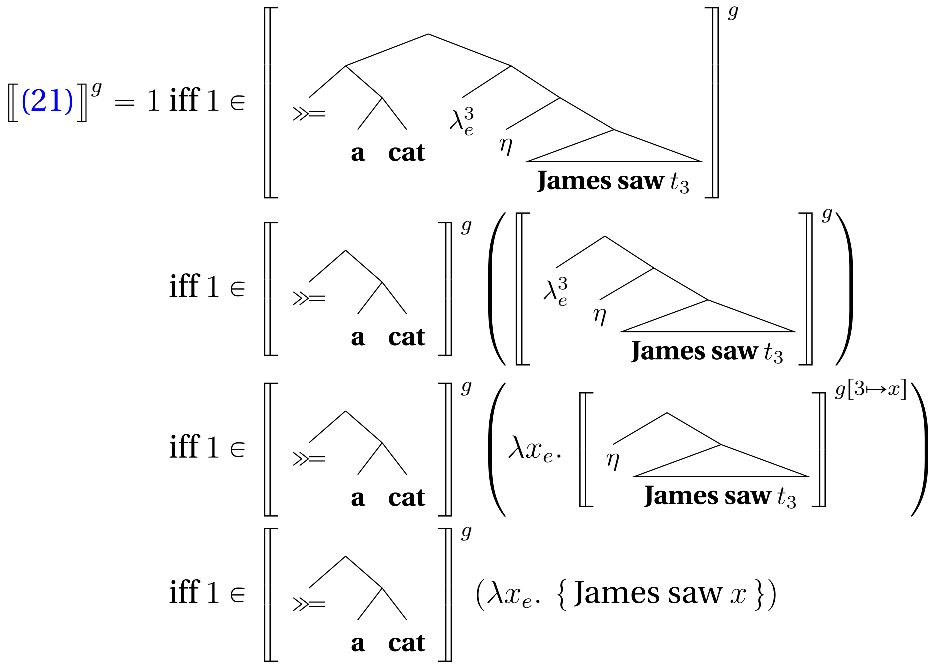
2.4 Example

A simple sentence with an indefinite is interpreted as follows. As Charlow remarks, scope taking doesn't need to be done by QR, but we'll stick to Heim & Kratzer 1998.

[1] Demirok 2019 proposes a similar account with the usual existential denotations for indefinites. We won't review it here.

(21)





$$\text{iff } 1 \in \bigcup_{y \in \{\, y \mid y \text{ is a cat} \,\}} \{\, \text{James saw } y \,\}$$

iff $1 \in \{\,\text{James saw } x \mid x \text{ is a cat}\,\}$

iff there is at least one cat that James saw

$\gg=$ takes $\{\, y \mid y$ is a cat $\}$, substitutes each cat for y in $\{$ James saw $y\,\}$, and returns the set containing each of these.

Since the present system is existential, the resulting set will be either $\{\,0\,\}$ (when James saw no cat), $\{\,1\,\}$ (when James saw every cat), or $\{\,0, 1\,\}$ (when James saw some but not all cats).

3 Exceptional wide scope via pied-piping

In this system, an indefinite can take exceptional wide scope without moving out a scope island. The key is that the scope island can take scope via $\gg=$.

(22) If a relative dies, James will be rich.

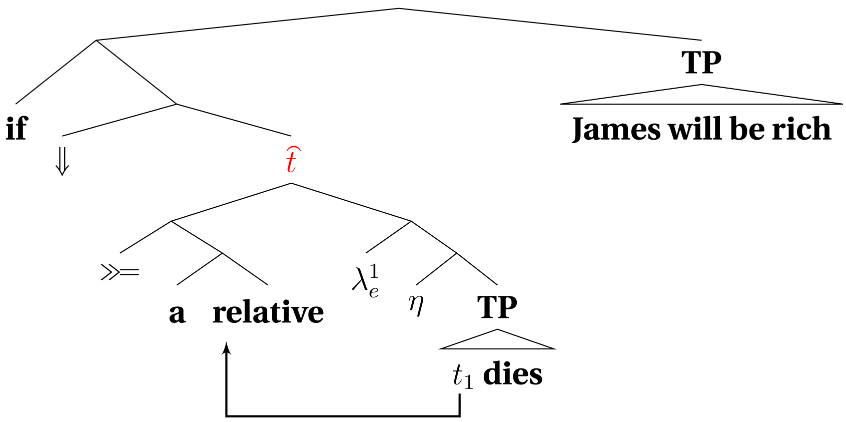
The current system is extensional, so let's assume *if …, (then) …* as material implication.

(23) $[\![\textbf{if}]\!]^g = \lambda v_t.\lambda u_t.v = 0 \text{ or } u = 1$
$\phantom{[\![\textbf{if}]\!]^g} = \lambda v_t.\lambda u_t.v \rightarrow u$

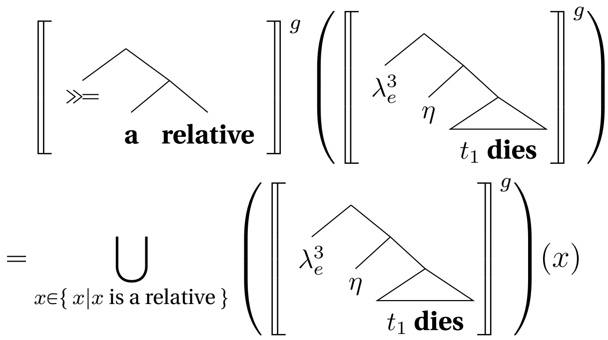
3.1 Narrow scope

The narrow scope reading will be derived with the following LF:

(24)



The antecedent is true iff the following set of truth-values contains 1:



$$= \bigcup_{x \in \{ x | x \text{ is a relative} \}} \{ x \text{ dies} \}$$

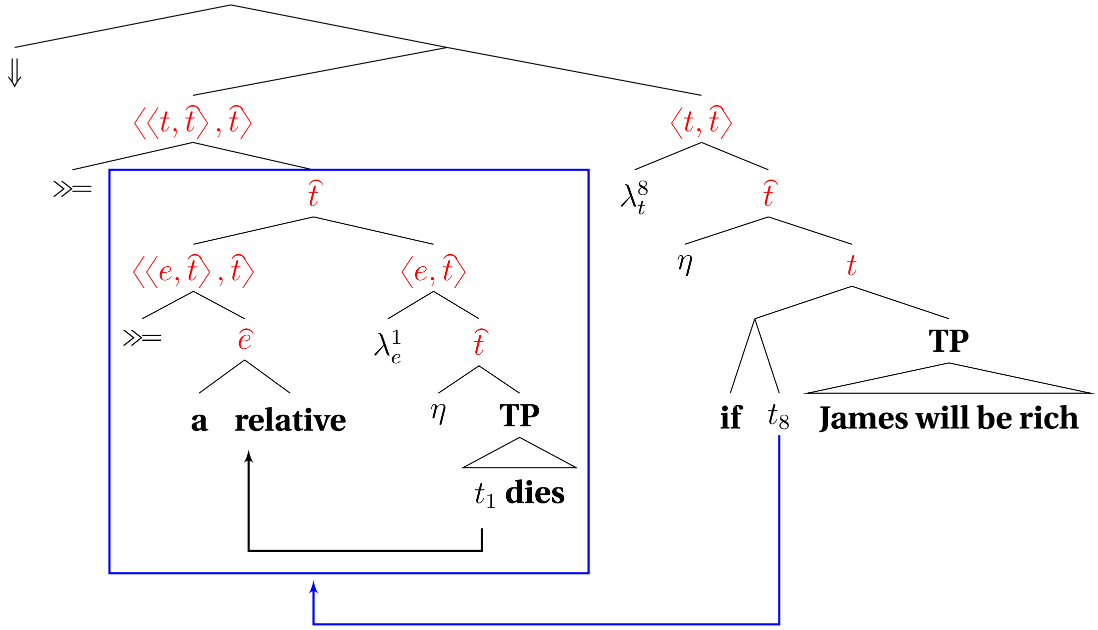
$$= \{ x \text{ dies} \mid x \text{ is a relative} \}$$

3.2 Wide scope

The exceptional wide scope reading will be derived by having the scope island (the antecedent clause here) take scope over *if*. (You might think that this movement is illicit, but see below for a more complicated derivation)

The scope island here is of type $\widehat{t}$, but $\gg\!=$ turns any constituent of a set type into a scope taker, here of type $\langle\langle t, \widehat{t}\rangle, \widehat{t}\rangle$.

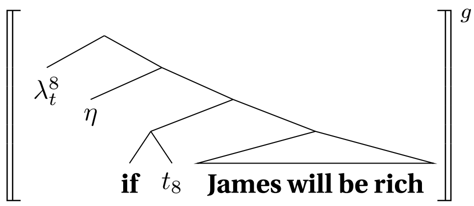
(25)



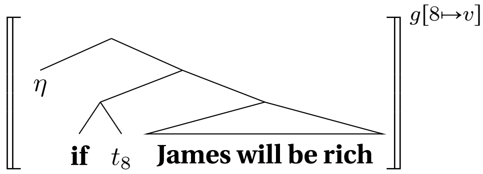
We've computed the denotation of the moved clause in the blue square, namely, $\{\, x$ dies $\mid x$ is a relative $\}$. Applying $\gg\!=$ to this, we get:

(26) $$\lambda f_{\langle t,\hat{t}\rangle}. \bigcup_{v\in\{\, x \text{ dies} \mid x \text{ is a relative}\,\}} f(v)$$

Let's compute the denotation of its argument (= the main clause):



$=\lambda v_t.$



$=\lambda v_t.\ \{\, v \rightarrow$ James will be rich $\}$

Applying (26) to this:

$$\{\, x \text{ dies} \rightarrow \text{James will be rich} \mid x \text{ is a relative} \,\}$$

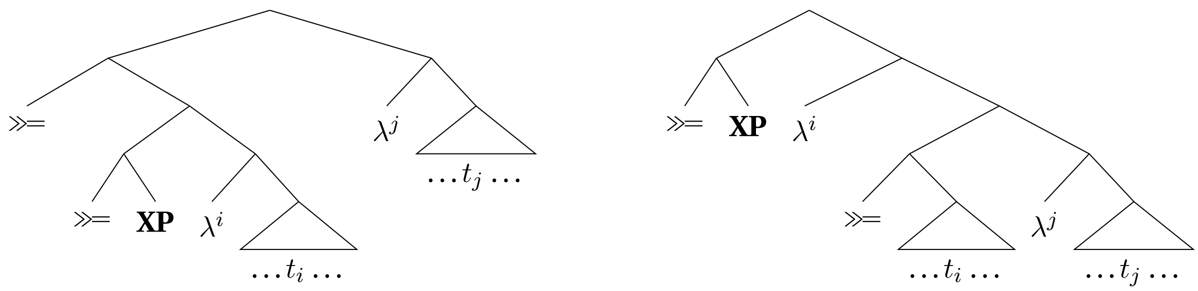
Closing this with $\Downarrow$, (25) will be true iff there is a relative x such that if x dies, James will be rich.

3.3 Wide scope via associativity

$\gg\!=$ shows associativity.

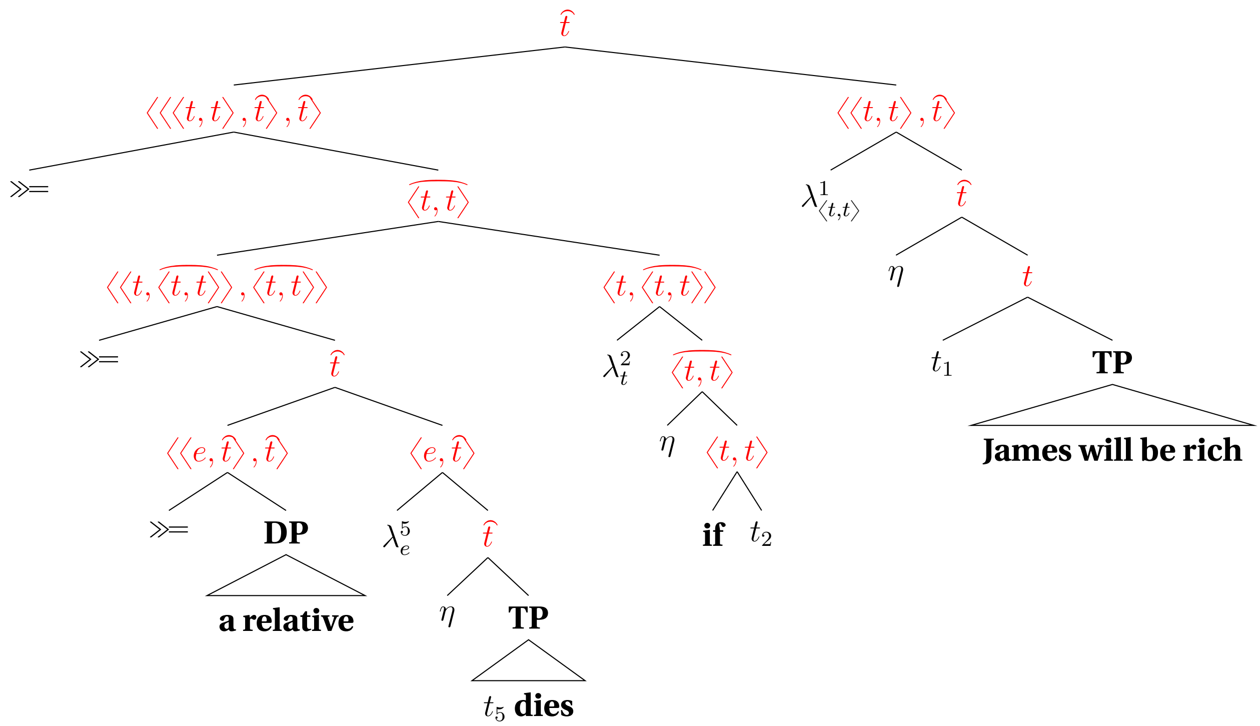
$$
\begin{aligned}
& [\![\gg\!=]\!]^g \left(\left[\!\!\left[\ \gg\!= \ \ \mathbf{XP} \ \right]\!\!\right]^g (\lambda x.\, f(x)) \right) (\lambda y.\, g(y)) \\
= \ & [\![\gg\!=]\!]^g \left(\textstyle\bigcup_{x \in [\![\mathbf{XP}]\!]^g} f(x) \right) (\lambda y.\, g(y)) \\
= \ & \textstyle\bigcup_{y \in \bigcup_{x \in [\![\mathbf{XP}]\!]^g} f(x)} g(y) \\
= \ & \{\, g(y) \mid y \in \{\, f(x) \mid x \in [\![\mathbf{XP}]\!]^g \,\}\,\} \\
= \ & \{\, \textstyle\bigcup_{y \in f(x)} g(y) \mid x \in [\![\mathbf{XP}]\!]^g \,\} \\
= \ & \textstyle\bigcup_{x \in [\![\mathbf{XP}]\!]^g} \left(\textstyle\bigcup_{y \in f(x)} g(y) \right) \\
= \ & \left[\!\!\left[\ \gg\!= \ \ \mathbf{XP} \ \right]\!\!\right]^g (\lambda x.\, [\![\gg\!=]\!]^g (f(x))(\lambda y.\, g(y)))
\end{aligned}
$$

In other words, the following two trees have the same denotations.



3.4 Double pied-piping

As Charlow 2020: fn. 11 remarks, we don't need to move the antecedent clause out of the *if*-phrase. We can move the antecedent clause to the edge of the *if*-phrase, and move the *if*-phrase.



By associativity, we'll get the wide scope truth-conditions.

3.5 Ruys' observation

The account derives Ruys' reading, because the distributivity stays in the scope island.

(27) a. $[\![\textbf{two relatives}]\!]^g = \{\, x \mid x = y \sqcup z$ and both y and z are relatives $\}$
b. $[\![\textbf{two}]\!]^g = \lambda P_{\langle e,t\rangle}.\ \{\, x \mid x = y \sqcup z$ and $P(y) = P(z) = 1\,\}$

But again, we don't know if this is really a good prediction.
Assuming that quantifiers, including noun phrases with modified numerals, do not denote sets but Generalised Quantifiers, there won't be exceptional wide scope readings for them.

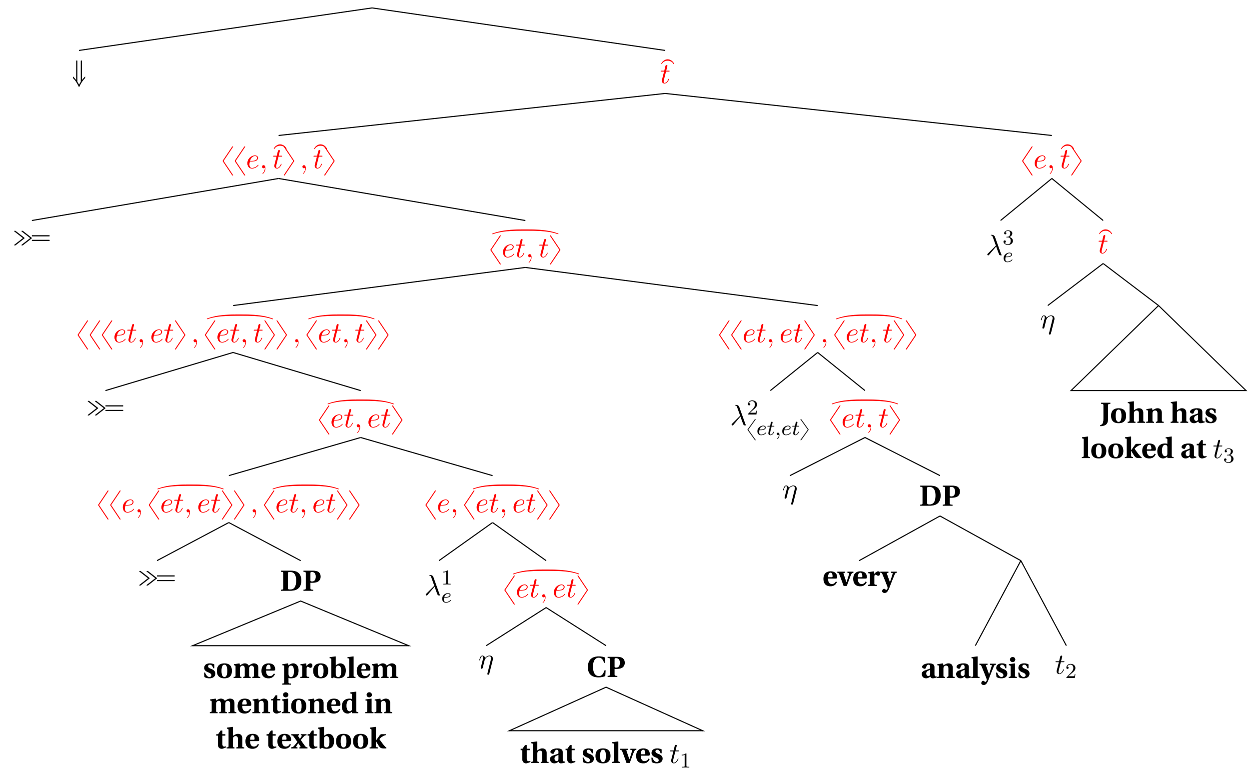
3.6 Universal quantifier

We can account for examples with universal quantifiers in the same way. We assume the usual Generalised Quantifier denotation for *every*.

(28) $[\![\textbf{every}]\!]^g = \lambda P_{\langle e,t\rangle}.\lambda Q_{\langle e,t\rangle}.$ for every $x \in D_e$ such that $P(x) = 1$, $Q(x) = 1$

(29) John has looked at every analysis that solves some problem mentioned in the textbook. (Schwarz 2011: p. 881)

For illustration, we analyse the relative clause as a nominal modifier of type $\langle\langle e,t\rangle,\langle e,t\rangle\rangle$.
(Abbreviation: *et* $:= \langle e,t\rangle$)

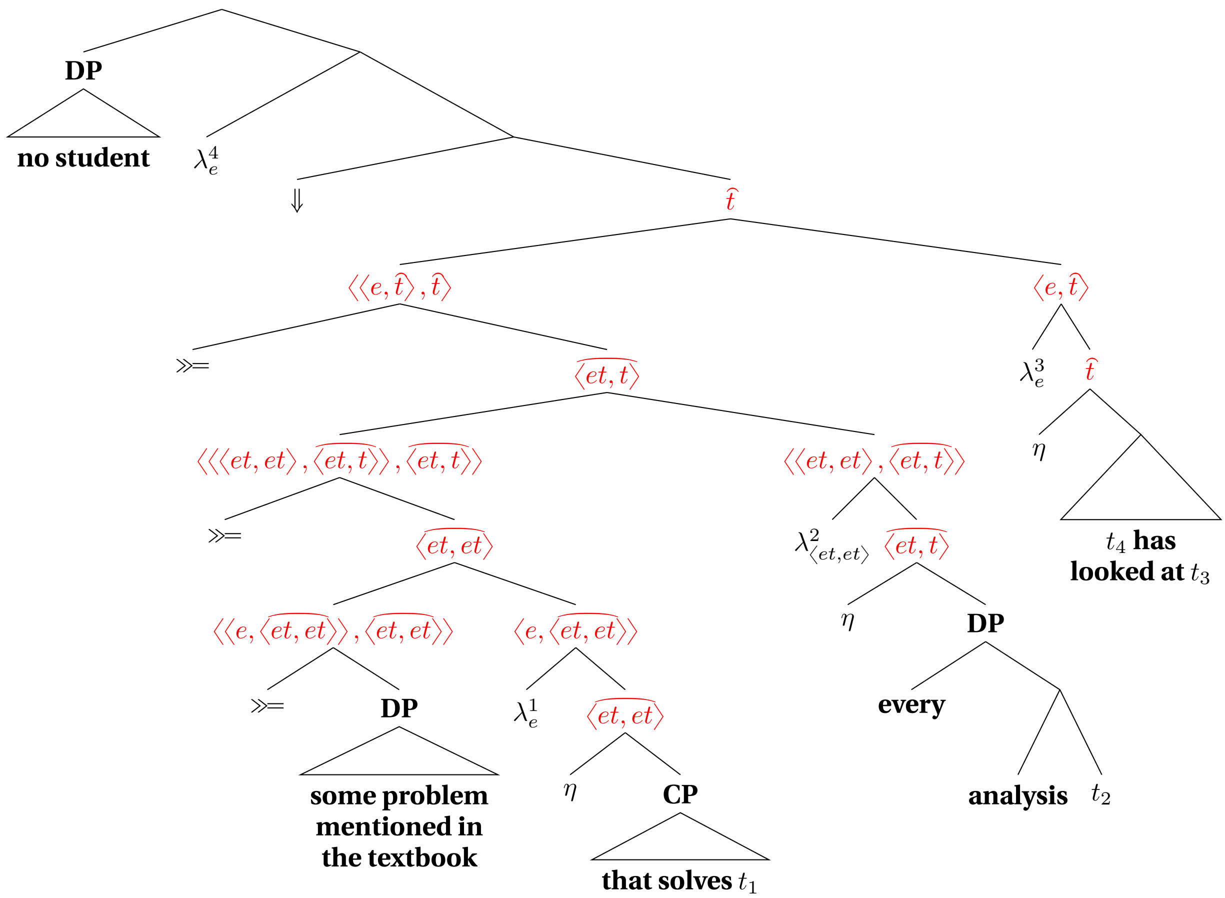


3.7 Intermediate scope reading

The intermediate scope reading is derived by letting the scope island take scope below an operator.

(30) $[\![\textbf{no}]\!]^g = \lambda P_{\langle e,t\rangle}.\lambda Q_{\langle e,t\rangle}.$ for every $x \in D_e$ such that $P(x) = 1$, $Q(x) = 0$

(31) No student has looked at every analysis that solves some problem mentioned in the textbook.



3.8 Undergeneration problem: Schlenker's example

But this analysis cannot explain Schlenker's 2006 observation:

(32) *Context: Every student in my syntax class has one weak point—John doesn't understand Case Theory, Mary has problems with Binding Theory, etc. Before the final I say:*

a. If each student makes progress in some area, nobody will flunk the exam.

b. If each student makes progress in a certain area, nobody will flunk the exam. (adapted from Schlenker 2006: p. 299)

The theory derives the narrow scope reading, the intermediate scope reading, and the wide scope reading. The narrow scope reading is too strong, the other two readings will be some $>$ every.

4 Semantic reconstruction

4.1 Selective scope with multiple indefinites

Charlow 2020: §5 observes that two indefinites in the same scope island don't need to take the same scope.

(33) a. Each student has to come up with three arguments showing that some

condition proposed by a famous syntactician is wrong.

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

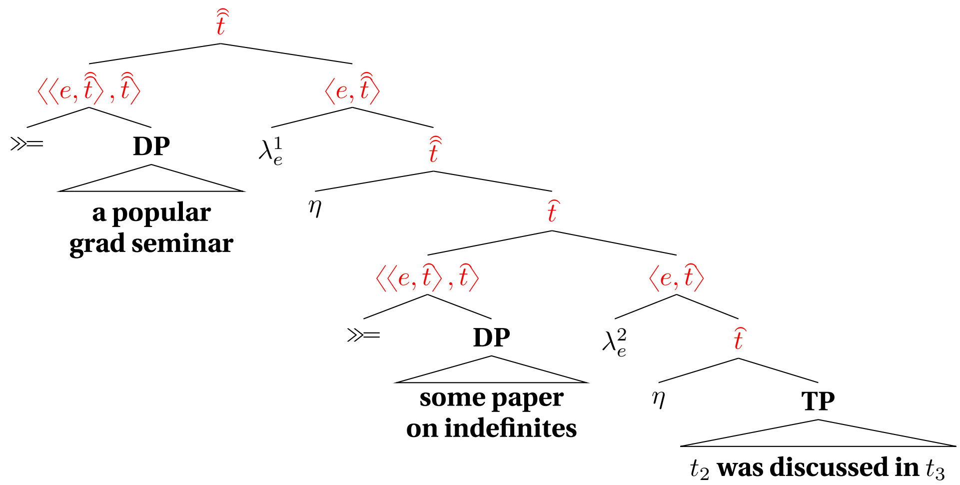
(Charlow 2020: p. 448)

These sentences have the following reading: a $>$ every $>$ some $>$ three/if

This reading is accounted for by using an extra η.

First, move both indefinites to the edge of the scope island. But insert η above the lower indefinite, which will take intermediate scope. Without this extra η, it will take the same scope as the higher indefinite.

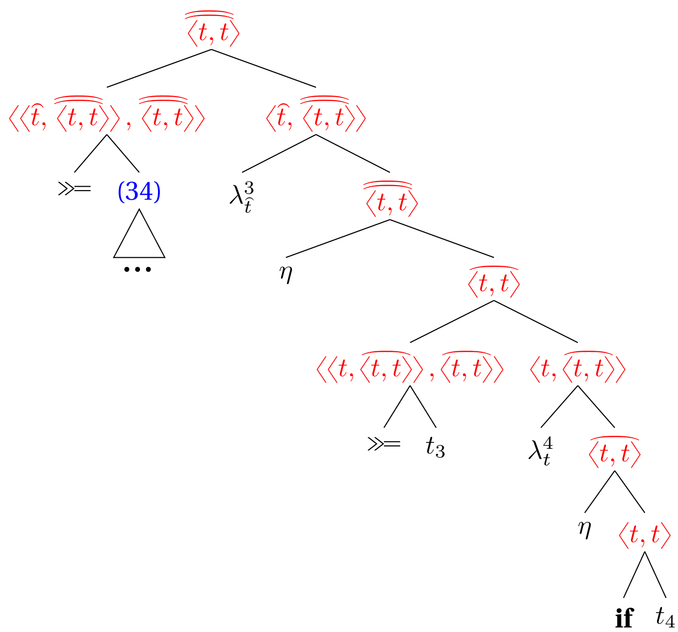
(34)



(35) $$[\![(34)]\!]^g = \left\{ \left\{ x \text{ was discussed in } y \;\middle|\; \begin{array}{l} x \text{ is a paper} \\ \text{on indefinites} \end{array} \right\} \;\middle|\; y \text{ is a grad seminar} \right\}$$

Then let (34) take scope at the edge of the *if*-clause.

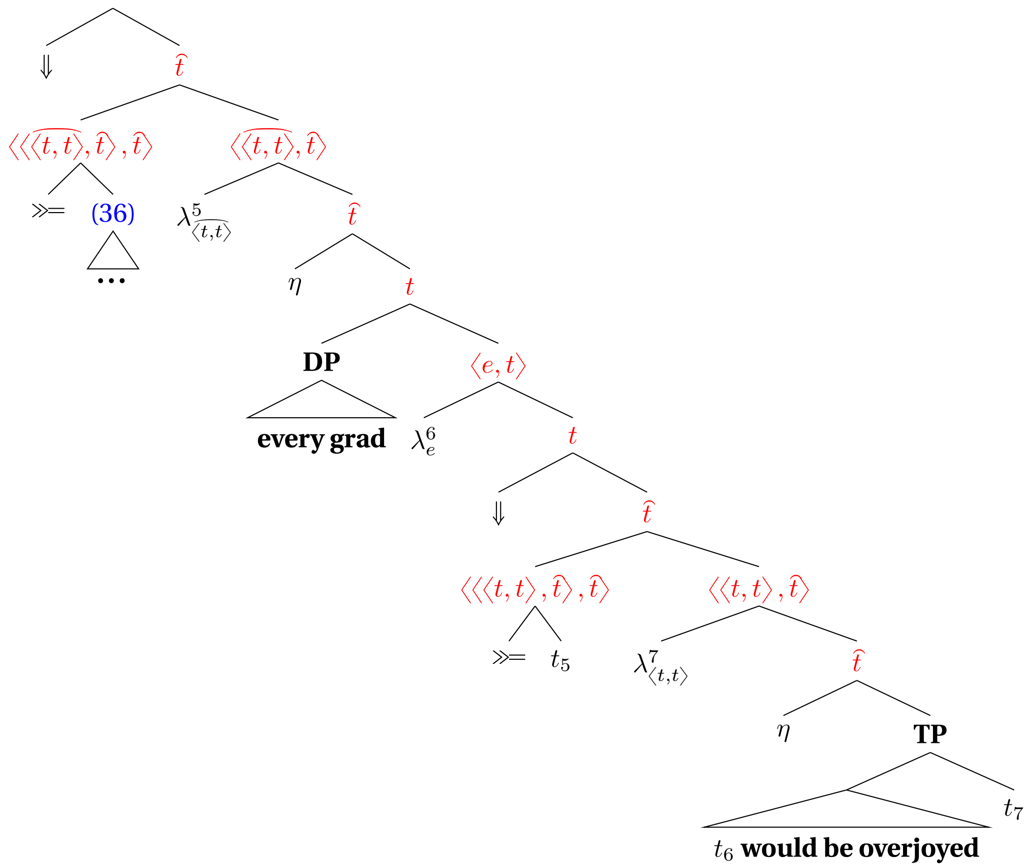
(36)



(37) $$[\![(36)]\!]^g = \left\{ \left\{ \lambda u_t.\ [x \text{ was discussed in } y] \rightarrow u \;\middle|\; \begin{array}{l} x \text{ is a paper} \\ \text{on indefinites} \end{array} \right\} \;\middle|\; \begin{array}{l} y \text{ is a grad} \\ \text{seminar} \end{array} \right\}$$

Finally (36) can take scope over the entire sentence:

(38)



$$[\![(38)]\!]^g = 1 \text{ iff } 1 \in \bigcup_{F \in [\![(36)]\!]^g} \left\{ \begin{array}{l} \text{for every graduate } z, \\ 1 \in \bigcup_{f \in F} \{ f(z \text{ would be overjoyed}) \} \end{array} \right\}$$

$$\text{iff } 1 \in \left\{ \begin{array}{l} \text{for every graduate } z, \\ 1 \in \left\{ \begin{array}{l} [x \text{ was discussed in } y] \\ \rightarrow [z \text{ would be overjoyed}] \end{array} \;\middle|\; \begin{array}{l} x \text{ is a paper} \\ \text{on indefinites} \end{array} \right\} \end{array} \;\middle|\; \begin{array}{l} y \text{ is a grad} \\ \text{seminar} \end{array} \right\}$$

iff there is a grad seminar y such that:
for every graduate student z:
there is a paper on indefinites x such that:
$[x$ was discussed in $y] \rightarrow [z$ would be overjoyed$]$.

The crucial observation is that (36) is a set of sets of conditional antecedents, and each member of this set, which is a set itself, will take scope at the position of t_5. Consequently, the lower indefinite behaves as if it is interpreted at this position. In other words, it semantically reconstructs.

4.2 Binding

A scope island is a scope taker in this approach, but we don't always want a pronoun in it to be interpreted in that position.

E.g., the wide scope reading of (39) is compatible with the bound reading of the pronoun.

(39) Everybody loves it when a famous expert on indefinites cites him.
(Charlow 2020: p. 453)

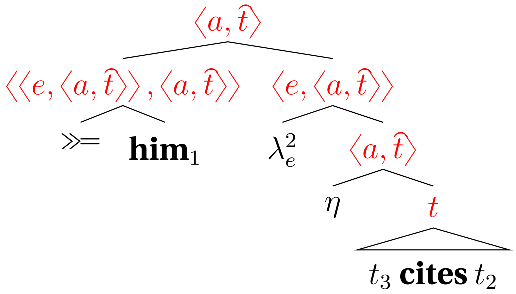
This can be dealt with by making use of the same semantic reconstruction effects as above.

To do this, Charlow 2020 'intensionalises' the whole system. Let a be the type of assignments. Note that we have both i and g: i will be used to interpret pronouns and g to interpret traces.

(40) $[\![\textbf{him}_\xi]\!]^g = \lambda i_a.\ \{\, i(\xi) \,\}$

(41) a. $[\![\eta]\!]^g = \lambda x_\tau . \lambda i_a.\ \{\, x \,\}$
b. $[\![\gg\!=]\!]^g = \lambda X_{\langle a, \widehat{\sigma}\rangle} . \lambda f_{\langle \sigma, \langle a, \widehat{\tau}\rangle\rangle} . \lambda i_a.\ \bigcup_{x \in X(i)} f(x)(i)$

(42)



$$
\begin{aligned}
[\![(42)]\!]^g &= \lambda i_a.\ \bigcup_{x \in \{\, i(1) \,\}} \left[\!\!\left[\left[\lambda^2_e \left[\eta \left[t_3\ \textbf{cites}\ t_2 \right] \right] \right] \right]\!\!\right]^g (x)(i) \\
&= \lambda i_a.\ \left[\!\!\left[\left[\lambda^2_e \left[\eta \left[t_3\ \textbf{cites}\ t_2 \right] \right] \right] \right]\!\!\right]^g (i(1))(i) \\
&= \lambda i_a.\ \left[\lambda x_e.\ \left[\!\!\left[\left[\eta \left[t_3\ \textbf{cites}\ t_2 \right] \right] \right]\!\!\right]^{g[2 \mapsto x]} \right] (i(1))(i) \\
&= \lambda i_a.\ \left[\!\!\left[\left[\eta \left[t_3\ \textbf{cites}\ t_2 \right] \right] \right]\!\!\right]^{g[2 \mapsto i(1)]} (i) \\
&= \lambda i_a.\ \{\, g(3) \text{ cites } i(1) \,\}
\end{aligned}
$$

The important trick is that applying η on top of this, we'll put the intension in a set.

$$
\begin{aligned}
[\![\eta\ (42)]\!]^g &= \lambda j_a.\ \{\, [\![(42)]\!]^g \,\} \\
&= \lambda j_a.\ \{\, \lambda i_a.\ \{\, g(3) \text{ cites } i(1) \,\} \,\}
\end{aligned}
$$

Adding the indefinite on top of this:

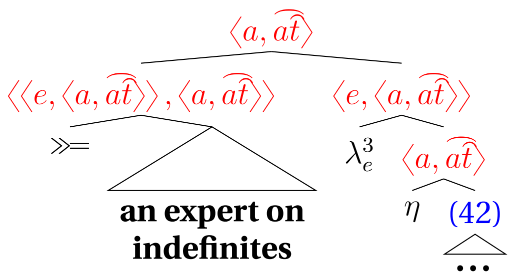
(43) $[\![\textbf{a cat}]\!]^g = \lambda i_a.\ \{\, x \mid x \text{ is a cat} \,\}$

a. $[\![\textbf{cat}]\!]^g = \lambda x_e. x \text{ is a cat}$

b. $[\![\textbf{a}]\!]^g = \lambda i_a.\ \{\, x \mid P(x) = 1 \,\}$

Abbreviation: $a\widehat{t} \coloneqq \langle a, \widehat{t} \rangle$.

(44)



$$
\begin{aligned}
[\![(44)]\!]^g &= \lambda j_a.\ \bigcup_{x \in \{\, x \mid x \text{ is an expert on indefinites} \,\}} [\![\, [\lambda^3_e\ [\eta\ (42) \ldots]] \,]\!]^g (x)(j) \\
&= \lambda j_a.\ \bigcup_{x \in \{\, x \mid x \text{ is an expert on indefinites} \,\}} \left[\lambda y_e.\ [\![\, [\eta\ (42) \ldots] \,]\!]^{g[3 \mapsto y]} \right] (x)(j) \\
&= \lambda j_a.\ \bigcup_{x \in \{\, x \mid x \text{ is an expert on indefinites} \,\}} [\![\, [\eta\ (42) \ldots] \,]\!]^{g[3 \mapsto x]} (j) \\
&= \lambda j_a.\ \{\, \lambda i_a.\ \{\, x \text{ cites } i(1) \,\} \mid x \text{ is an expert on indefinites} \,\}
\end{aligned}
$$

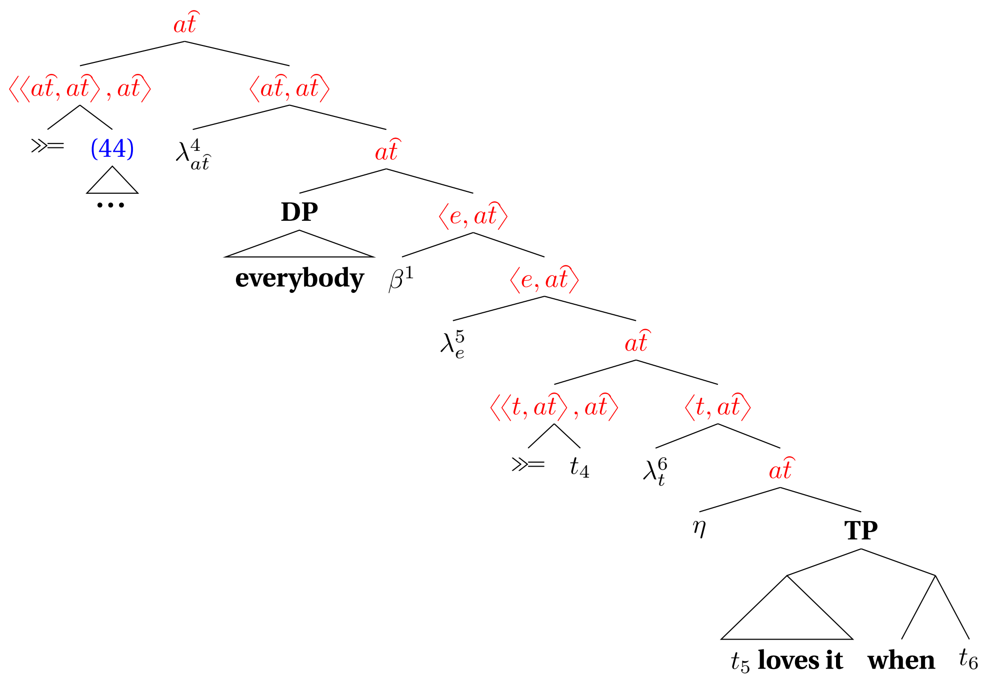
This scopes above the entire sentence that contains a binder of the pronoun. To enable pronominal binding, let us use β (Büring 2004).

(45) $[\![\beta^\xi]\!]^g = \lambda f_{\langle \sigma, \langle a, \tau \rangle \rangle}. \lambda x_e. \lambda i_a.\ f(x)(i[\xi \mapsto x])$

In order for quantifiers to be able to bind pronouns, they are type-raised:

(46) $[\![\textbf{everybody}]\!]^g = \lambda P_{\langle e, a\hat{t} \rangle}. \lambda i_a.\ \{\, \text{for every person } x,\ 1 \in P(x)(i) \,\}$

(47)



$$[\![(47)]\!]^g = \lambda i_a.\ \bigcup_{x \in [\![(44)]\!]^g(i)} \left[\!\!\left[[\,[_{\textbf{DP}}\ \textbf{everybody}]\ [\beta^1\ [\lambda^5_e\ [[\gg\!=\ t_4]\ [\lambda^6_t\ [\eta\ [_{\textbf{TP}}\ t_5\ \textbf{loves it when}\ t_6]]]]]]\,] \right]\!\!\right]^{g[4\mapsto x]}(i)$$

$$= \lambda i_a.\ \bigcup_{x \in [\![(44)]\!]^g(i)} \left\{ \begin{array}{l} \text{for every person } y, \\ 1 \in \left[\!\!\left[[\beta^1\ [\lambda^5_e\ [[\gg\!=\ t_4]\ [\lambda^6_t\ [\eta\ [_{\textbf{TP}}\ t_5\ \textbf{loves it when}\ t_6]]]]]] \right]\!\!\right]^{g[4\mapsto x]}(y)(i) \end{array} \right\}$$

$$= \lambda i_a.\ \bigcup_{x \in [\![(44)]\!]^g(i)} \left\{ \begin{array}{l} \text{for every person } y, \\ 1 \in \left[\!\!\left[[[\gg\!=\ t_4]\ [\lambda^6_t\ [\eta\ [_{\textbf{TP}}\ t_5\ \textbf{loves it when}\ t_6]]]] \right]\!\!\right]^{g[4\mapsto x, 5\mapsto y]}(i[1 \mapsto y]) \end{array} \right\}$$

$$= \lambda i_a.\ \bigcup_{x \in [\![(44)]\!]^g(i)} \left\{ \begin{array}{l} \text{for every person } y, \\ 1 \in \bigcup_{z \in x(i[1\mapsto y])} \left[\!\!\left[[\lambda^6_t\ [\eta\ [_{\textbf{TP}}\ t_5\ \textbf{loves it when}\ t_6]]] \right]\!\!\right]^{g[4\mapsto x, 5\mapsto y]}(z)(i[1 \mapsto y]) \end{array} \right\}$$

$$= \lambda i_a.\ \left\{ \begin{array}{l} \text{for every person } y, \\ 1 \in \bigcup_{z \in \{\, e \text{ cites } y \,\}} \left[\!\!\left[[\lambda^6_t\ [\eta\ [_{\textbf{TP}}\ t_5\ \textbf{loves it when}\ t_6]]] \right]\!\!\right]^{g\left[\begin{array}{l} 4 \mapsto \lambda j_a.\{\, e \text{ cites } j(1) \,\}, \\ 5 \mapsto y \end{array}\right]}(z)(i[1 \mapsto y]) \end{array} \;\middle|\; \begin{array}{l} e \text{ is an expert} \\ \text{on indefinites} \end{array} \right\}$$

4.3 Binder roof constraint

Charlow 2020 remarks that this system disallows indefinites with bound pronouns from taking scope over the binders of the pronouns.

(48) a. Every boy who talked to a friend of his left.

b. No candidate submitted a paper he had written.
(Charlow 2020: p. 458)

Cresti 1995 argues that such readings are available in some examples.

(49) a. If every Italian in this room could manage to watch a certain program about his country (that will be aired on PBS tonight) we might have an interesting discussion tomorrow.
b. No doctor believed the claim that a (certain) member of her profession had been arrested.
c. Everyone who used the bathroom between 2 and 4 pm was questioned about a sink that he could have broken. (Cresti 1995: p. 63)

4.4 *De re/de dicto*

Elliott to appear uses the same scope taking mechanism to account for *de re/de dicto*, especially the so-called 'third reading' (Fodor 1970). See also Demirok 2019.

5 Summary

Charlow 2020 semantically scopes indefinites out of the scope islands they are in.
Two potential undergeneration issues:

- Schlenker's wide scope functional reading
- Cresti's wide scope indefinites with bound pronouns

Charlow 2020: fn. 22 remarks that *certain* might be an indexical modifier, e.g. *a certain paper she had written* means 'a paper she had written with the property I have in mind', thereby giving rise to an impression of wide scope. But some of the problematic examples don't contain *certain*.
Also, the theory doesn't say much about variation among indefinites.

- Charlow motivates the set denotation for indefinites based on the predicative uses. But not all indefinites have predicative uses, e.g., *some NP*, *many NP*.

  (50) a. If some rich relatives of John's die, he will inherit a fortune.
  b. Every professor overheard the rumor that many graduate students in our department were called before the dean.

- Conversely, bare plurals can be used as predicates, but they don't give rise to exceptionally wide scope readings.

  (51) a. If relatives of John's die, he will inherit a fortune.
  b. Every professor overheard the rumor that graduate students in our department were called before the dean.

  Similarly for other narrow scope indefinites e.g., incorporated nouns in West Greenlandic and German split topics (Van Geenhoven 1998).

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