Local contexts for anaphora

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[A woman]$_1$ entered the bar. She$_1$ ordered a beer.

Indefinites and pronouns

Indefinites are special among quantifiers for their anaphoric properties. They can co-vary with:

(1) Pronouns from a different clause $\rightarrow$ *cross-sentential anaphora*
[A woman]$_1$ entered the bar. She$_1$ ordered a beer.

(2) Pronouns outside their scope $\rightarrow$ *donkey anaphora*
Every farmer who owns [a donkey]$_1$ treats it$_1$ well.

Geach (1964)

Even more complicated:

(3) **Cross-sentential + Co-variation with pronouns outside scope**
Every man saw [a donkey]$_1$ in his garden …

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(3) **Cross-sentential + Co-variation with pronouns outside scope**
Every man saw [a donkey]$_1$ in his garden …
= for every man, there was a donkey such that …

Even more complicated:

(3) **Cross-sentential + Co-variation with pronouns outside scope**
Every man saw [a donkey]$_1$ in his garden …
…but very few men dared to touch it$_1$.

Other quantifiers and pronouns

Unlike other singular quantifiers:

(4) **Cross-sentential binding**

a.# [Every woman]$_1$ entered the bar. She$_1$ ordered a beer.

b.# [No woman]$_1$ entered the bar. She$_1$ ordered a beer.

[1] Keshet (2007); Roberts (1987)

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a.#[Every woman]$_1$ entered the bar. She$_1$ ordered a beer.

b.#[No woman]$_1$ entered the bar. She$_1$ ordered a beer.

But, in special contexts:

(5) **Telescoping**[1]
Each degree candidate walked to the stage. He took his diploma from the Dean and returned to his seat.

[1] Keshet (2007); Roberts (1987)

Other quantifiers and pronouns

(6) **Donkey anaphora**
Every fisherman who has sailed every shore$_1$ knows it$_1$ well.

Other quantifiers and pronouns

(6) **Donkey anaphora**
Every fisherman who has sailed every shore$_1$ knows it$_1$ well.

But:

(7) Every fisherman who has sailed every shore$_i$ knows them$_i$ well.

Exceptionality of indefinites

- Cross-sentential binding (cross-sentential anaphora)
- Co-variation with pronouns outside scope (donkey anaphora)
- Both (functional anaphora)

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(8) Every farmer who owns [a donkey]$_1$ treats it$_1$ well.

Most solutions to the donkey problem involve two components[2]

- changing the denotation of indefinite so that it affects some representation of contexts,
- changing the denotation of *every* so that it may pass that representation of context from its scope to its restriction.

[2] Frameworks that can be described in this way: Elbourne's situation approach (**?**), Onea (2013), standard DPL frameworks Groenendijk and Stokhof (1991), etc.

Schlenker's challenge

(9) Every farmer who owns [a donkey]$_1$ treats it$_1$ well.

Most solutions to the donkey problem involve two components[2]

- changing the denotation of indefinite so that it affects some representation of contexts,
- changing the denotation of *every* so that it may pass that representation of context from its scope to its restriction.

Lexical items' denotations therefore need to define:

- their semantic value
- their anaphoric behaviour

---

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Schlenker's challenge

Can the anaphoric behaviour be deduced from the semantic value?

Theoretical desiderata

Explain exceptionality of indefinites

- Cross-sentential anaphora
- Donkey anaphora
- Functional anaphora

Do not encode anaphoric behaviour in particular lexical entry.

Question

What makes indefinites special?

Indefinites are special among quantifiers because:

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Question

What makes indefinites special?

Indefinites are special among quantifiers because:

- they don't have the semantics of a quantifier. $\rightarrow$ System I
- they contribute existential claims. $\rightarrow$ System II

System I: a standard dynamic system

Indefinites in Dynamic Semantics

Indefinites are special in some other ways as well.

(10) **Exceptional scope**[3]
Every professor overheard the rumour that a student of mine was called before the dean.

= there is a student of mine such that ...

It is natural to seek connections between indefinites' **anaphoric behaviour** and **scope behaviour**.

[3] Charlow (2017); Fodor and Sag (1982); Kratzer (1998)

Champollion et al. (2017a)

> “*Assigning “a” an inherently dynamic type and thereby putting it into a separate semantic class from other determiners is common in dynamic frameworks, and is usually motivated at least in part by the different behavior of indefinite determiners, which can bind and take scope out of islands, and quantificational operators, which cannot.*”

$\Rightarrow$ indefinites are special because they have a referent-introduction semantics

Indefinites denote alternatives and introduce a referent[4].

(11) $[\![\text{a woman}]\!]^g \quad = \quad \{\langle \texttt{lola}', g[i \to \texttt{lola}'] \rangle,$
$\langle \texttt{melody}', g[i \to \texttt{melody}'] \rangle,$
$\ldots\}$

[4] Charlow (2014)

Indefinites denote alternatives and introduce a referent[4].

(11) $$[\![\text{a woman}]\!]^g = \{\langle \texttt{lola}', g[i \rightarrow \texttt{lola}']\rangle, \langle \underbrace{\texttt{melody}'}_{\text{semantic value}}, \underbrace{g[i \rightarrow \texttt{melody}']}_{\text{output context}}\rangle, \ldots\}$$

[4] Charlow (2014)

The scope of the alternatives may be closed but the context indeterminacy remain.

(12) $$[\![\exists \text{ a woman entered}]\!]^g \quad = \quad \{\langle \exists x, \mathtt{w}'(x) \wedge \mathtt{e}'(x), g[i \rightarrow \mathtt{lola}']\rangle, \langle \exists x, \mathtt{w}'(x) \wedge \mathtt{e}'(x), g[i \rightarrow \mathtt{melody}']\rangle, \ldots\}$$

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$\rightsquigarrow$ exceptional scope

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$\rightsquigarrow$ exceptional scope
$\rightsquigarrow$ co-variation with element outside scope

(13) a. ∃ A woman$_1$ entered the bar.

b. She$_1$ ordered a beer.

$$\begin{tikzcd}[column sep=large]
 & g[1 \to \texttt{melody}'] & \text{(13b) Melody ordered a beer.} \\
g \arrow[ur, bend left, "\text{(13a)}"] \arrow[r] \arrow[dr, bend right] & g[1 \to \texttt{lola}'] & \text{(13b) Lola ordered a beer.} \\
 & g[1 \to \texttt{sarah}'] & \text{(13b) Sarah ordered a beer.}
\end{tikzcd}$$

Today's observation

Indefinites are not the only DPs to generate donkey readings. Any DP with existential force does.

Under special circumstances, some non-indefinite DPs may get existential readings.

- derived kind predication
- definite plurals

Derived kind predication

Kind-denoting terms introduce existential quantification over instances. (Chierchia, 1998; Scontras, 2017)

(14) I lived with that kind of person once (and I'm not doing it again!)

Derived kind predication

Kind-denoting terms introduce existential quantification over instances. (Chierchia, 1998; Scontras, 2017)

(14) I lived with that kind of person once (and I'm not doing it again!)
= I lived with an instance of the kind ”roommate from hell”

Derived kind predication

(15) If I see that kind of animal in the wild, I'll take a picture of it for you.

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(16) If I see that kind of animal in the wild, I won't take a picture of it.

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= If I see an instance of *Panthera Tigris*, I'll take a picture of that instance.
≈ If I see an instance of *Panthera Tigris*, I'll take a picture of an instance of *Panthera Tigris*

(16) If I see that kind of animal in the wild, I won't take a picture of it.
= If I see an instance of *Panthera Tigris* in the wild, I won't take a picture of that instance.

Derived kind predication

(15) If I see that kind of animal in the wild, I'll take a picture of it for you.
= If I see an instance of *Panthera Tigris*, I'll take a picture of that instance.
$\approx$ If I see an instance of *Panthera Tigris*, I'll take a picture of an instance of *Panthera Tigris*

(16) If I see that kind of animal in the wild, I won't take a picture of it.
= If I see an instance of *Panthera Tigris* in the wild, I won't take a picture of that instance.
$\neq$ If I see an instance of *Panthera Tigris* in the wild, I won't take a picture of an instance of *Panthera Tigris*.

Existential definite plurals

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Existential definite plurals

(17) The toys/**they** are dirty. Yoon (1996)
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Existential definite plurals

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Existential definite plurals

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$\neq$ if any player has an ace of spade, some players get 13 points right away
$\neq$ if any player has an ace of spade, all players get 13 points right away

(20) If you move, I’ll shoot you.

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(20) If you move, I'll shoot you.

= if any of y'all moves, I shoot the person(s) that moved.
≠ if any of y'all moves, I shoot all of you's.
≠ if any of y'all moves, I shoot one of you's.

(21) Every visitor that tried to touch the octopuses in this aquarium made them throw ink.

= every visitor that tried to touch some of the octopuses made these octopuses throw ink.

Today's observation

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So either:

- ⇝ all DPs with existentials involve alternatives (potentially high-scope)
- ⇝ it is not alternatives that generate donkey-like readings.

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So either:

- $\rightsquigarrow$ ~~all DPs with existentials involve alternatives (potentially high-scope)~~
- $\rightsquigarrow$ it is not alternatives that generate donkey-like readings.

(22) Different structures for derived existential meanings
(*a* is the type of DP)

a. [*Op* DP] VP

b. DP [*Op* VP]

(22b) seems to be the preferred option (Chierchia (1998); Križ and Spector (2017); Scontras (2017), Bar-Lev (p.c.))

$\rightsquigarrow$ no exceptional scope !

System II: a truth-conditional approach

Goals

- Remove the dynamics of discourse from lexical entries
- Ensure that any DPs with existential force introduce context indeterminacy.

$\rightsquigarrow$ Schlenker’s system inspired from his work on presupposition

What’s new?

- Use of plural assignments to deal with functional dependencies

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What's new?

- Use of plural assignments to deal with functional dependencies
- Negative quantifiers

$\rightsquigarrow$ Schlenker's system inspired from his work on presupposition

What's new?

- Use of plural assignments to deal with functional dependencies
- Negative quantifiers
- A handle on $\exists/\forall$ readings

Let's proceed stepwise:

- plural assignments to model functional dependencies (Brasoveanu, 2007).
- a "*transparency approach*" for anaphora.

Housekeeping work

(23) **Functional anaphora**

a. Every man saw [a donkey]$_1$ in his garden but very few men dared to touch it$_i$.

b. Every man saw [a donkey]$_1$ in his garden but they$_1$ were too far to touch.

Representation of context

The context is represented as a set of assignment G.

(24) Every man$_1$ saw a donkey$_2$

	1	2	…
g_0	$\texttt{bill}'$	$\texttt{floppy}'$	…
g_1	$\texttt{joey}'$	$\texttt{twix}'$	…
g_2	$\texttt{kurt}'$	$\texttt{crunch}'$	…

…

Housekeeping work

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$$G = \{g_0, g_1, g_2, \ldots\}$$

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		...	

$G = \{g_0, g_1, g_2, \ldots\}$

a man

a donkey that he saw

Housekeeping work

Pronoun interpretation

$[\![\mathrm{pro_i}]\!]^G = \bigoplus_{g \in G} g(i)$

(25) Every man_1 saw a donkey_2 ... $\text{They}_{1/2}$ ...

	1	2	...
g_0	$\mathtt{bill}'$	$\mathtt{floppy}'$	...
g_1	$\mathtt{joey}'$	$\mathtt{twix}'$	...
g_2	$\mathtt{kurt}'$	$\mathtt{crunch}'$	...
	...		

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g_2	$\texttt{kurt}'$	$\texttt{crunch}'$	...
		...	

$[\![\mathrm{they_1}]\!]^G = \texttt{bill}' \oplus \texttt{joey}' \oplus \ldots$

$[\![\mathrm{they_2}]\!]^G = \texttt{floppy}' \oplus \texttt{twix}' \oplus \ldots$

Housekeeping work

$\lambda-$abstraction rule

$[\![\lambda_i.\ \mathsf{A}]\!]^G = \lambda x.\ [\![\mathsf{A}]\!]^{G \cap \{g\ /\ g(i)=x\}}$

(26) Every man$_1$ saw a donkey$_2$ ... No man λ_1. t_1 touched it$_2$ ...

	1	2	...
g_0	`bill`′	`floppy`′	...
g_1	`joey`′	`twix`′	...
g_2	`kurt`′	`crunch`′	...

...

Housekeeping work

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	1	2	...	
g_0	$\mathtt{bill}'$	$\mathtt{floppy}'$	...	$x = \mathtt{bill}'$

...

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	1	2	…	
g_1	$\mathtt{joey}'$	$\mathtt{twix}'$	…	$x = \mathtt{joey}'$
	…			

Housekeeping work

$\lambda-$abstraction rule

$[\![\lambda_i.\ \mathsf{A}]\!]^G = \lambda x.\ [\![\mathsf{A}]\!]^{G \cap \{g\ /\ g(i)=x\}}$

(26) Every man$_1$ saw a donkey$_2$ … No man λ_1. t_1 touched it$_2$ …

	1	2	…	
g_2	$\mathtt{kurt}'$	$\mathtt{crunch}'$	…	$x = \mathtt{kurt}'$
		…		

Recap

- Plural assignments record relations between individuals.
- Pronouns pick up the plurality of individuals in a columns.
- $\lambda-$abstraction evaluate constituents over sub-contexts.

Information contributed by a quantified sentence

Question

How do those contexts come to be?

Information contributed by a quantified sentence

Question

How do those contexts come to be?

(27) [Quantifier NP] Predicate

What information about a referent does a quantified sentence contribute ?
$\rightsquigarrow$ the strongest predicate R that can be added to its scope *salva veritate*
This information is added to the context by simple intersection

(28) Every woman λ_1 t_1 entered the bar … They$_1$ …

- [*Every* woman] λ_i. t_i entered-the-bar

(28) Every woman λ_1 t_1 entered the bar … They$_1$ …

- [*Every* woman] λ_i. t_i entered-the-bar $\cap$ $R(t_i)$

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- [*Every* woman] λ_i. t_i entered-the-bar $\cap$ $R(t_i)$
    - predicates that preserve truth: R s.t. $[\![\text{woman}]\!] \subset R$

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  - context change: $G \rightarrow G' = G \cap \{g/g(1) \text{ is a woman}\}$

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  - context change: $G \rightarrow G' = G \cap \{g/g(1)$ is a woman$\}$

G	1	...
g_0	`anna`$'$	...
g_1	`joey`$'$	...
g_2	`melody`$'$	...
	...	

(28) Every woman λ_1 t_1 entered the bar ... They$_1$ ...

➤ [*Every* woman] λ_i. t_i entered-the-bar $\cap$ $R(t_i)$

- predicates that preserve truth: R s.t. $[\![\textbf{woman}]\!] \subset R$
- strongest predicta: $R = [\![\textbf{woman}]\!]$
- context change: $G \to G' = G \cap \{g/g(1) \text{ is a woman}\}$

G'	1	...
g_0	anna′	...
~~g_1~~	~~joey′~~	...
g_2	melody′	...
	...	

Recap

A universal statement makes available a referent to the restrictor set. This referent can be accessed using *they*.

$\rightsquigarrow$ cross-sentential anaphora?

(29) Some woman λ_1 t_1 entered the bar … She_1 …

- [*Some* woman] λ_i. t_i entered-the-bar

(29) Some woman λ_1 t_1 entered the bar … She$_1$ …

- [*Some* woman] λ_i. t_i entered-the-bar $\cap$ $R(t_i)$

(29) Some woman λ_1 t_1 entered the bar … She$_1$ …

- [*Some* woman] λ_i. t_i entered-the-bar $\cap$ $R(t_i)$
  - restrictions that preserve truth: R s.t. $\texttt{woman}' \cap \texttt{entered}' \cap R \neq \varnothing$

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  - strongest restriction<u>s</u> $R = \{x\}$ for any woman x that entered the bar.

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  - strongest restrictions $R = \{x\}$ for any woman x that entered the bar.
  - context change: **indeterminacy !**

$$\begin{tikzcd}[column sep=huge]
 & G \cap \{g \,/\, g(1) = \texttt{melody}'\} \\
G \arrow[ur, bend left, "?"] \arrow[r, "?"] \arrow[dr, bend right, "?"] & G \cap \{g \,/\, g(1) = \texttt{lola}'\} \\
 & G \cap \{g \,/\, g(1) = \texttt{sarah}'\}
\end{tikzcd}$$

(30) Some woman λ_1 t_1 entered the bar ... She$_1$ ordered a beer

$$G \xrightarrow{?} G \cap \{g \,/\, g(1) = \texttt{melody}'\} \quad \rightarrow \text{Melody ordered a beer}$$

$$G \xrightarrow{?} G \cap \{g \,/\, g(1) = \texttt{lola}'\} \quad \rightarrow \text{Lola ordered a beer}$$

$$G \xrightarrow{?} G \cap \{g \,/\, g(1) = \texttt{sarah}'\} \quad \rightarrow \text{Sarah ordered a beer}$$

(30) Some woman λ_1 t_1 entered the bar … She$_1$ ordered a beer

$$\begin{tikzcd}
 & G \cap \{g \,/\, g(1) = \texttt{melody}'\} & \rightarrow \text{Melody ordered a beer} \\
G \arrow[ur, "?"] \arrow[r, "?"] \arrow[dr, "?"] & G \cap \{g \,/\, g(1) = \texttt{lola}'\} & \rightarrow \text{Lola ordered a beer} \\
 & G \cap \{g \,/\, g(1) = \texttt{sarah}'\} & \rightarrow \text{Sarah ordered a beer}
\end{tikzcd}$$

Principle of indeterminacy (provisory)

When there is indeterminacy about which context we are in, evaluate upcoming sentences wrt. all possible contexts ; update the common ground with the disjunction of the propositions expressed.

(30) Some woman λ_1 t_1 entered the bar … She_1 ordered a beer

$$
\begin{tikzcd}[column sep=large]
 & G \cap \{g \,/\, g(1) = \texttt{melody}'\} & \rightarrow \text{Melody ordered a beer} \\
G \arrow[ur, bend left, "?"] \arrow[r, "?"] \arrow[dr, bend right, "?"'] & G \cap \{g \,/\, g(1) = \texttt{lola}'\} & \rightarrow \text{Lola ordered a beer} \\
 & G \cap \{g \,/\, g(1) = \texttt{sarah}'\} & \rightarrow \text{Sarah ordered a beer}
\end{tikzcd}
$$

Principle of indeterminacy (provisory)

When there is indeterminacy about which context we are in, evaluate upcoming sentences wrt. all possible contexts ; update the common ground with the disjunction of the propositions expressed.

$\Leftrightarrow$ Some woman who entered the bar ordered a beer.

More suited for $\exists/\forall$ readings:

Principle of supervaluation (provisory)

When there is indeterminacy about which context we are in, evaluate upcoming sentences wrt. all possible contexts ; upcoming sentences are true iff all of their resolutions are true, false iff all of their resolutions are false.

$\approx$ (Champollion et al., 2017b)[5]

[5] Except for cross-conjunction cases where they predict no ambiguity between $\exists$ and $\forall$; there are reasons to believe that the ambiguity exist even in the latter case.

Recap

An existential statement makes simultaneously available multiple referents to the witness set. This referent can be accessed using *he/she/it*.

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Also works for structure like the following:

(31) That kind of animal [Op λ_i I see t_i]

(32) a. Every man saw some donkey.

b. [*Every* man] [*Some* donkey] λ_1. λ_2. t_2 saw t_1

c. strongest restriction<u>s</u>: $R(x, y) =$ **true** iff x is a man and $y = f(x)$ for f that maps men to donkey that they saw.

(32) a. Every man saw some donkey.

b. [*Every* man] [*Some* donkey] λ_1. λ_2. t_2 saw $t_1 \cap R(t_1, t_2)$

c. strongest restrictions: $R(x, y) = \textsf{true}$ iff x is a man and $y = f(x)$ for f that maps men to donkey that they saw.

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c. strongest restrictions: $R(x, y) = \textbf{true}$ iff x is a man and $y = f(x)$ for f that maps men to donkey that they saw.

G	1	...	
g_0	anna′	twix′	...
g_1	joey′	crunch′	...
g_2	joey′	twix′	...
g_3	mark′	floppy′	...
g_4	mark′	kitty′	...
		...	

(32) a. Every man saw some donkey.

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G'	1	...	
$\cancel{g_0}$	$\cancel{\texttt{anna}'}$	$\cancel{\texttt{twix}'}$	...
$\cancel{g_1}$	$\cancel{\texttt{joey}'}$	$\cancel{\texttt{crunch}'}$	...
g_2	$\texttt{joey}'$	$\texttt{twix}'$	...
g_3	$\texttt{mark}'$	$\texttt{floppy}'$	...
$\cancel{g_4}$	$\cancel{\texttt{mark}'}$	$\cancel{\texttt{kitty}'}$	...
	...		

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$\cancel{g_0}$	~~anna′~~	~~twix′~~	...
g_1	joey′	crunch′	...
$\cancel{g_2}$	~~joey′~~	~~twix′~~	...
g_3	mark′	floppy′	...
$\cancel{g_4}$	~~mark′~~	~~kitty′~~	...

...

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An embedded existential statement makes simultaneously available one referent for each member of the restrictor set of the embedding *every*. This referent can be accessed using *he/she/it* or *they*.

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The predicate used to capture the information about the referent has to be able to co-vary with any c-commanding quantifier

The case of *no* and *not every*

Anaphorically speaking, “*not every*”$\neq$“*some not*”

The case of *no* and *not every*

Anaphorically speaking, “*not every*”$\neq$“*some not*”

(33) a. # [Not every movie star]$_1$ came to my boat party …She$_1$ was under the weather.

b. [Some movie star]$_1$ didn’t come to my boat party …She$_1$ was under the weather.

The case of *no* and *not every*

Anaphorically speaking, "*not every*"≠"*some not*"

(33) a. # [Not every movie star]$_1$ came to my boat party ...She$_1$ was under the weather.

b. [Some movie star]$_1$ didn't come to my boat party ...She$_1$ was under the weather.

Why is that?

- [*Not every* NP] λ_i. t_i Predicate

- [*Not every* NP] λ_i. t_i Predicate $\cap$ $R(t_i)$

- [*Not every* NP] $\lambda_i.\ t_i$ Predicate $\cap\ R(t_i)$
  - restrictions that preserve truth: **any!**

- $[$*Not every* NP$]$ λ_i. t_i Predicate $\cap$ $R(t_i)$
    - restrictions that preserve truth: **any!**
    - strongest restriction: $R = \varnothing$

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Similarly:

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Similarly:

- [*No* **NP**] $\lambda_i.\ t_i$ Predicate $\cap\ R(t_i)$
    - restrictions that preserve truth: **any!**
    - strongest restriction: $R = \varnothing$
    - context change: $G \rightarrow \varnothing$

Downward-entailing quantifiers

Quantifiers that are downward-entailing in their scope crash the context!

[6] A notion of precedence has to be defined ; it is often left implicit in Dynamic Semantics.

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$\rightarrow$ The process has to be optional.

Restrictions

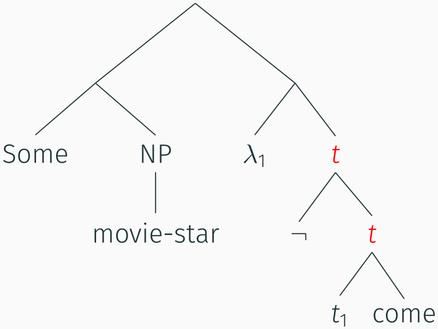
One may optionally attach a predicate to every t-node. This predicate contains as many variables as there are binders c-commanding it. It has to be the strongest that could be added *salva veritate*

Context change

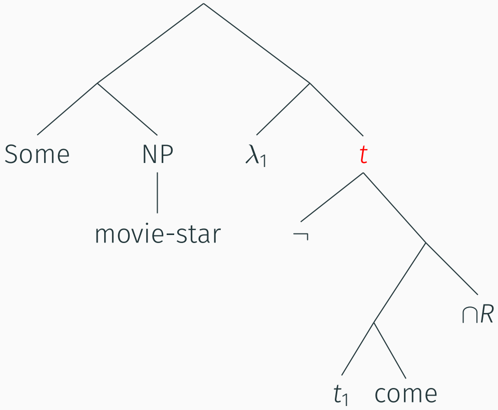
A node is evaluated wrt to the restriction of G, the context of the utterance, by predicates attached to previous[6] nodes.

[6] A notion of precedence has to be defined ; it is often left implicit in Dynamic Semantics.

some not $\neq$ not every



some not $\neq$ not every



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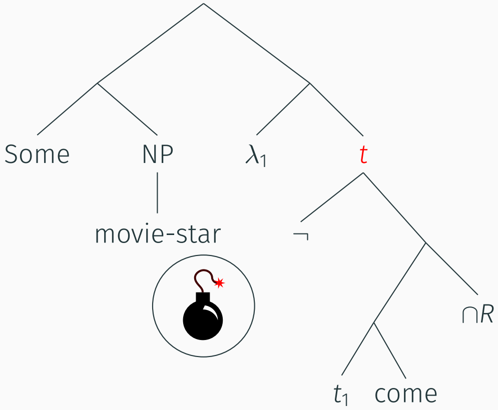

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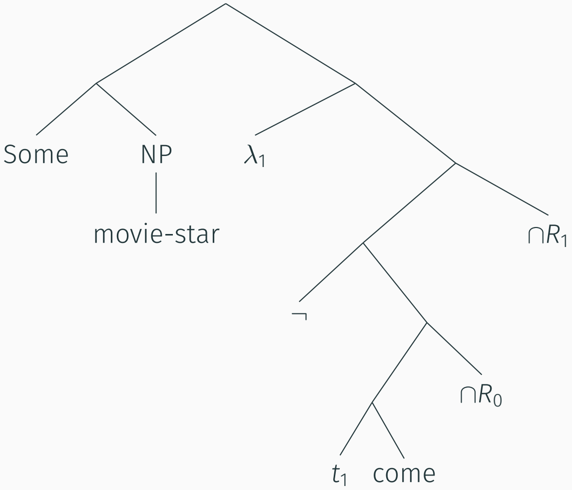

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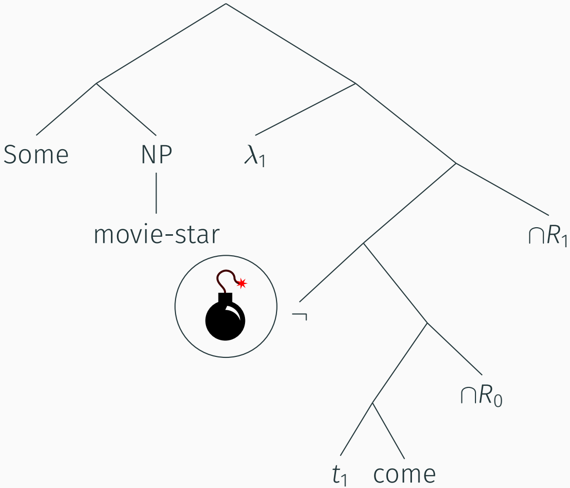
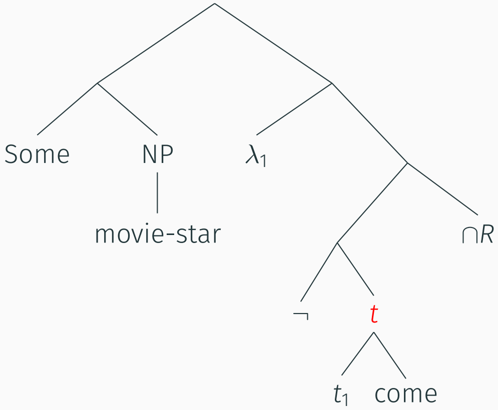
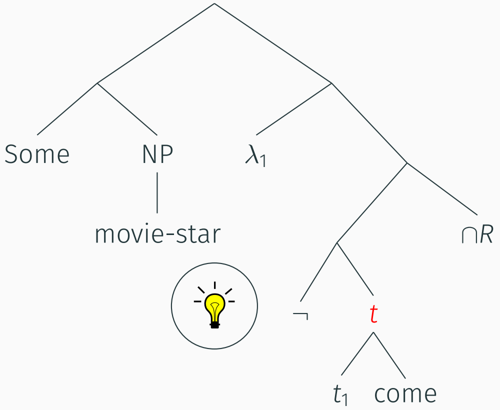


some not $\neq$ not every



some not $\neq$ not every



Recap

- The system is also structure-sensitive: truth-conditionally equivalent statements have different context-change potentials.
- Generalisation: outer negations are more restricted than inner negations.

What about intra-sentential anaphora?

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(34) Every [λ_1 t_1 woman] entered the bar.

What about intra-sentential anaphora? $\rightarrow$ donkey anaphora.

(34) Every [λ_1 t_1 woman] entered the bar.

The strongest restriction that preserve the truth value of the sentence *for all continuations of the sentence* (Schlenker, 2008).

What about intra-sentential anaphora? $\rightarrow$ donkey anaphora.

(34) Every [λ_1 t_1 woman] entered the bar.

The strongest restriction that preserve the truth value of the sentence *for all continuations of the sentence* (Schlenker, 2008).

With this modification, donkey anaphora pattern with functional anaphora.

Conclusion

Recap

System I

- Alternative semantics is the cause of indefinites exceptionality.
- Context indeterminacy survives existential closure.
- Does not account for donkey readings of non-alternative existential.

System II

- Existential semantics is the cause of indefinites exceptionality.
- Discourse indeterminacy arises as multiple maximally informative contexts become available.
- Discourse indeterminacy creates the illusion of "*binding outside scope*"
- Has some structure-sensitivity (not every = some not).

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