Wide Scope Indefinites

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PLIN0056 Semantic Research Seminar 2022: Week 4

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

Week 2 ~~14 October: Choice functions~~

Week 3 ~~21 October: Pied-piping and scope~~

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 Exceptional wide scope via presupposition projection

Another popular approach to indefinites with exceptional scope uses *presupposition projection* to derive wide scope readings (Cresti 1995, Van Geenhoven 1998, Yeom 1998, Jäger 2007, Geurts 2010, Onea 2015).

(1) a. John is aware that it is raining.
b. John isn't aware that it is raining.
c. If John is aware that it is raining, he has an umbrella.

There are different theories of presupposition projection and the above authors put forward technically different implementations of the idea.

Today we'll review Van Geenhoven's 1998: Ch. 6, who adopt the presupposition-as-anaphora theory (Van der Sandt 1992, Geurts 1999), which is standardly implemented in Discourse Representation Theory (DRT).

We'll then discuss pros and cons of this theory (Endriss 2009: §4.6, Geurts 2010, Onea 2015, Ebert 2021), and some ideas for addressing the issues (Yeom 1998, Geurts 2010, Onea 2015).

Next week, I will propose a new implementation of the idea that is free from the drawbacks of Van Geenhoven 1998 and others. The major issues of the previous implementations are largely due to the theories of presuppositions they chose.

2 A DRT primer

DRT is a representational theory of discourse. The original version was developed for pronominal anaphora (Kamp 1981, Kamp & Reyle 1993, Geurts, Beaver & Maier 2020).

2.1 Basics

In DRT *Discourse Representation Structures (DRSs)* represent discourses as well as sentence meanings.

- A DRS is formally a pair $\langle V, C\rangle$, where V is a (possibly empty) set of variables and C is a set of DRS-conditions.
- We adopt the linear notation (instead of boxes). DRS $\langle\{x_1,\dots,x_n\},\{c_1,\dots,c_m\}\rangle$ is represented as $[x_1,\dots,x_n \mid c_1,\dots,c_n]$.

Some examples:

(2) a. There is a^x cat. It$_x$ is not chasing a^y mouse. It$_x$ is sleeping.

b. $\left[\, x \;\middle|\; \begin{array}{l} \text{cat}(x), \\ \neg\left[\, y \;\middle|\; \begin{array}{l}\text{mouse}(y), \\ \text{chase}(x,y)\end{array}\right], \text{sleeping}(x)\end{array}\right]$

(3) a. If a^x farmer owns a^y donkey, he$_x$ vaccinates it$_y$.

b. $\left[\;\middle|\; \left[\, x,y \;\middle|\; \begin{array}{l}\text{farmer}(x), \\ \text{donkey}(y), \\ \text{own}(x,y)\end{array}\right] \Rightarrow [\,\mid \text{vaccinate}(x,y)]\right]$

(4) a. Every^x farmer that owns a^y donkey vaccinates it$_y$.

b. $\left[\;\middle|\; \left[\, y \;\middle|\; \begin{array}{l}\text{donkey}(y), \\ \text{own}(x,y)\end{array}\right] \langle\forall x\rangle [\,\mid \text{vaccinate}(x,y)]\right]$

You could extend this with modal operators, second-order quantifiers, etc. For simplicity, we stick to extensional first-order DRT.

2.2 Syntax

(5) A DRS is a pair $\langle V, C\rangle$:

a. V is a set of variables.
b. C is a set of DRS-conditions.

DRS-conditions are defined as:

(6) a. If P is an n-ary predicate and $x_1,\dots x_n$ are all variables, then $P(x_1,\dots,x_n)$ is a DRS-condition.
b. If x and y are variables, then $x = y$ is a DRS-condition.
c. If ϕ and ψ are DRSs, then $\neg\phi$, $\phi \vee \psi$, $\phi \Rightarrow \psi$, are DRS-conditions.
d. If ϕ and ψ are DRSs and ξ is a variable, then $\phi\,\langle\forall\xi\rangle\,\psi$ is a DRS-condition.
e. Nothing else is a DRS-condition.

2.3 Accessibility

In DRT, a pronoun needs to find an antecedent in a DRS 'accessible' to it.
Anaphoric accessibility is defined in terms of a syntactic relation between DRSs:

(7) $\geq$ ('accessible to') is the smallest preorder (reflexive and transitive order) over DRSs such that: for any DRSs $\phi = \langle V_\phi, C_\phi \rangle$, $\psi = \langle V_\psi, C_\psi \rangle$ and $\chi = \langle V_\chi, C_\chi \rangle$,
  a. if $\neg\psi \in C_\phi$, then $\phi \geq \psi$;
  b. if $(\psi \vee \chi) \in C_\phi$, then $\phi \geq \psi$ and $\phi \geq \chi$;
  c. if $\psi \Rightarrow \chi \in C_\phi$, then $\phi \geq \psi \geq \chi$.
  d. if $\psi \langle \forall \xi \rangle \chi \in C_\phi$, then $\phi \geq \psi \geq \chi$.

Using $\geq$, we define the set of variables that are accessible from a given DRS ϕ:

(8) $\mathrm{Acc}(\phi) = \bigcup \{ V_\psi \mid \psi \geq \phi \}$

A DRS is said to be proper if all the pronouns in it are bound. Formally:

(9) The set of employed variables in DRS $\phi = \langle V, C \rangle$, $\mathrm{Emp}(\phi)$ is the smallest set such that:
  a. if $P(x_1, \ldots, x_n) \in C$, then $x_1, \ldots, x_n \in \mathrm{Emp}(\phi)$; and
  b. if $x = y \in C$, then $x, y \in \mathrm{Emp}(\phi)$.

(10) A DRS ϕ is proper iff for each ψ such that $\phi \geq \psi$, $\mathrm{Emp}(\psi) \subseteq \mathrm{Acc}(\psi)$.

For example, the three examples at the beginning of this section are proper, while the following DRSs are not proper.

(11) a. There isn't a^x cat. It$_x$ is sleeping.
  b. $[\,\mid \neg[x \mid \text{cat}(x)], \text{sleeping}(x)]$

(12) a. Every^x farmer that owns it$_y$ vaccinates a^y donkey.
  b. $\left[\;\middle|\; [\,\mid \text{own}(x, y)] \langle \forall x \rangle \left[y \;\middle|\; \begin{array}{l} \text{donkey}(y), \\ \text{vaccinate}(x, y) \end{array} \right] \right]$

Improper DRSs contain free pronouns. They may become proper when embedded in larger DRSs.
If the DRS representing a discourse is improper, it means there's an unresolved pronominal anaphora in the discourse (and therefore the discourse is infelicitous).

2.4 Semantics

A DRS is evaluated with respect to a first-order model $M = \langle D, I \rangle$ and an embedding (= assignment function) f, which is a partial function from variables to D.

(13) For any DRS $\phi = \langle V, C \rangle$, any model $M = \langle D, I \rangle$, and any embedding f, $[\![\phi]\!]^f_M = 1$ iff $V \subseteq \mathrm{dom}(f)$ and for each $\psi \in C$, $[\![\psi]\!]^f_M = 1$.

DRS-conditions are interpreted as follows:

$$\begin{aligned}
[\![P(x_1,\dots,x_n)]\!]^f_M &= 1 \text{ iff } \langle f(x_1),\dots,f(x_n)\rangle \in I(P)\\
[\![x = y]\!]^f_M &= 1 \text{ iff } f(x) = f(y)\\
[\![\neg\phi]\!]^f_M &= 1 \text{ iff for no } g \geqslant f, [\![\phi]\!]^g_M = 1\\
[\![\phi \vee \psi]\!]^f_M &= 1 \text{ iff for some } g \geqslant f, [\![\phi]\!]^g_M \text{ or } [\![\psi]\!]^g_M = 1\\
[\![\phi \Rightarrow \psi]\!]^f_M &= 1 \text{ iff for each } g \geqslant f, \text{ such that } [\![\phi]\!]^g_M = 1, \text{ for some } h \geqslant g, [\![\psi]\!]^h_M = 1\\
[\![\phi\langle\forall x\rangle\psi]\!]^f_M &= 1 \text{ iff for each } a \in D \text{ and for each } g \geqslant f[x \mapsto a] \text{ such that } [\![\phi]\!]^g_M = 1,\\
&\qquad \text{for some } h \geqslant g, [\![\psi]\!]^h_M = 1
\end{aligned}$$

(14) a. g is an extension of f ($g \geqslant f$) iff for each $x \in \mathrm{dom}(f)$, $f(x) = g(x)$.
b. $f[x \mapsto a]$ is the unique embedding such that
(i) for each $y \in \mathrm{dom}(f)$, $f(y) = g(y)$,
(ii) $g(x) = a$,
(iii) $\mathrm{dom}(g) = \mathrm{dom}(f) \cup \{x\}$.

(15) DRS ϕ is true with respect to M iff for some embedding f, $[\![\phi]\!]^f_M = 1$.

Notice that Existential Closure is part of the definition of DRS-truth, (15), and the meanings of the connectives: In $[x_1,\dots,x_n \mid \dots]$, the variables $x_1,\dots,x_n$ are interpreted existentially.

2.5 Remarks

Groenendijk & Stokhof 1991 give a proof for the equivalence between first-order Dynamic Predicate Logic and first-order DRT.

See Muskens 1996 for a compositional translation from a fragment of English into DRT (see also Brasoveanu 2007). We will be implicit about compositional details.

There are many extensions of DRT: modals, attitudes, generalised quantifiers, coherent relations, etc.

Today we are interested in presuppositions.

2.6 Two-stage model

A two-stage interpretive model is often assumed (especially in the literature on presuppositions):

1. A sentence/utterance is translated into a DRS. Variables that need to be anaphorically resolved are underlined.

2. This DRS is merged with the DRS that represents the conversational background of the utterance, and the anaphoric dependencies are resolved with respect to it.

Illustration:

(16) It$_y$ is sleeping. $\rightsquigarrow$ $\left[\underline{y} \mid \text{sleeping}(y)\right]$

Suppose that this sentence was uttered against the background context represented by the DRS in (17).

(17) $[x, a \mid \text{Alice}(a), \text{cat}(x), \text{owns}(a, x), \text{fat}(x), \neg[\ \mid \text{young}(x)]]$

Then (16) gets 'merged' with this DRS, yieding:

(18) $\left[x, a, \underline{y} \;\middle|\; \text{Alice}(a), \text{cat}(x), \text{owns}(a, x), \text{fat}(x), \neg[\ \mid \text{young}(x)], \text{sleeping}(y)\right]$

Formally, DRS merger is point-wise union:

(19) For any DRSs $\phi = \langle V_\phi, C_\phi \rangle$ and $\psi = \langle V_\psi, C_\psi \rangle$,
$\phi \sqcup \psi = \langle V_\phi \cup V_\psi,\ \ C_\phi \cup C_\psi \rangle$

Finally, the anaphoric dependency is resolved by syntactically transforming (18) by inserting an equality statement:

(20) $[x, a, y \mid \text{Alice}(a), \text{cat}(x), \text{owns}(a, x), \text{fat}(x), \neg[\ \mid \text{young}(x)], \text{sleeping}(y), x = y]$

This is semantically equivalent to:

(21) $[x, a \mid \text{Alice}(a), \text{cat}(x), \text{owns}(a, x), \text{fat}(x), \neg[\ \mid \text{young}(x)], \text{sleeping}(x)]$

In DRT, anaphora resolution is a syntactic transformation: For each underlined element x in ϕ, insert an equality statement $x = y$ for some $y \in \text{Acc}(\phi)$ and remove the underline.

3 Presuppositions as anaphora

Van der Sandt 1992 proposes that presuppositions can be seen as propositional anaphora (also Van der Sandt 1988), and implements this idea in a version of DRT (also see Geurts 1999).

3.1 Presupposition binding

Van der Sandt's idea is to treat presuppositions as 'propositional anaphors'.

Formally, presuppositions are represented as DRSs, and to accommodate them, we need to tweak the details, but for now it's enough to understand how they work informally (see Section 3.7 for some formal details; see Van der Sandt 1992, Geurts 1999 for in-depth explanations).

We represent presuppositions by underlined DRSs.

(22) The cat is sleeping. $\rightsquigarrow$ $\left[\ \middle|\ \underline{[x \mid \text{cat}(x)]}, \text{sleeping}(x)\right]$

Suppose that the background context looks like:

(23) $[a, y, z \mid \text{Alice}(a), \text{cat}(y), \text{dog}(z), \text{owns}(a, y), \text{owns}(a, z), \text{outside}(z)]$

First, merge the two DRSs:

(24) $\left[a, y, z \;\middle|\; \begin{array}{l} \text{Alice}(a), \text{cat}(y), \text{dog}(z), \text{owns}(a,y), \text{owns}(a,z), \text{outside}(z), \\ \underline{[x \mid \text{cat}(x)]}, \text{sleeping}(x), \end{array} \right]$

Then, we can resolve the presupposition by 'binding' the DRS to the main DRS. This amounts to inserting $x = y$ and merging the presuppositional DRS and the main DRS:

(25) $\left[a, x, y, z \;\middle|\; \begin{array}{l} \text{Alice}(a), \text{cat}(y), \text{dog}(z), \text{owns}(a,y), \text{owns}(a,z), \text{outside}(z), \\ \text{cat}(x), \text{sleeping}(x), x = y \end{array} \right]$

(25) is equivalent to (26), and this represents the state of the discourse after the utterance + presupposition resolution.

(26) $\left[a, y, z \;\middle|\; \begin{array}{l} \text{Alice}(a), \text{cat}(y), \text{dog}(z), \text{owns}(a,y), \text{owns}(a,z), \text{outside}(z), \\ \text{sleeping}(y) \end{array} \right]$

Note that this is a 'familiar definite' with an existential presupposition; we could have a uniqueness presupposition, too, but we don't worry too much about how to properly account for definites for now. We'll discuss definites in more detail next week.

Presupposition can be bound to a proposition in a different but accessible DRS.

(27) If there is a cat and a dog, then the cat is upstairs.
$\rightsquigarrow \left[\;\middle|\; [y, z \mid \text{cat}(y), \text{dog}(z)] \Rightarrow \left[\;\middle|\; \underline{[x \mid \text{cat}(x)]}, \text{upstairs}(x) \right] \right]$

No matter what the background discourse, the presupposition can be bound to the conditional antecedent DRS. Without loss of generality, let's consider an empty background. Then, after presupposition binding:

(28) $[\mid [y, z, x \mid \text{cat}(y), \text{dog}(z), \text{cat}(x), x = y] \Rightarrow [\mid \text{upstairs}(x)]]$

And this can be simplified to:

(29) $[\mid [y, z \mid \text{cat}(y), \text{dog}(z)] \Rightarrow [\mid \text{upstairs}(y)]]$

Thus, the presupposition is resolved within the sentence, and as a consequence, (27) feels like there's no presupposition overall.

The following examples can be analysed analogously:

(30) a. If a man visited a big city, he will not visit it again.

b. $\left[\;\middle|\; \begin{array}{l} [x, y \mid \text{man}(x), \text{city}(y), \text{big}(y), \text{visited}(x,y)] \\ \Rightarrow \neg \left[\;\middle|\; \underline{[\mid \underline{[z \mid \text{male}(z)]}, \underline{[l \mid \text{neuter}(l)]}, \text{visited}(z,l)]}, \text{will\_visit}(z,l) \right] \end{array} \right]$

- Here we analyse pronouns as definites, thereby reducing pronominal anaphora to presupposition. (Not technically necessary, but Van der Sandt 1992 and Geurts 1999 make a big deal out of it)
- In (30), the presupposition triggered by *again* contains the presuppositions triggered by the pronouns. In such a case, you should work on the contained presuppositions first (but see Geurts 1999: pp. 54–55 for an alternative idea).

Some examples with *every*:

(31) Everyone who has a cat and a dog has more pictures of the cat than pictures of the dog.

(32) a. Everyone who used to smoke quit smoking.
b. $\Big[\ \Big|\ [\ |\ \text{former-smoker}(x)]\ \langle\forall x\rangle\ \Big[\ \Big|\ \underline{[\ |\ \text{former-smoker}(x)]}, \text{non-smoker}(x)\Big]\Big]$

3.2 Presupposition accommodation

There's one important difference between pronominal anaphora and presuppositions: In case there's no suitable antecedent, pronominal anaphora is simply infelicitous, while presuppositions can be *accommodated*.

E.g., out-of-the-blue uses of *it* (and other weak pronouns like clitics) are generally infelicitous, but presuppositions can often be accommodated.

(33) a. It is expensive.
b. The king of Bhutan started to use Twitter last year.

Van der Sandt 1992 and Geurts 1999 consider this difference to be a matter of degree: Pronouns carry very little descriptive information, so it's harder to guess who/what the intended referents are.

- Like pronouns, very simple definite descriptions like *the guy* are indeed not so easy to accommodate, cf. *the guy sitting next to me on the tube.*
- Demonstrative pronouns (and other strong pronouns) are descriptively rich, so they can be used out of the blue.

The presupposition-as-anaphora theory analyses presupposition accommodation as simple merger of a presuppositional DRS with an accessible DRS.

For example, if (34) is uttered out of the blue:

(34) a. The king of Bhutan is young.
b. $\Big[\ \Big|\ \underline{[x\ |\ \text{KoB}(x)]}, \text{young}(x)\Big]$

Then you merge (34) with the background DRS, and accommodate the presupposition (if there's no inconsistency):

(35) $[\ldots, x\ |\ \ldots, \text{KoB}(x), \text{young}(x)]$

Formally, the difference between binding and accommodation is that the former involves insertion of an equality statement $x = y$.

It is assumed that binding is preferred to accommodation, whenever possible. Accommodation is considered to be a rescue mechanism. See Van der Sandt 1992, Geurts 1999, Beaver & Zeevat 2007 for more discussion.

3.3 Local accommodation

Accommodation can target non-global DRSs as well.

(36) It didn't start raining. It never rained!

The first sentence of (36) is interpreted as:

(37) $$\left[\ \middle|\ \neg\left[\ \middle|\ \underline{[\ |\ \text{not\_raining\_before}]}, \text{raining\_now}\right]\right]$$

If we accommodate the presupposition globally, we'll get (38), but this won't be consistent with the second sentence.

(38) $$[\ |\ [\ |\ \text{not\_raining\_before}]\ , \neg\ [\ |\ \text{raining\_now}]]$$

To obtain the coherent interpretation, the presupposition needs to be accommodated under negation.

(39) $$[\ |\ \neg\ [\ |\ \text{not\_raining\_before}, \text{raining\_now}]]$$

Similarly, multiple accommodation sites are available for (40).

(40) If Alice is married, then her child lives with her.

This is interpreted as:

(41) $$\left[\ \middle|\ \begin{array}{l} \left[\ \middle|\ \underline{[a\ |\ \text{Alice}(a)]}, \text{married}(a)\right] \\ \Rightarrow \left[\ \middle|\ \begin{array}{l} \underline{\left[x\ \middle|\ \underline{[y\ |\ \text{female}(y)]}, \text{child\_of}(x,y)\right]}, \\ \\ \underline{[z\ |\ \text{female}(z)]}, \text{live\_with}(x,z) \end{array}\right] \end{array}\right]$$

Let's resolves the proper name's presupposition and the pronominal anaphora:

(42) $$\left[a\ \middle|\ \begin{array}{l} \text{Alice}(a), \text{female}(a) \\ [\ |\ \text{married}(a)] \Rightarrow [\ |\ \underline{[x\ |\ \text{child\_of}(x,a)]}, \text{live\_with}(x,a)\ ] \end{array}\right]$$

The possessive presupposition can be accommodated in the global DRS, yielding:

(43) $$\left[a, x\ \middle|\ \begin{array}{l} \text{Alice}(a), \text{female}(a), \text{child\_of}(x,a), \\ [\ |\ \text{married}(a)] \Rightarrow [\ |\ \text{live\_with}(x,a)] \end{array}\right]$$

('Alice has a child x and if Alice is married, x lives with her.')

Or, it can be accommodated in the consequent DRS:

(44) $$\left[a\ \middle|\ \begin{array}{l} \text{Alice}(a), \text{female}(a), \\ [\ |\ \text{married}(a)] \Rightarrow [x\ |\ \text{child\_of}(x,a), \text{live\_with}(x,a)] \end{array}\right]$$

('If Alice is married, then she has a child that lives with her.')

3.4 Intermediate accommodation

In this case there's one more possibility:

(45) $$\left[a\ \middle|\ \begin{array}{l} \text{Alice}(a), \\ [x\ |\ \text{married}(a)]\ , \text{child\_of}(x,a) \Rightarrow [x\ |\ \text{live\_with}(x,a)] \end{array}\right]$$

('If Alice is married and has a child, then her child lives with her.')

This reading seems to be marked, if available at all.

Here are other similar examples, for which the intermediate accommodation reading seems to be unavailable.

(46) a. If Alice is carrying an umbrella, then she's aware that it is raining.
b. If Alice drives to work, then her Toyota is in the garage.

These cannot be understood as:

(47) a. If Alice is carrying an umbrella and it is raining, then she's aware that it is raining.
b. If Alice drives to work and owns a Toyota, then it is in the garage.

Rather, they have either global or local accommodation readings. The local accommodation readings are as in (48) (Perhaps (48b) is a bit harder to access).

(48) a. If Alice is carrying an umbrella, then it is raining and she's aware of it.
b. If Alice drives to work, then she has a Toyota and it is in the garage.

Note that presupposition binding is assumed to be fine in the antecedent clause:

(49) a. If Alice is married, she'll bring her husband to the party.
b. If it is raining, then it will stop soon.

3.5 Trapping

Trapping is a hard constraint on accommodation (and binding) in this theory.

(50) Every cat looks down on its owner.

This is interpreted as:

(51) $$\left[\ \middle|\ [\ \mid \text{cat}(x)]\,\langle\forall x\rangle \left[\ \middle|\ \underline{\left[y\ \middle|\ \text{owner\_of}(y,z), \underline{[z \mid \text{non-human}(z)]}\right]}, \text{look\_down}(x,y)\right]\right]$$

After resolving the pronoun to x (we'll omit non-human(z)):

(52) $$\left[\ \middle|\ [\ \mid \text{cat}(x)]\,\langle\forall x\rangle \left[\ \middle|\ \underline{[y \mid \text{owner\_of}(y,x)]}, \text{look\_down}(x,y)\right]\right]$$

The possessive presupposition cannot be accommodated globally, because that'll leave x unbound:

(53) $$\left[y\ \middle|\ \begin{array}{l}\text{owner\_of}(y,x),\\ [\ \mid \text{cat}(x)]\,\langle\forall x\rangle\,[\ \mid \text{look\_down}(x,y)]\end{array}\right]$$

This is improper.

The most natural interpretation is the local accommodation reading.

(54) $[\ \mid [\ \mid \text{cat}(x)]\,\langle\forall x\rangle\,[y \mid \text{owner\_of}(y,x), \text{look\_down}(x,y)]]$
('Every cat has an owner and looks down on them.')

Note that the intermediate accommodation reading is again not easily available:

(55) $[\ |\ [y\ |\ \text{cat}(x), \text{owner\_of}(y,x)]\ \langle\forall x\rangle\ [\ |\ \text{look\_down}(x,y)]]$
('Every cat that has an owner looks down on them.')

Beaver 2001 discusses the same issue with (56).

(56) Every German woman drives her car to work. (Beaver 2001: p. 119)

This doesn't seem to mean 'Every German woman that has a car drives it to work'. Intuitively, the sentence entails that every German woman has a car.
But presupposition binding is possible in the restrictor.

(57) Everyone who has a cat and a dog takes many pictures of their cat.

The issue of intermediate accommodation is well known, e.g., Beaver 2001: §5.6, Van Geenhoven 1998: pp. 200–201, Yeom 1998: pp. 219–221, Jäger 2007: pp. 134–135, Beaver & Zeevat 2007.
Some take it to be a problem of the presupposition-as-anaphora theory, but see Geurts & Van der Sandt 1999 for a possible solution.
We'll not discuss this issue any further.

3.6 Summary

- According to the presupposition-as-anaphora theory, presuppositions and pronominal anaphora are the same thing.
- The idea is formalised in a version of DRT, where anaphora resolution is syntactically defined.
- Presuppositions can be accommodated.

Van der Sandt 1992 assumes (see also Geurts 1999 for discussion):

- Presupposition binding is preferred to presupposition accommodation.
- Global accommodation is preferred to non-global accommodation (the higher the landing site, the better).
- Accommodation into *if*-conditionals and the restrictor of *every* seems to be marked (but see Geurts & Van der Sandt 1999).

3.7 Formal details of presupposition binding and accommodation

Van der Sandt 1992 defines DRSs as triples, $\langle V, C, A\rangle$:

- V is a set of variables.
- C is a set of DRS-conditions.
- A is a set of DRSs, representing presuppositions.

Presupposition binding amounts to merging the DRSs in A to an accessible DRS. Let $K = \langle V_K, C_K, A_K \rangle$ be a DRS with non-empty A_K.

1. Find a DRS $\phi = \langle V_\phi, C_\phi, A_\phi \rangle$ in A_K such that $A_\phi = \varnothing$ (i.e., ϕ is a presupposition that doesn't contain a presupposition).
2. Take some $\psi = \langle V_\psi, C_\psi, A_\psi \rangle$ such that $\psi \geq K$.
3. Binding ϕ to ψ amounts to the following transformation:
   - Let f be a function from V_ϕ to $\mathrm{Acc}(\psi)$.
   - Delete ϕ.
   - Change ψ to $\langle V_\phi \cup V_\psi,\ C_\phi \cup C_\psi \cup \{\, x = f(x) \mid x \in V_\phi \,\},\ A_\psi \rangle$.

   Accommodating ϕ to ψ amounts to the following transformation:
   - Let f be a function from V_ϕ to $\mathrm{Acc}(\psi)$.
   - Delete ϕ.
   - Change ψ to $\langle V_\phi \cup V_\psi,\ C_\phi \cup C_\psi,\ A_\psi \rangle$.
4. Call the resulting DRS K and repeat, unless A_K is empty.

When there are multiple presuppositional DRSs, it makes sense to work on them top-down, but see Geurts 1999: pp. 54–55 for an alternative idea.

4 Exceptional wide scope via presupposition projection

4.1 Presuppositioinal indefinites

Van Geenhoven 1998 assumes that indefinites can be presuppositional. This is a common assumption (Diesing 1992, Cresti 1995, Yeom 1998, von Fintel 1998, Geurts 2010, Onea 2015). More on this next week.

Crucially, when they are presuppositional, they project like other presuppositions, giving rise to exceptional wide scope readings.

Van Geenhoven 1998 also proposes that non-presuppositional indefinites are all 'incorporated', but this part of her theory is independent from her analysis of wide scope indefinites. We will ignore it and simply assume that indefinites can have presuppositional and non-presuppositional readings.

4.2 Exceptional wide scope

(58) If a relative of John's dies, he will be rich.

1. $$\left[\ \middle|\ \left[\ \middle|\ \underline{\left[x \ \middle|\ \underline{[j \mid \mathrm{John}(j)]}, \mathrm{relative}(x,j)\right]}, \mathrm{dies}(x)\right] \Rightarrow \left[\ \middle|\ \underline{[y \mid \mathrm{male}(y)]}, \mathrm{rich}(y)\right]\right]$$

2. Accommodate $\underline{[j \mid \mathrm{John}(j)]}$ in the main DRS:
$$\left[j \ \middle|\ \begin{array}{l} \mathrm{John}(j), \\ \left[\ \middle|\ \underline{[x \mid \mathrm{relative}(x,j)]}, \mathrm{dies}(x)\right] \Rightarrow \left[\ \middle|\ \underline{[y \mid \mathrm{male}(y)]}, \mathrm{rich}(y)\right] \end{array} \right]$$

3. Accommodate $\underline{[x \mid \text{relative}(x,j)]}$ in the main DRS:
$$\left[\begin{array}{c|l} j,x & \text{John}(j), \text{relative}(x,j), \\ & [\;\mid \text{dies}(x)] \Rightarrow \left[\;\middle|\; \underline{[y \mid \text{male}(y)]}, \text{rich}(y)\right] \end{array}\right]$$

4. Bind $\underline{[y \mid \text{male}(y)]}$ to the main DRS via $y = j$:
$$\left[\begin{array}{c|l} j,x,y & \text{John}(j), \text{relative}(x,j), \text{male}(y), y=j, \\ & [\;\mid \text{dies}(x)] \Rightarrow [\;\mid \text{rich}(y)] \end{array}\right]$$

5. Simplify:
$$\left[\begin{array}{c|l} j,x & \text{John}(j), \text{relative}(x,j), \text{male}(j), \\ & [\;\mid \text{dies}(x)] \Rightarrow [\;\mid \text{rich}(j)] \end{array}\right]$$

4.3 Intermediate scope reading

An intermediate scope reading is derived via non-global accommodation.
For (59), global accommodation is not available due to trapping.

(59) Every professor rewarded every student who read a book he had recommended.
(Abusch 1993: p. 90)

This is interpreted as:

(60) $$\left[\;\middle|\; [\;\mid \text{professor}(x)]\,\langle\forall x\rangle \left[\;\middle|\; \left[\;\middle|\; \underline{\begin{array}{l} \text{student}(y), \text{read}(z), \\ \left[\begin{array}{c|l} z & \text{book}(z), \\ & \underline{[w \mid \text{male}(w)]}, \\ & \text{recommended}(w,z) \end{array}\right] \end{array}}\right] \langle\forall y\rangle\,[\;\mid \text{rewarded}(x,y)]\right]\right]$$

After resolving the pronoun to x (we'll omit male(x)):

(61) $$\left[\;\middle|\; [\;\mid \text{professor}(x)]\,\langle\forall x\rangle \left[\;\middle|\; \left[\;\middle|\; \underline{\begin{array}{l} \text{student}(y), \text{read}(z), \\ \left[\begin{array}{c|l} z & \text{book}(z), \\ & \text{recommended}(x,z) \end{array}\right] \end{array}}\right] \langle\forall y\rangle\,[\;\mid \text{rewarded}(x,y)]\right]\right]$$

The presuppositional indefinite cannot be accommodated globally, due to trapping.
If it is accommodated locally:

(62) $$\left[\;\middle|\; [\;\mid \text{professor}(x)]\,\langle\forall x\rangle \left[\begin{array}{c|l} z & \text{book}(z), \text{recommended}(x,z), \\ & \left[\;\middle|\; \begin{array}{l} \text{student}(y), \\ \text{read}(z) \end{array}\right] \langle\forall y\rangle\,[\;\mid \text{rewarded}(x,y)] \end{array}\right]\right]$$
('Every professor recommended a book z, and rewarded every student that read z')

This is the intermediate scope reading.
This account can deal with negative operators (unlike Schwarzschild 2002 and theories with Skolemised choice functions):

(63) No professor rewarded every student who read a book he had recommended.

(64) Not every linguist studied every conceivable solution that some problem might have. (Chierchia 2001: p. 60)

(We'll ignore the intermediate accommodation reading here; but Van Geenhoven 1998: pp. 209–210 seems to assume that definites allow intermediate readings while presuppositional indefinites don't, and suggests that anaphoricity is relevant. But she does not explain why that is so.)

4.4 Indefinites vs. definites

Van Geenhoven 1998: pp. 221–222 points out that her approach predicts the following two sentences to be able to mean the same thing:

(65) a. Max didn't like some neighbour's cats who had made scratches on his door.
b. Max didn't like the neighbour's cats who had made scratches on his door. (Van Geenhoven 1998: p. 221)

She suggests that this issue arises because the semantics of definites we are assuming is too rudimentary. She doesn't propose anything concrete, but one could indeed assume that definites have more presuppositions than presuppositional indefinites.

It is however true that presuppositional indefinites can never be bound in the DRT sense. Because they were, they would behave like pronouns/definites.

One could make use of *Maximise Presupposition!* (Heim 1991, Grønn & Sæbø 2012) to block this. We will talk about this in more detail next week.

5 Pros

5.1 Variation among indefinites/existnetials

This account might give us a better understanding of variation among indefinites/existential quantifiers.

Idea: Some indefinites more easily receive presuppositional readings than others.

- Indefinites with heavy descriptions more easily receive presuppositional interpretations, because they are easier to accommodate.
- Bare plurals are (almost) never presuppositional (though why remains a question; see Carlson 1977, Diesing 1992, van Geenhoven 1998, Dayal 2011 for discussion).
- *This*-indefinites are always presuppositional.
- Some suggest that presuppositional indefinites are 'topical' (Cresti 1995, Endriss 2009), and topics are 'given/presupposed'.

  But topichood is potentially not a necessary condition. E.g., Van Geenhoven 1998: p. 208 remarks that focusing *einen* in (66) facilitates the wide scope reading.

(66) Daß die meisten Franzosen EINEN Film besonders mögen, liegt wohl daran, daß Cathérine Deneuve die Hauptdarstellerin ist.
'The fact that most Frenchmen like one movie particularly is related to the fact that Cathérine Deneuve plays the leading part.'
(Van Geenhoven 1998: p. 208)

- *There*-constructions block presuppositional readings (maybe because they are obligatorily anti-topical).
- Bare numerals can be presuppositional/topical, but modified numerals are harder to be (or even never?) interpreted as presuppositional/topical.

5.2 Functional readings

(67) *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:*
If each student makes progress in some area, nobody will flunk the exam.
(adapted from Schlenker 2006: p. 299)

This is potentially amenable to the presuppositional account. Suppose that *some area* can denote a 'natural function' (we would need to extend the theory to higher-order):

(68)
$$\left[\;\middle|\; [\;|\;\text{student}(x)]\,\langle\forall x\rangle \left[\;\middle|\; \left[\;\middle|\; \underline{\begin{array}{l}\text{make\_progress\_in}(x, f(x)),\\ \left[f \;\middle|\; \begin{array}{l}\text{nat\_func}(f),\\ \text{dom}(f) = \text{student},\\ \text{ran}(f) = \text{area}\end{array}\right]\end{array}} \right] \Rightarrow [\;|\;\neg[y\;|\;\text{flunk}(y)]] \right]\right]$$

This presupposition can be globally accommodated/bound, giving rise to the desired reading.
Similarly for Cresti's 1995 example.

(69) No doctor believed the claim that a (certain) member of her profession had been arrested. (Cresti 1995: p. 63)

But how to get the functional reading (especially the domain of the function) compositionally is unclear.
Next time, we'll try to derive these functional readings via presupposition projection through quantifiers, which is not available under the presupposition-as-anaphora theory.

5.3 *Certain*

Similarly, we could analyse *certain* as a word triggering a functional presupposition (a functional interpretation is only optional for indefinites themselves).

(70) A man saw a certain woman.

(71) $$\left[\begin{array}{c|l} x, y & \text{man}(x), \text{woman}(y), \underline{\left[\begin{array}{c|l} f & \begin{array}{l}\text{nat\_func}(f),\\ \text{ran}(f) = \text{woman},\\ f(x) = y\end{array}\end{array}\right]}\end{array}\right]$$

But again how to get this compositionally needs to be explained (especially $f(x) = y$). We'll come back to this next week.

5.4 Specificity phenomena

Van Geenhoven 1998 and Geurts 2010 remark that this account allows us to explain linguistic phenomena sensitive to specificity/definiteness in terms of presuppositionality, e.g.

- Constraints on partitives in English: The *of*-NP must be definite or specific (Ladusaw 1982).
- Differential object marking in Turkish, West Greenlandic, etc.: Definite and specific objects are obligatorily accusative marked (Enç 1991, Diesing 1992, Van Geenhoven 1998).
- Specific/definite determiner in Samoan and St'át'imcets.

These can be understood as requiring/marking presuppositionality. More on this next time.

6 Cons

The biggest issue of Van Geenhoven's 1998 account is that presuppositional indefinites need to be always accommodated. This is conceptually weird.

- Van Geenhoven 1998 herself acknowledges this, and claims that accommodation should not be seen as a rescue mechanism.
- Cresti 1995 proposes a related theory couched in Heim's 1982 File Change Semantics, rather than the presupposition-as-anaphora theory. She runs into a very similar (or maybe worse) issue, and needs to always accommodate indefinites with exceptional scope, but she doesn't explicitly discuss this issue.
- Geurts 2010 proposes that indefinites are never presuppositional, but can be backgrounded and backgrounded information project like presuppositions. The crucial difference is that backgrounded information need not be 'accommodated'. But this is just renaming things. In fact, he seems to think that all presuppositions are just backgrounded information.
- Onea 2015 does not use DRT, but basically says the same thing as Geurts 2010: Indefinites with exceptional scope encode additional information that projects. In a sense, it is also similar to Abusch's 1993 theory. I don't consider these to be solutions.

Diesing 1992 'syntacticises' the (non-)presuppositionality of existentials via the Mapping Hypothesis, but her account is too coarse and fails to account for scopal properties; see Van Geenhoven 1998 for detailed discussion.

The intermediate accommodation remains as a technical problem of the presupposition-as-anaphora theory.

Next time: I will propose a neo-Heimian framework for (in)definiteness and presupposition, where presuppositional indefinites don't need to be (always) accommodated, and behave like any other presuppositions. It will also give a better account of functional readings, as well as certain crosslinguistic facts about specificity and definiteness.

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