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Anaphora with(out) C-command: where do we stand?

I. Reflecting on the empirical landscape of anaphora in the new millenium.

A. Basics.

(1) Classic core data (with a twist).

a. Every person that has a cat/most people that have a cat pet it. D-quantifiers anaphora

b. i. A friend of mine$_1$ lives in a village$_2$. He$_1$ is an artist/it$_2$ is pretty. Discourse sequencing

ii. * He$_1$ is an artist/it$_2$ is pretty. A friend of mine$_1$ lives in a village$_2$.

In (1b.i) the antecedent of the pronoun is on the 'right side' of conjunction; in (1b.ii) it is not.

c. If a friend of mine$_1$ lives in a village$_2$ [he$_1$ often/rarely… is an artist. / it$_2$ often/rarely/… is pretty.] A-quantifiers anaphora

But, unlike what happens in (1b.ii):

d. If he$_1$ is an artist, a friend of mine$_1$ usually lives in a village

What (a)-(c) have in common is that there is some cross-sentential transfer of 'antecedent-hood' involving indefinites.

(2) Traditional crossover facts in light of non C-command anaphora.

The facts in (1b), naively speaking, bear resemblance to (Weak) Crossover violations: binding to the left is banned or limited.

a. Mary met every student$_1$ at his$_1$ place.

b. * His$_1$ teacher met every student$_1$ at Mary's place.

To see the parallel between (2a,b), a canonical case of Weak Crossover (WCO) and (1b), think event-semantics:

For every student u:

d. ∃e [Mary is the agent of e **and** INDEF-*u* the theme of e **and** e is at *his* house **and** e is a meeting]

e. ∃e [*his* teacher is the agent of e **and** INDEF-*u* the theme of e **and** at Mary's house e **and** e is a meeting]

Both the extra clausal discourse in (1b) and the intra clausal 'argument structure' in (2a-b) boil down to a sequence of coordinations involving events, with a strong left-to-right bias. As in (1b), the potential antecedent *u* of the pronoun *his* stands a chance at satisfying the presuppositions of the pronoun *his* in (d) but not in (e).

[INDEF-u, i.e. the capacity for 'antecedenthood', must be positionally anchored to the base

position, for this explanation to go through]. Hope: if we get the semantics of coordination/discourse sequencint right, we don't have to say anything about crossover phenomena.

(3) Two main approaches to non C-command anaphora.

a. Every man who has a donkey pets it.

b. Situation based approaches + E-type pronouns.

every minimal situation s containing a man-and-donkey pair is also part of a situation in which the man in s pets the donkey in s.

b. Dynamic approaches.

i. - Information units are, at each world, relations between assignments.
- DRs are introduced by a dedicated operation on information units.
- They are passed on through an operation of 'composition of relations', until they find a block.

iii. A friend of mine lives in a village. She is an artist. I met her in the 80's …

iv. If a friend of mine lives in a village, she is **usually** an artist. * I met her in the 80's

v. * If **no** friend of mine lives in a village, she is an artist.

The pattern in (iii)-(v) displays an 'accessibility' constraint: antecedents can covary with a pronoun if they are 'accessible' to them. Roughly: A is a accessible to B iff the first strong binder that C-commands A also C-commands B.

(4) Recent developments: Partial logic approaches.

[Rothschild 2017, Crnic 2023, Mandelkern 2024, Heim 2024, Spector 2025, Chatain 2025, Anvari 2026]

Information units (or propositions) are regarded, classically, as functions from worlds into sets of assignments. BUT, within a partial logic.

a. $\lambda w \lambda g.||\text{a cat}_1 \text{ stepped in}_w||^g = 1$ iff (i) g(1) is defined (ii) g(1) is a cat that stepped in in w.

(a) is a total function: no presuppositions.

b. $\lambda w \lambda g.||\text{it}_1 \text{ meowed}_w||^g = 1$ iff g(1) meowed in w.

If we work with partial assignments, (b) is only defined for *some* world-assignment pairs. I.e., it has presuppositions, namely that g be defined for 1. It can be used only when its presuppositions are met; the hope/intuition is that sentences like (a) can be used to filter or satisfy the presuppositions of sentences like (b). That's it. No dynamics.

The program as outlined seeks to get donkey anaphora with 'classical' meanings for propositions.

My goal is to lay out why I (still) see myself compelled not to follow these latter developments. The main reasons have to do with (i) crossover phenomena and (ii) how to optimally make the cut between direct vs. indirect binding.

I also would like to argue that while we do need to go beyond classical semantics values, we only need to do so mildly, not in the sweeping ways of Heim (82, ch 3).

(5) Why does it matter?

a. i. John/he is smart ii. every linguist is smart

Quantifiers are crucial to express 'general' toughts and to emancipate us from reference.

b. i. That number can be decomposed into a set of prime numbers that are smaller than it.

ii. Every non prime number can be decomposed into a set of prime number smaller than it.

Pronouns enable to extend general thoughts using the full power of arbitrarily complex sentences. Without some such device science is impossible…

Suppose that scope is movement:

c. i. A guard was standing in front of every house

ii. every house$_1$ [a guard was standing in front of t$_1$]

This would lead us to expect binding of the following sort:

d. QP$_1$ […pro$_1$….t$_1$…]

But this does not happen in general:

e. i. * He$_1$ complained in front of everyone$_1$ ii. * His child$_1$ bit no parent$_1$

It happens only in 'special' cases. E.g.

f. i. If it$_1$ is with cubs, a bear$_1$ is usually aggressive

ii. In front of his$_1$ child, no parent$_1$ wants to appear weak.

Why?

Speakers are endowed with a rich set of intuitions about co-variation/binding. The arguments people are having are about the architecture of this fundamental capacity of expressing fully general statements.

B. Empirical defense of a dualistic view.

(6) Two natural classes of quantification-and-binding phenomena.

D-quantifiers anaphora and Discourse sequencing/A-quantifiers anaphora are distinct phenomena to be dealt with separately. D-quantifiers are generalized quantifiers and D-quantifier anaphora is anaphora is a case of *indirect* binding;

Discourse sequencing and A-quantifiers anaphora have a dynamic kernel.

(7) What is indirect binding?

a. The employes all got a bonus. Every senior employee$_2$ re-invested [his/her/their$_2$ bonus]$_1$ in the company, while every junior one just cashed it$_{bonus}$ out. it$_{bonus}$ = his/her/their bonus

The pronoun *it$_{bonus}$* must be interpreted as a 'dependent definites', i.e., say , as a function that contains a variable bound by *every junior employee*, i.e. the local subject. By analogy,

b. i. [Every person who has a cat$_2$]$_1$ petted it$_{cat}$

ii. [Every person who has a cat$_2$]$_1$ petted the cat(s) he or she has/whatever cat(s) he or she has.

In general, indirect pronouns are interpreted as descriptions that depend on a 'normally' anteceded pronoun ('normally anteceded' = C-command bound or contextually supplied). Indirect binding is also known as E-type anaphora.

(8) Possible coverage of indirect binding.

a. Paycheck anaphora
Every employee got his yearly bonus. Every junior employee cashed it; every senior one reinvested it in the company.

b. D-quantifier anaphora [= Donkey anaphora out of relative clauses]
Every person who has a cat pets it.

c. Bach Peters sentences.
Every friend of mine who participated to it won a marathon he trained for.

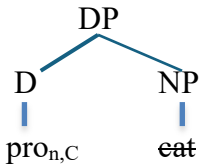
d. Possessor binding/Inverse linking
i. Every city's mayor must know its problems well.
ii. Every Englishman's mother's loves him.

e. i. Every boy's mother
ii. $[_{DP}$ [every boy_1[t_1' s mother]] $_2$
iii. $\lambda P \forall x$ [boy(x) $\rightarrow$ P(ιy.mother(y)(x))] 'the set of properties that every boy's mother has'

f. i. $[_{DP}$ Every boy's mom] $_2$ [t_2 loves $[_{DP}$ $him_{E\text{-}2}$ ~~boy~~]]
ii. [t_2 loves $[_{DP}$ him_2 ~~boy~~]] $\Rightarrow$ x_2 loves $f_{BOY}(x_2)$
iii. (i) $\Rightarrow$ $\lambda P \forall x$ [boy(x) $\rightarrow$ P(ιy mother(y)(x))](λx_2. x_2 loves $f_{BOY}(x_2)$)
= $\forall x$ [boy(x) $\rightarrow$ ιy . mother(y)(x) loves f_{BOY}(ιy.mother(y)(x)) relational notation
= $\forall x$ [boy(x) $\rightarrow$ love (f_{BOY}(ιy.mother(y)(x))(ιy.mother(y)(x))] functional notation
= every boy's mother loves the boy or boys that are her children
= every boy is such that his mother loves him

(9) A strawman (Elbournesque) take on indirect binding.

a. Syntax: Pronouns as Det's (Postal 1966)



'every person who has a cat pets it_{cat}'

Pronouns come with an index and occupy syntactically the D-position. The accompanying NP undergoes deletion under identity with a DP in its local environment. The interpretation of (a) might be that of a definite description as in (b.i), or, nearly equivalently, a Skolemized choice function as in (c):

b. Semantics.
i. ι x [$cat_w(x) \wedge C_w(x, x_n)$] Number neutral definite descriptions with an embedded variable.
ii. $f_{cat,w}(x_n)$ Variable over a Skolemized choice function.

Both approaches contain variables, C and x_n in (i), f and x_n in (ii). The higher order free variables C and f need to be 'resolved' through context; the e-level variable x_n needs to be bound in the 'normal ways' whatever they are. Retrieving values for C and f is what yields indirect binding proper.

For argument's sake, let us assume the (b.ii) variant of this approach: indirect pronouns are

(free) variables over Skolemized choice functions of a 'covert' pronominal element which is C-command bound; we will call such element the 'pivot' of an indirect pronoun.

(10) How to avoid excessively strong uniqueness presuppositions in D-quantifiers anaphora (without resorting to situation theory).
What to do in a context where there is more than one choice functions that can satisfy a sentence?

a. Every person who has a cat pets it.
b. [Every person who has a cat]$_1$ [t_1 pets $f_{cat}(pro_1)$]
c. A 'supervaluationist' take. [Bumford, Champollion and Henderson 2019, Chatain 2024 a.o.]
(b) is true if for all assignments defined over functions f_{cat} that map people into one of their cat, $||(b)||^g = 1$; it is false if for all possible assignments defined over functions that map people into their cats, $||(b)||^g = 0$; undefined, otherwise.
d. A semantically undefined sentence can become pragmatically effective/usable via some form of domain selection; this happens if it helps settling some contextually salient QUD and/ or if the un D-restricted reading clashes with contextual knowledge.
i. Were people able to pay their bill?
ii. Not all. But everybody who had a credit card did manage to pay its bill with it.

There are other ways to go. But for our purposes, we maybe have enough of an existence proof of the viability of this idea to move on to Discourse Sequencing and A-quantifier anaphora.

(11) Why not to extend the indirect strategy to all of non C-command anaphora and live happily ever after?
D-quantifier anaphora involves subordinate clauses that cannot stand on their own, like relative clauses. Discourse Sequencing and A-quantifier anaphora involve clauses that are self-standing (i.e. potential root-clauses).
a. A friend of mine lives in a village; it is pretty.
b. If a friend of mine lives in a village, it is (usually/rarely) pretty.
Suppose we try to interpret it in (a) as an indirect pronoun:
c. $f_{village}(pro_n)$ is pretty.
What would bind its pronoun? If D-quantifiers are clause bound, there is nothing in the adjacent sentence in either (a) or (b) that could (or should) do that.
How about leaving both f *and* its pivot unbound? Let f(village)(pro) denote the village at some location present in the speaker's mind. Then the supervaluationist approach above should kick in. And, if we have more than one witness for the indefinite, we would expect a universal reading of the pronoun to be felicitous and to have the same status in, e.g., (i) and (ii):
d. i. John ate a hamburger. It was overcooked.
ii. If John eats a hamburger, it is overcooked
Not so. This holds also of D-quantifier anaphora when driven by indefinites.
e. i. Every student that wrote an essay wrote it without AI ∀-reading

ii. A student that wrote an essay wrote it without AI ∃-reading

Strong quantifiers yield 'strong' readings of non C-command bound pronouns. Indefinites drive weak existential readings. The E-type strategy only yields strong readings.

This makes sense if:

(i) Indefinites 'push forward' through discourse their potential for antecendenthood differently from other D-quantifiers.

Moreover whatever way of pushing forward antecedenthood we have in (11a) should carry over to (11b), for the parallel between the two structures is too plain to miss.

This yields the following division within non C-command anaphora:

(ii) D-quantification D-Sequencing/A-quantification
E-type strategy Something else

(12) Exceptional scope?

Might the effect in (a) be a consequence of the long distance scope properties of indefinites?

Take the choice functional approach. Let us say indefinites denote variables over choice functions, subject to 'unbounded' ∃-closure. It is tempting, then, to reproduce the DRT-approach using quantification over choice functions:

a. ∃ [A friend of mine lives in f(village); f(village) is pretty.] Text level ∃-closure

b. Most f ([a friend of mine lives in f(village)) (f(village) is pretty.) Crnič, Chatain

(13) Two reasons not to go with exceptional scope.

Reason 1. For quantification over choice functions to work out, choice functions should be in one-one correspondence with the individuals in their domain, e.g., in (8f), with the villages.

This is so because sentence (8f), on its most salient reading, has the same truth conditions as:

a. Most villages inhabited by a friend of mine are pretty.

While this *can* be done (e.g., by stipulating that quantification is over extensional choice functions whose domain is limited to villages in the relevant world), it feels underwhelming.

Reason 2. This one is empirical. Polarity sensitive and epistemic indefinites are often ostensibly clause-bound in their scope. Yet they support donkey anaphora. So do bare plurals and many other kind of indefinites.

b. This term, each one of my colleagues has read every paper that a student of mine wrote.

Sentence (b) has an intermediate scope reading, one of the arguments used in the literature to show the special scope properties of *a*. The same holds of the Italian counterpart of (b):

c. Questo semestre, ciascuno dei miei colleghi ha letto ogni paper che un mio studente ha scritto.
This term, each one of my colleagues has red every paper that a my student wrote

The insertion of the free-standing choice modifier *qualsiasi* after the indefinite article completely blocks the intermediate scope reading.

d. Questo semestre, ciascuno dei miei colleghi ha letto ogni paper che un *qualsiasi* mio studente ha scritto

Sentence (c) can only mean the same as:

e. Every one of my colleagues read every paper that any student of mine wrote

Yet *uno qualsiasi*, just like *any*, effortlessly sustains donkey anaphora.

e. Se Gianni vede un qualsiasi mio studente, di solito lo tratta male.

f. If John sees any student of mine, he is usually rude to him.

Treating discourse sequencing and A-quantifier anaphora by appealing to the exceptional scope properties of indefinites seems wrong.

Unlike D-quantification, Discourse sequencing and A-quantification does call for a dynamic take or whatever subsumes its effects.

(14) Summary and to do's

a. D-quantifier anaphora is indirect binding. No dynamics.

b. Discourse sequencing and A-quantifier anaphora do call for some dynamics (or DRT).

C. Crossover phenomena, for real.

(15) Traditional data

SCO/Principle C

a. * He$_1$ complained to no one$_1$ 'No x is such that x complained to x'

b. * He complained at no student's defense 'At no student's x defense, x complained'

WCO

c. * His$_1$ teacher complained to no student$_1$ 'To no student x, x's teacher complained to x'

d. *His$_1$ parents complained at no student$_1$'s defense. 'At no student's x defense, x's parents complained'

Crossover and movement.

e. * who$_1$ did he$_1$ complain to t$_1$

f. * who did his teacher complain to?

It has been known for a while that certain kinds of movement 'obviate' or 'repair' certain cross over violation. But only recently there is some appreciation of how robust this phenomenon is.

If movement is the way in which scope is set, the phenomena above should NOT exists.

g. Q_i […pro$_i$ …t$_i$….]

If *pro$_i$* and *t$_i$* are the same type of variables, there should be no problem

(16) New data I: Hindi Scrambling. (Bhatt and Keine 2019, 2023)

a. * Us-ne$_1$ har chattra-ke$_1$ kaam-ki prashansa ki.
DEM-ERG every student-GEN work-GEN praise did
'For every student x, x praised x's work'

b. *Uske$_1$ shikshak-ne har chattra-ke$_1$ kaam-ki prashansa ki.
DEM-GEN teacher-ERG every student-GEN work-GEN praise did
'For every student x, x's teacher praised x's work'

b. * Har chattra-ke$_1$ kaam-ki us-ne$_1$ prashansa ki.
Every student-GEN work-GEN DEM-ERG DEM praise did.
'For every student x, x praised x's work'

d. Har chattra-ke$_1$ kaam-ki us-ke$_1$ shikshak-ne prashansa ki.

Every student-GEN work-GEN DEM-GEN teacher-ERG praise did
'For every student x, x's teacher praised x's work'

(17) New data II: Italian Clitic Left Dislocation (CLLD). (Chierchia 2024)

a. * Pro$_1$ ha presentato le proposte di ogni ricercatore$_1$.
(he$_1$) presented the proposal of every researcher$_3$

b. * Il suo$_1$ direttore di ricerca ha presentato le proposte di [ogni ricercatore]$_1$.
His$_1$ research director presented the proposals of every researcher$_1$

c. * [Le proposte di ogni ricercatore$_1$] $_2$ pro$_1$ le$_2$ deve controllare una per una
[the proposals by every researcher$_1$] $_2$ he$_1$ them$_2$ must control one by one

d. [Le proposte di ogni ricercatore$_1$] $_2$ il suo$_1$ direttore di ricerca le$_2$ deve controllare una per una.
[the proposals by every researcher $_1$] $_2$ his$_1$ research director them$_2$ must control one by one.
For every researcher x, x's proposals are such that x's research director must control them one by one.

(18) New data III: Seediq Pivot movement. (Wu 2025, 2026)

a. * q<m-n>ita kn-kingal seediq$_3$ [ka heya$_3$ / dheya$_3$]
<av-pfv>see red-one person piv 3sg /3pl ‘[$_{PV}$ he$_3$] saw every person$_3$.’
See every person-OBJ he-SUBJ VOS

b. * q<n>ita-an na heya$_3$ / dheya$_3$ [ka kn-kingal seediq$_3$]
<pv.pfv>see gen 3sg /3pl piv red-one person ‘he$_3$ saw [$_{PV}$ every person$_3$].’
See he-SUBJ every person-OBJ VSO

c. * wada m-emux kn-kingal laqi$_2$ [ka bubu=daha$_2$]
pst av-hug red-one child piv mother=3pl.gen ‘[$_{PV}$ his$_2$ mother] hugged every child$_2$.’
Hug every child-OBJ his mother-SUBJ VOS

d. wada mex-un na bubu=daha$_2$ [ka kn-kingal laqi$_2$]
pst hug-pv gen mother=3pl.gen piv red-one child ‘his$_2$ mother hugged [every child$_2$].
Hug his mother-SUBJ every child-OBJ VSO

(19) New data IV: English PP-fronting. (Chierchia 2024)

a. * He$_3$ burst into tears at every student$_3$'s defense.

b. * His$_3$ advisor burst into tears at no student$_3$'s defense.

c. i. * At every student$_3$'s defense he$_3$ burst into tears.
ii. * At no student$_3$'s defense did he$_3$ burst into tears . [Thanks to P. Elliott]

d. i. At every student$_3$'s defense, his$_3$ advisor burst into tears.
ii. At no student$_3$'s defense did his$_3$ advisor burst into tears.

(20) Taking stock

SCO/Principle C

a. * He$_1$ complained to no one$_1$ 'No x is such that x complained to x'

b. * He complained at no student's defense 'At no student's x defense, x complained'

WCO

c. * His$_1$ teacher complained to no student$_1$ 'To no student x, x's teacher complained to x'

d. * His$_1$ parents complained at no student$_1$'s defense. 'At no student's x defense, x's parents complained'

Overt wh-moment 'preserves' both effects.

e. * Who$_1$ did he$_1$ complain to t$_1$ 'For which x did x complain to x?'

f. * Who$_1$ did his$_1$ teacher complain to t$_1$ 'For which x, did x's teacher complain to x?'

g. *At whose$_1$ defense did his$_1$ parents complain 'At whose x's defense, did x's parents complain?'

Topic oriented movement retains only SCO effect.

h. * At no student's defense he complained __ 'At no student x's defense, x complained'

i. √At no students defense his parents complained __ 'At no student x's defense x's parents complained'

II. Accounting for the old and the new facts: the role of the 'dynamics'.

D. The two faces of anaphora.

(21) Two logics of binding.

a. 'Ordinary' lambda abstraction (Tarski-style).

i. The λ-operator targets a variable and manipulates the corresponding assignment.

$\lambda x_n [_\phi \ldots x_n \ldots] \wedge [_\Psi \ldots x_n \ldots$ The first occurrence of x_n is bound; the second is free.

(There clearly is a 'C-command' constraint on λ-binding)

b. Dynamic binding

i. There is an operation of 'Discourse Referent' activation; active DRs are passed on to anaphors through accessible domains.

$[_\phi \ E^{\underline{n}}\mathbf{(u)} \wedge [_\Psi \ldots \omega_{\underline{n}} \ldots \wedge \ldots \omega_{\underline{n}} \ldots \wedge \ldots \ ]$

DR-introduction Anaphors

ii. Dynamic binding is not subject to C-command, but to 'Accessibility.' DRs are activated and asymmetrically passed on via function composition. They are 'kept alive' until they find some barrier in the form of negation or of a strong quantifier. The reason for this 'barrier' effects is that negation and strong quantifiers are 'tests'.

c. Exemplifying accessibility.

i. [$_\phi$ There was [a cat]$^{\underline{3}}$ on the mat; it$_{\underline{3}}$ was black; I chased it$_{\underline{3}}$ away; …]

ii. *? There [$_\alpha$ wasn't] [$_\phi$ a cat$^{\underline{3}}$ on the mat]. I saw it$_{\underline{3}}$ on the kitchen table.

d. i. [$_\phi$ A friend of mine brought his cat$^{\underline{3}}$. It$_{\underline{3}}$ was a very annoying one…]

ii. *? [[$_\alpha$ Every friend of mine] [$_\phi$ brought his cat$^{\underline{3}}$]]. It$_{\underline{3}}$ was a very annoying one.

The reason for this 'barrier' effects is that negation and strong quantifiers probe their input for specific properties; if the input passes the test, it is returned unchanged, wiping the 'auxiliary info' used in the test.

> "Flexible, pliant without breaking, such as leather, dough, or limbs. It also refers to graceful, limber movement or a quick, adaptable mind."

(22) Supple dynamics.

i. Information Units: (world indexed) partial relations between partial assignments (as

opposed to (world indexed) sets of assignment), built on a strong Kleene logic.

ii. It mimics aspects of the dynamics, without the presuppositional part.

(23) The object of contention.

In the dynamic tradition, propositions/information units (IUs) are viewed as functions from information states into new information states. Information states can be thought of as sets of world-assignment pairs. This leads to a semantics based on 'high types'.

a. Dynamics at the turn of the century (and beyond).

i. Dynamic Montague Grammar (Groenendijk and Stokhof; Chierchia)

ii. Plural Dynamic Semantics (van der Berg, Nouwen)

iii. Continuations, functional programming (Barker, Charlow, Eliott)

Is there a way to get the effects of dynamics with a low type? And how low?

b. i. Classical meaning: functions from worlds into sets of assignments.

He_1 runs $\Rightarrow \lambda w \lambda g$ || he_1 runs$||^{w,g}$

ii. Relational meaning: functions from worlds into relation between assignments.

He_1 runs $\Rightarrow \lambda w \lambda g \lambda g'$. g = g' and || he_1 runs$||^{w,g}$

(bii) is a revisitation of a proposal put forth by G&S themselves in their Dynamic Predicate Logic (which then they expanded, type-wise, to their Dynamic Montague Grammar – which I followed). Lately, I have been trying to revisit the DPL idea in a spirit closer to that of avoiding high types and relying on an independent theory of projection for presuppositions.

Main object of disagreement: classical or relational IUs?

As things stands, (bii) appears to be just a redundant way to couch classical meanings. Its potential strength and key feature lies in the fact that relational information units allow us to directly model an operation of 'DR introduction', designed to satisfy the presupposition of pronouns, and one of 'projecting it through' discourse.

(24) From classical meanings to relational ones.

Let's keep using g, g' as ranging over total assignments to variables (in the metalanguage). Let's use, henceforth ω, ω', for partial assignments. There are straightforward ways of mapping classical meanings into relational ones, for when we need/want to do that.

i. ||Rosie walked in|| = $\uparrow$walked $in_w(r)$ = $\lambda\omega\lambda\omega'$ [ω = ω' ∧ walked $in_w(r)$] total

ii. ||she_1 meowed|| = $\uparrow$ $meowed_w(\omega_1)$ = $\lambda\omega\lambda\omega'$ [ω = ω' ∧ $meowed_w(\omega_1)$] partial

We do not need to always be operating with relational meanings; but when anaphora is involved we may want/have to. And the basic step in that direction is straightforward.

(25) Dynamics in three steps.

a. Step 1. DR introduction as an operation on information units, i.e. a 'declaration'.

For any expression u of type e,

i. $E^n(u) = \lambda\omega\lambda\omega'$. ω' = ω ∪ {<n,u>} (defined only if ω ∪ {<n,u>} is a function). [Eliott pc]

ii. ||$\underline{a\ cat_u\ E^1(u)}$ walked in|| = $\underline{\exists u(\uparrow cat(u) \odot E^1(u)}$ $\odot$ $\uparrow$walked $in_w(u)$)

$= \lambda\omega\lambda\omega'\ \exists u\ cat(u) \wedge \omega' = \omega \cup \{<1,u>\} \wedge$ walked $in_w(u)$

As a completion to DR introduction, we want to be able to existentially close (ordinary/'total') variables occurring inside relational IUs (cf. (b.ii), the underlined part).

b. Step 2: Existential closure on relational IUs.

$\exists u\ R = \lambda\omega\lambda\omega'\exists u\ R(\omega)(\omega')$ $\exists$-Closure

c. Step 3: Discourse sequencing as function composition.

i. $\|$ A cat_u $E^1(u)$ walked in. It_1 meowed$\|$ = $\|$A cat_u $E^1(u)$ walked in$\|$ © $\|It_1$ meowed$\|$

ii. R©R' = $\lambda u\lambda u'\ \exists u''$ R(u)(u'') $\wedge$ R'(u'')(u') IU-Composition

iii. $\lambda\omega\lambda\omega'\ \exists u\ cat(u) \wedge \omega' = \omega \cup \{<1,u>\} \wedge$ walked $in_w(u)$ © $\lambda\omega\lambda\omega'$ $[\omega = \omega' \wedge meowed_w(\omega_1)]$

= $\lambda\omega\lambda\omega'\ \exists u\ cat(u) \wedge \omega' = \omega \cup \{<1,u>\} \wedge$ walked $in_w(u) \wedge meowed_w(\omega'_1)$

(26) Technical notes.

The representation language is a standardly typed language, with a strong Kleene underlying logic for connectives and quantifiers. It contains a new type **ω**, for partial assignments. Information units are (intensional) relations of type T = <**ω**,<**ω**,t>>, Φ_w, Ψ_w,…

i. An information unit is true in w relative to ω iff $\Phi_w(\omega)$ is defined and yields an output (in symbols, $\downarrow\omega\ \Phi_w = \exists\omega'\ \Phi_w\ (\omega)(\omega')$); it is false in w relative to ω iff $\Phi_w(\omega)$ is defined and yields no output. It is undefined otherwise.

ii. An information unit is true in w iff Φ_w is true relative to $\omega_\varnothing$ (the empty partial assignment).

The logic of I(nformation) U(nits):

a. The dynamic component.

iii. If ϕ is of type t, $\uparrow_\omega\phi = \lambda\omega\lambda\omega'\ .\ \omega = \omega' \wedge \phi$ IU creation

iv. For any index n and any expression u of type e, $E^n(u)$ is defined as in (23a.i):

$E^n(u) = \lambda\omega\lambda\omega'.\ \omega' = \omega \cup \{<n,u>\}$

v. $\Phi©\Psi = \lambda\omega\lambda\omega'\ \exists\omega''\ \Phi\ (\omega)(\omega'') \wedge \Psi(\omega'')(\omega')$ Composition

vi. $\exists u\Phi = \lambda\omega\lambda\omega'\exists u\Phi(\omega)(\omega')$ Composition

b. The 'classical' (partial) component Pointwise lifting

vi. $\neg\ \Phi = \uparrow_\omega \neg \downarrow_\omega \Phi$

vii. $\Phi \rightarrow \Psi = \neg\ (\Phi\ © \neg\Psi)$

viii. $\Phi \vee \Psi = \neg\ (\neg\ \Phi\ © \neg\Psi)$

c. <u>Bottom line</u>:

i. The underlying logical apparatus is strong Kleene (= decide as soon as you have sufficient info);

ii. We overlay on it a composition operation on IUs, yielding an asymmetric, incremental mode of discourse sequencing.

(27) Mapping Hypothesis.

a. Base positions (= Theta positions) activate DRs:

Freely adjoin E^n as a sister to any theta position.

Example:

iii. John E^{1}_{2} AG walked in

$\lambda u_2\ E^{1}(u_2) \copyright \uparrow$walked in$(u_2)(j) = E^{1}(j) \copyright \uparrow$walked in$(j)$

$= \lambda\omega\lambda\omega' \exists\ \omega' = \omega \cup \{<1, j>\} \wedge$ walked in$_w(j)$

Note: I am not saying that *only* theta positions activate DRs. Stay tuned…

(28) DP types.

a. Pronouns as quantifiers:

i. $pro_n = \lambda P_{<e,T>}\ \lambda\omega\lambda\omega' .\ \omega = \omega' \wedge P(\omega_n)(\omega)(\omega')$ [Charlow pc]

Example

ii. $pro_3(\uparrow$walked in$) = \lambda\omega\lambda\omega' .\ \omega = \omega' \wedge$ walked in (ω_3)

b. Asymmetries in the D-quantificational system: Strong D-quantifiers vs. indefinites.

Strong quantifiers are first merged into a theta position, then moved to a scope site.

c. Every cat_1 $[t_1\ E^{2}_{1}$ AG licks its_2 whiskers].

ii. The QP only binds its trace. The trace is linked to (identified with) a DR introduced by the AG head, which can host the E-operator.

iii. The E + AG complex 'binds' the pronoun (= the E^n operator satisfies the presuppositions of the pronoun embedded in the object position).

Note: this constitutes a departure from the traditional take on C-command binding.

Indefinites are all property denoting (i.e., <e,t>). They are merged with verbs via something like 'restrict'. (We want this regardless of anaphora!)

d. i. walk + a cat $= {}_{\exists}$[walk](a cat) $= \lambda P\ \exists x\ [P(x) \copyright \uparrow walk(x)]\ (\uparrow cat) = \exists x\ [\uparrow cat(x) \copyright \uparrow walk(x)]$

ii. A cat ${}_{\exists}[E^{2}_{1}$ AG licks its_2 whiskers$] = \exists u \uparrow cat(u) \wedge \omega' = \omega \cup \{<1,u>\} \wedge$ walked in$_w(u)$

iii. $\exists u \uparrow cat(u) \wedge \omega' = \omega \cup \{<1,u>\} \wedge$ walked in$_w(u)$

Evidence: predicative uses, there-sentences, numerals coocurring with quantifiers, narrow scope indefinites like bare plurals.

(Some indefinites also allow for wide scope construal, of course, on top of their basic predicative use – for those, follow your heart).

The (strictly local) ∃-closure operation keeps discourse markers 'alive' and allows cross sentential anaphora.

e. A cat ${}_{\exists}[E^{2}_{1}$ AG licked its_2 whiskers$]$ © [it_1 was evidently proud of them]

(29) A bimodal approach to crossover. (cf. Büring 2004)

Standard cases of crossover follow immediately:

a. * His_1 cat bit no one_1

b. * Who_1 did his_1 cat bit t_1

The pronoun in (19a), being contained in the subject, simply has no clause internal accessible antecedent. Both QR and Wh-movement are movements to discharge or mark scope. As such they are movement to a non DR activating position, which means that they can only bind their own traces and are unable to provide an antecedent for the pronoun.

In other terms the configuration in (15b), repeated here as (19x) no longer automatically

predicts binding. It no longer requires a construction specific constraint to block it.

h. Q_i […pro_i …t_i….]

(30) Partial Crossover override.

Positions derived via movement fall into two categories:

b. Non DR-activating, interpreted as Tarkian variables ('weak' derived positions)

c. DR activating, interpreted as (active)DRs ('strong' derived positions)

Typically, topic like positions will introduce DRs; positions created to discharge scope won't. This mapping lines up only partially with with A/A'distinction. All traditional A-positions are DR activating. But some traditional A' positions (say, the landing site of CLLD in Italian) would also qualify as DR introducing. The two systems (DR vs non DR activating) 'talk' through predication.

While movement associated with 'weak' discourse functions (e.g. scope discharging) do not activate DRs, movement to positions associated with robust topical functions activate DRs. A prime example of DR creating movement: Raising.

a. $John_1$ T^1 seems to his_1 friends [t_1 not to be in good shape]

The external subject position (Spec of TP?), even if it is non thematic, as with raising, clearly has topic like properties (e.g., Rizzi 2005) and activates DRs. The heads that drive (i) Local scrambling in Hindi, (ii) CLLD in Italian, (iii) Voice Pivot in Seediq and (iv) PP-fronting in English are like the external subject position in being able to active DRs.

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(31) Principle C/Strong Crossover as a minimality effect.

Why Strong Crossover/Principle C are never overridden by movement?

a. * Who_1 C^1 did he_1 complain to t_1

b. * Who_1 C^1 did he_1 say Mary complained to t_1

c. * Who_1 C^1 did Sue say that he_1 believes that Mary will complain to t_1

Which $person_1$ did Sue say t_1 believes that Mary will complain to him_1.

In all of these cases the wh-words is attracted to an interrogative C, which targets a DP with a specific index. And in all of these cases there is a potential target bearing that index which is closer to the probe than its wh-targets. It is hard not conclude that *this* is the source of the problem: A strong intervention/minimality effect (cf. Rizzi 1990).

Ordinary QR configurations such as (d) have the same general shape as (c). One needs to think of QR as movement that targets specific scope sites Σ, along the lines proposed by, e.g., Beghelli and Stowell (1994,1997).

f. i. he_1 complains to one_1
   ii. no one_1 Σ^1 [he_1 complains to t_1]

(32) An on the road balance.

a. Two sorts of binding
   i. Operator/Tarskian variables; realized as movement, subject to C-command.
   ii. Dynamic: DRs are activated by certain heads/positions and kept alive until fenced off by a 'test'; Realized as antecedent/pronouns relations.

b. Pronouns are presuppositional; their presuppositions can only be met by E^n.

c. Traces are never presuppositional.

d. E^n is not part of the meaning of any DP. It is merged at (certain) predicate positions.

→ DRs are activated by TH-positions and positions/heads associated with strong discourse functions (topic/possibly some focus positions).

c. Heads that trigger movement for purposes of scope marking do not activate DRs

⇒ d. WCO is caused by movement to scope sites that do not introduce DRs.

e. SCO is a minimality effect. Hence, it cuts across all types of movement.

f. Anaphora and binding are a great source of insight onto the spontaneous logicality of language.

(33) Novelty.

E^n does *not* automatically yield novelty.

a. A man $_{\exists}$[E^1 walked in]. A man $_{\exists}$[E^1 sat down].

b. $\lambda\omega\lambda\omega'\ \exists u\ man(u) \wedge \omega' = \omega \cup \{<1,u>\} \wedge walked\ in_w(u)$ © $\lambda\omega\lambda\omega'\ \exists u\ man(u) \wedge \omega' = \omega \cup \{<1,u>\} \wedge walked\ in_w(u)$

Sentence (a) is interpreted as (b), which is the same as (c).

c. A man [E^1 walked in]. He_1 sat down].

So, (a) needs to be ruled out. We can go Maximize Presupposition, if it works.

Or we can state Novelty as a presupposition on E^n:

d. $E^n(u) = \lambda\omega\lambda\omega'$: $n \notin D(\omega)$. $\omega' = \omega \cup \{<n,u>\}$

[This second option paves the way to studying indefinites apparently non subject to novelty:

e. i. Si è andati; si è giocato e si è perso.
   One went; one played and one lost
   ii. Se si è alti, si è belli.
   If one is tall, one is handsome 'tall people are handsome'
   iii. Se si è biondi raramente si hanno gli occhi scuri.
   If one is blond rarely one has dark eyes 'few blond people have dark eyes']

E. A-quantifiers and anaphora

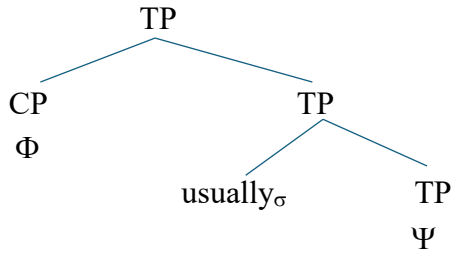
(34) A-quantifiers.

A-quantifiers are relations between IUs; This allows for dynamic transfer.

A-quantifiers target indefinites via 'disclosue

a. $ADV_{\sigma}(\Phi)(\Psi) = ADV(\lambda u_{\sigma}\,\Phi)(\lambda u_{\sigma}\,\Phi \rightarrow \Psi)$ where σ is a non empty sequence of indices.
The indices target indefinites in the restriction and 'disclose' them.

b. LF:



c. Example

i. If a friend[1] of mine lives in a village[2], she is usually$_1$ an artist

ii. usually$_{1,w}$

↑friend of mine (x_1) © ↑lives in a village[2] (x_1)	R
↑friend(x_1) © ↑lives in a village[2] (x_1) → ↑she$_1$ is an artist	S

iii. Most friends of mine that live in a village are such that none of them isn't an artist (in every accessible world).

Other possible reading for (i):

iv. If a friend[1] of mine lives in a village[2], it$_2$ is usually$_2$ pretty

v. Most villages inhabited by a friend of mine are pretty.

d. <u>Take home</u>:

A-quantifiers exploit the very same mechanism at the basis of discourse sequencing:

i. a friend[1] of mine lives in a village[2]

ii. usually (λ u [a friend[1] of mine lives in a village[2]] © ↑ω_1 = u)

Important: the if-clause is interpreted just like it is in isolation. It may contain potential antecedents for pronouns; they can be targeted by Q-adverbs ad 're-opened' – so to say.

(35) Consequences for cataphora.

Cataphora requires one of three things:

a. Syntactic movement (overt or covert) to a site that can host E^n

b. Semantic 'accessibility'

c. Indirect binding

(36) Cataphora via syntactic movement

a. i. A man$_1$ walked and Mary greeted him$_1$

ii. He$_1$ walked in and Mary greeted a man$_1$ Movement impossible

b. i. If a cat$_1$ is hungry, it$_1$ meows

ii. If it_1 is hungry, a cat_1 meows — Movement to a topic position possible

iii. a cat_1 E^2_1 [if it_2 is hungry] [t_1 meows] — (Covert)

iv. [if-CP Top [TP]] ⇒ DP Top [if-CP Top [TP]]

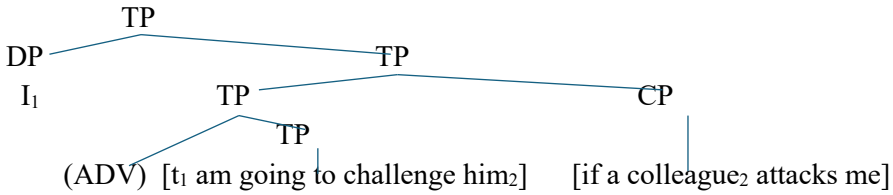
v. Un $gatto_1$ E^2_1 [se pro_1 ha fame][t_1 miagola] (Overt)

(37) Cataphora via accessibility

a. i. I hope you managed to get its_1 plate, if it was a car_1 that hit you.

ii. I am (always)ready to challenge him_1, if a $colleague_1$ attacks me with bad arguments.

b.



Material in an if-clause is always in principle semantically accessible to material in a main clause, even when the if-clause is adjoined to the right. That's just part of the meaning of if-clauses.

(38) Cataphora via indirect binding.

This happens whenever pronouns are not accessible to direct binding.

An example: Bach-Peters sentences.

a. Every professor that interviewed him was impressed by the candidate assigned to her.

b. every ranger who managed to shoot at it hit every wild pig that attacked him.

c. ever $ranger_1$ who managed to shoot at $it_{1,pig}$ [every wild pig_2 that attacked $him_{2,ranger}$ [t_2 hit t_1]

d. $every(\lambda x.\ ranger(x) \wedge x \text{ shot at } f_{pig}(x))\ (\lambda y_1.\ every(\lambda z.\ wild\ pig(z) \wedge z \text{ attacked } f_{ranger}(z))(\ \lambda y_2\ [y_1 \text{ hit } y_2]))$

The presuppositions of the dependent definites (that interpret the pronouns) are sustained by the semantics of the clause.

(39) Lights on the architecture of anaphora.

a. D-quantification is static.

i. Strong D-quantifiers rely on indirect binding.

ii. Weak D-quantifiers 'keep open' active DR and sustain Discourse anaphora with ∃-readings.

b . The quasi dynamic module that deals with:

i. Discourse sequencing ii. A-quantification

Why 'quasi'? Basic types stay low; and while anaphora relies on presuppositions (pronouns have presuppositions; DR introduction 'satisfies' them), the nature of the latter is largely left open (with a Strong Kleene base line).

c. A predictive enough 'E-type' take on anaphora, whenever we get beyond the reach of direct binding.

d. What do we get:

i. The classic data non C-command covariation, where D-quantification is treated via the indirect strategy, the rest via direct binging.

ii. Crossover phenomena may be beginning to yield.

iii. A modular approach to cataphora that stands a chance at being both principled and general enough.