Origins of Weak Crossover
When Dynamic Semantics Meets Event Semantics

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Abstract. Approaches to anaphora generally seek to explain the potential for a DP to covary with a pronoun in terms of a combination of factors like (i) the inherent semantics of the antecedent DP (i.e. whether it is indefinite, quantificational, referential), (ii) its scope properties, and (iii) its structural position. A case in point is Reinhart's classical condition on bound anaphora. "A DP can antecede a pronoun pro only if the DP C-commands pro at S-structure," with some extra machinery needed to allow indefinites to co-vary with pronouns beyond their C-command domains. In the present paper, I explore a different take: anaphora is governed not by DPs and their properties; it is governed by predicates (i.e., in the unary case, objects of type <e, t>) and their properties. To use a Dynamic Semantics terminology/metaphor, Discourse Referents can only be activated by predicates; never by DPs. This conceptually simple assumption is shown to have far reaching consequences, among others that of yielding a new take on WCO, arguably worthy of consideration, and of leading to a (further) restatement of the anaphora question.

1. What is at stake?

> "WCO may be described as a syntactic configuration in which pronouns cannot be interpreted as coconstrued with certain kinds of displaced or quantified antecedents. If it is correct to say that (a) the blocking of this coconstrual does not seem logically required, (b) the effect is syntactically conditioned, (c) the effect is widespread in the world's languages, and (d) it does not appear to arise from instruction, then it is reasonable to assume that the WCO effect is a peculiar consequence of the human language capacity and a clue to the structure of that capacity" (Safir 2017)

Weak Crossover (WCO) has been at the center of intense research for some 50 years (since at least Postal 1971).[1] The persisting recurrence of research aimed at providing accounts for WCO, including the present attempt, is symptom of the fact that we all still look at it with a sense of awe and mystery.[2] A mystery that, if pried open, might reveal important properties of the syntax/semantics interface. The present paper explores a novel

[1] Another important early reference among many is Jacobson (1977).
[2] Cf., e.g., Jacobson (1999), Shan and Barker (2006), Ruys (2010), Safir (2018), among many others. For an overview, see Safir (2017).

explanation for WCO in terms of the dynamics of discourse. Textbook style cases of WCO typically have the following form:

(1) **Canonical crossover cases:**
a. *Who$_1$ did [his$_1$ book make t$_1$ rich]
b. [whose$_1$ book]$_2$ [t$_2$ made him$_1$ rich]
c. *No author who$_1$ [his$_1$ book made t$_1$ rich] showed up
d. No author [whose$_1$ book]$_2$ [t$_2$ made him$_1$ rich]] showed up
e. i. some manager interviewed every analyst
ii. every analyst$_i$ [some manager interviewed t$_i$]
iii. his manager interviewed every analyst
iv. * every analyst$_i$ [his$_i$ manager interviewed t$_i$]

In (1a) and (1c) a wh-item is dislocated to the left periphery of a clause and in so doing it 'crosses over' a constituent that contains a pronoun. Such a pronoun cannot be interpreted as co-varying with (or bound by) the dislocated constituent. This contrasts with what happens in, e.g., (1b) and (1d)), where no crossing over occurs. WCO effects extend to non-wh dependencies (in particular, scope assignment for quantifiers) as illustrated in (1e). It is easy to get an inverse scope reading for sentences (cf. 1e.i-ii). But in the very same configuration it is hard or impossible to get pronoun binding (as in 1.e.iii-iv).[3]

Beyond the canonical cases, WCO has huge ramifications into many aspects of grammar. Consider for example the case of functional readings of wh-words (2a-b) or the distribution of list-readings in questions with quantifiers (2c-d):

(2) a. Which person does no one ever have dinner with? His undertaker
b. Which person has dinner with no one? * His undertaker
c. Which extra guest did everyone bring along?
John brought Sue, Mary brought Bill, …
d. Which person brought every guest? * John brought Sue, Mary brought Bill,…

The impossibility of getting a functional answer in (2b) and a list reading in (2d) have been analyzed as cases of WCO.[4] For example, the trace in (2a-b) can be argued to be a functional one, with the argument of the function understood as a null pronoun that has to be bound by a suitable antecedent. The binding of this covert pronoun turns out to be WCO-compliant in (2a) but not in (2b), whence the impossibility of a functional reading in the latter case. Our proposal will have consequences for many ramifications of WCO effects, but we won't be able to pursue them all within a single paper, given how widespread they are.

While we won't be able to follow through all the consequences of our proposal, there is one class of WCO extensions that will play an important role in our argumentation, namely extensions to donkey anaphora. The following illustrates the relevant paradigm:[5]

[3] I do not believe that this is an artifact of the view that scope is movement. Any way of getting inverse scope for quantifiers is bound to give the option of binding pronouns as in (2.e).
[4] Cf., e.g., Chierchia (1993), Dayal (2016, Chapter 4).
[5] This data, from Chierchia (1995a), goes as far back as Higginbotham (1980, 1985).

(3) a. Every farmer who owns a donkey relies on its strength.
b. *its$_j$ strength impresses every farmer who owns a donkey$_j$
c. *[every farmer who owns a donkey$_j$]$_i$ [its$_j$ strength impresses t$_i$]
d. Which farmer that owns a donkey$_i$ relies on its$_i$ strength?
e. *Which farmer that owns a donkey$_i$ does its$_i$ strength impress t?

The reason why this paradigm constitutes a challenge above and beyond the paradigm in (1) is that accounts of the contrast in (1) in general do not automatically extend to (3). For example, Büring (2004) provides an account of the contrasts in (1), based on the use of two different operators for scope assignment vs. pronoun binding; he furthermore takes a stance in favor of a situation based approach for sentences like (3a);[6] but a situation based account for (3a) would lead us to expect sentences like (3b) to be good, for if minimal man-situations are available in (3a) to provide a basis for interpreting the donkey pronoun *its*, they'll surely be also available in (3b) (see Section 2 for details). Thus on his take the account for the contrast in (3) would have to be independent of the account he provides for the contrast in (1). And yet the parallelism between (1) and (3) cries out for a uniform account.

To further put the problem in perspective, let us briefly review some of the main approaches that have set the stage for much work on WCO over the past 30 years or so. They are sketched in (4):

(4) **Approaches to WCO:**

a. **Reinhart (1983):**
A pronoun *pro* can be bound by (/covary with) an antecedent X iff XP (or its trace, if XP is quantificational) is in a A position that C-commands pro.
(= XP must C-commands pro before A'- movement, if any).

b. **Koopman and Sportiche (1983):**
An XP in an A' position can bind one and only one element. (Bijectivity)

c. **Safir (1984):**
If a single quantifier binds more than one syntactic variable, then either (i) or (ii):
i. Both syntactic variables are pronouns.
ii. Both syntactic variables are traces.
(Parallelism on Operator-Binding).

What is striking about all of these proposals is that they appear to be more complex than other constraints on binding like, say, the Binding Theory (along the classical lines of Chomsky 1981). E.g., they have no obvious 'functional grounding'. Principles A and B of the Binding Theory do: Reflexive morphology on a pronoun encodes the need for a local antecedent. It is natural then to try to relate to this the fact that non reflexive pronouns *cannot* be locally bound, as a kind of 'elsewhere' effect.[7] Nothing of the sort can be said about constraints like those in (4).

[6] See, e.g., Heim (1990), Elbourne (2005, 2010) a.o.
[7] See, e.g., Schlenker (2005), Marty (2017) for takes on the BT directly relevant to the present approach.

Beyond these general qualms, there are well-known, and pretty formidable empirical challenges that all of the approaches in (4) face. In particular, the following phenomena have been repeatedly pointed out in the literature as problematic for all of them:

(5) **Empirical issues with canonical WCO constraints:**

a. *Donkey anaphora:*

i. If a farmer$_1$ buys a donkey$_2$, he$_1$ trains it$_2$.

ii. Every farmer that buys a donkey$_1$ trains it$_1$.

b. *Inverse linking:*

iii. The mayor of no city$_1$ despises it$_1$/its$_1$ population.

c. *Possessor binding:*

iv. Every first year student$_1$'s advisor tries to help him$_1$ or her$_1$ through the initial rough phase.

d. *Binding into adjuncts:*

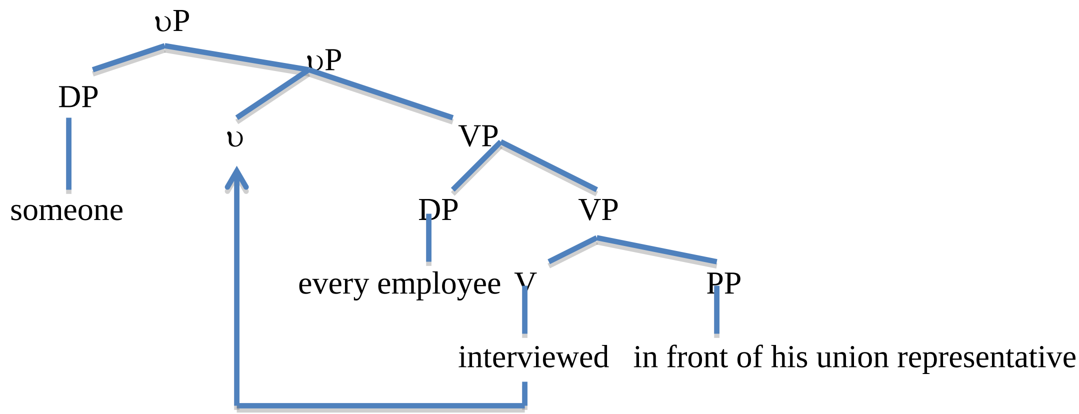
v. I spend an inordinate amount of time time with every first year student$_1$ in order to afford him$_1$ or her$_1$ a smooth entrance into our program.

All of these familiar phenomena are known to be prima facie incompatible with the C-command condition on pronoun binding, or with bijectivity, or with parallelism. It is worth focusing, in particular, on the case of binding from the object position into adjuncts, i.e. (5d). Its problematic nature can be best appreciated by considering the paradigm in (6):

(6) a. Someone interviewed every new employee.
b. His manager interviewed every new employee.
c. Someone interviewed every new employee in presence of his union representative.

We already pointed out that while it is easy to construe (6a) with the object having wide scope over the subject, it is hard or impossible to get the object to bind a pronoun embedded in the subject position as in (6b). However, it is perfectly natural for a quantifier in object position to bind into a higher adjunct as in (6c), regardless of whether the object is construed with wide or narrow scope with respect to the object. The problem here is the asymmetry between the subject vs. the adjuncts: both are higher than the object, and yet the object can easily bind into adjuncts, but hardly so into the subject. This situation has led some researchers (e.g. Larson 1988, Pesetsky 2004) to invoke 'cascading' structures / VP-shells such as (7):

(7)



The idea here is that adjuncts, no matter how high they wind up at spell out, are generated as sisters to the verb, which is subsequently head raised leftwards, as indicated by the arrow in (7). In their base position, adjuncts are C-commanded by the object, which supposedly explains why binding by objects into adjuncts is possible. However, this generalization of the VP-shell approach faces many issues. For one thing, approaches based on bijectivity or parallelism still have a problem here, for structures like (7) wind up with an operator binding two (non parallel) positions. Moreover, adjuncts pattern very differently from arguments when it comes to, e.g., extraction, and show no Principle C effect with respect to the object (cf. *they caught him, before John could say 'beep'*).[8] All of this makes it desirable to try to understand binding into adjuncts in a way that retains a more surfacy constituency for adjunction.

If things were not sufficiently complex, one has to also keep in mind the existence of A'-like kinds of movement that appear to obviate WCO effects. Topicalization in English and Clitic Left Dislocation in Italian are a case in point:

(8) a. This book$_i$ [I would expect its$_i$ author to disavow t$_i$] but that book$_j$ [I wouldn't __].
(Lasnik and Stowell 1991)

b. i. ??Il suo dipartimento incoraggia sempre un bravo studente.
the his/her department incorages always a good student

ii. Un bravo studente, il suo dipartimento lo incoraggia sempre
A good student the his department him incorages always

Also scrambling, which we won't be able to discuss within the limits of the present paper, presents similar characteristics. Some forms of (typically local) scrambling obviate WCO, while other don't, and this has led to characterize them as A- vs. A'-scrambling, respectively.[9]

So while scope assignment and wh-movement in English display very robust WCO effects, other kinds of displacements like those in (8) appear to obviate them, and this too is part of the picture we'd like to make some sense of. While we in no way will be able to enlighten fully all of these complexities, we may be able to add a tool useful in exploring them further.

[8] Example due to one of the referees.
[9] Cf., e.g., Mahajan (1990), Baylin (2001), Titov (2012), among many others.

2.1. The idea in a nutshell

Allow me to couch the main idea I would like to pursue in 'dynamic talk.' Dynamic Semantics (DS) involves three things: (i) an operation of Discourse Referent (DR) introduction, (ii) a way of passing on DRs that have been properly introduced/declared via context updates through 'accessible' domains, and (iii) an interpretation of pronouns according to which they covary with accessible DRs. The introduction of DRs in a dynamic setting is usually associated with an existential operator, which I'll notate for now as '$\textit{∃}$' to distinguish it from the ordinary, static existential quantifier '$\exists$'. Accessibility is determined by the lexical semantics of the basic Boolean operators. In all versions of DS I am familiar with, DR introduction is considered to be a property of DPs. For example, a sentence like (9a), on a typical DS, is compositionally broken down as in (9b).

(9) **Introduction of DRs via DPs/arguments:**

a. A man walked in.

b. i. a man $\Rightarrow \lambda P \textit{∃} x\, [\text{man}(x) \wedge P(x)]$

ii. walked in $\Rightarrow \lambda y.\ \text{walked-in}(y)$

c. $\lambda P \textit{∃} x\, [\text{man}(x) \wedge P(x)](\ \lambda y.\ \text{walked-in}(y)) = \textit{∃} x\, [\text{man}(x) \wedge \text{walked in}\ (x)]$

The result of composing the parts in (9b) is (9c), in which a DR has been properly declared and is ready to be picked up by a pronoun, modulo accessibility. I propose to consider, instead, the compositional break down in (10a):

(10) **Introduction of DRs through predicates:**

a. i. a man $\Rightarrow \lambda P \exists x\, [\text{man}(x) \wedge P(x)]$

ii. walked in $\Rightarrow \lambda x \textit{∃} y.\ x = y \wedge \text{walked-in}(x)$

b. $\exists x\, [\text{man}(x) \wedge \textit{∃} y.\ x = y \wedge \text{walked-in}(y)] \quad \Leftrightarrow \textit{∃} x\, [\text{man}(x) \wedge \text{walked in}\ (x)]$

The existential quantifier associated with the subject in (10a) is an ordinary static one. It does not declare a DR, whose value can be passed on. The one in the predicate in (10a) does. The final outcome in (10b) is equivalent to the one in (9c), but the compositional path through which it is derived differs from that in (9).

Why bother? What is the deal in switching from the traditional approach in (9) to the one in (10)? Consider a canonical WCO case like *his son saw a man*, with a quantified DP *a man* now in object position. Quantified DPs need to be assigned scope. But if DPs *never* introduce DRs, then the object DP *a man* won't be able to, wherever it gets scoped at. The object argument slot of *see* will introduce a DR. But plausibly a DR introduced in the object position won't be accessible to a pronoun embedded in the subject position. This, in fact, turns out to be a 'theorem', once we switch to event semantics and the clause gets broken down in a series of structurally determined conjuncts, as we will see below. And so the pronoun embedded in the subject position in *his son saw a man* turns not to have a sentence internal accessible antecedent.

This idea needs to be fleshed out in many ways. But, it is simple and clearly has non trivial consequences. Such consequences are worthy of being played out, especially if the various pieces of the proposal (e.g. event semantics, or the idea that argument slots may introduce DRs) turn out to have some amount of independent motivation, as I believe they do (cf. Section 2.4, below).

One more thing. To say that DPs never introduce DRs entails that DR introductions don't take place at their scope sites either. Consider (11a) again:

(11) **DPs never introduce DRs:**
a. His son saw a man.
b. a man_i [his son saw t_i]
c. $\lambda P \exists x\, [man(x) \wedge P(x)]$ (λx_i. his father saw x_i) Heim and Kratzer (1998)
d. i. DPi [ϕ] $\Rightarrow$ DP(λx_i. ϕ)
ii.* DPi [ϕ] $\Rightarrow$ DP(λx_i. $\exists y$. x = y $\wedge$ ϕ)

In a movement based approach to scope, the object *a man* in (11a) undergoes covert movement resulting in structures like (11b). These structures are generally interpreted as in (11c). According, e.g., to Heim and Kratzer (1998) the index on the DP acts an abstractor over the rest of the clause (i.e. the scope), thereby creating something of type <e,t>, that then can properly combine with the DP meaning as in (11c). The interpretive rule that Heim and Kratzer give is as in (11d.i). We want to keep it that way. We definitely do not want it to be as in (11d.i), where a DR is being introduced at the landing site of Quantifier Raising (QR). For otherwise the claim that DP never introduce DRs would be vacuous, and couldn't even begin to be tested. To put it differently, our claim is not that *all* predicates introduce DRs. The claim is that *only* predicates can. Which predicates? Well, presumably the lexical ones. Plus, probably, a few derived ones. But certainly not those that are created just to resolve a type mismatch and allow to discharge scope. This is what we want to explore.

1.2. The plan

I've couched my main claim in 'dynamic talk'. The kind of DS I will end up using is very basic. In fact, it will be simpler than most dynamic approaches, in that we will not want to have around Dynamic Generalized Quantifiers (a corollary of the view that DPs do not introduce DRs).[10] While this paves the way for a potential simplification of dynamic takes, the way I am putting dynamics to use, i.e. the mapping between syntax and semantics, obviously, is very different from the way it is done elsewhere.

The central idea in this project has important point of contacts and precedents in approaches that employ background frameworks different from DS. In particular, it has points of contacts with the approach developed by Büring (2004), who endorses a situation theoretic framework. It is also well known that DS has both formal and conceptual overlaps with, e. g., continuation based approaches (e.g. Barker (2002) and

[10] Dynamic Generalized Quantifiers not only introduce DRs; they also allow dynamic transfers of DRs introduced in their restrictions to their scope. For example in *every man that has a donkey beats it* the subject DP *every man that has a donkey* activates a DR for the head noun *man* and enables transfer of the DR associated with *a donkey* to the scope of the subject. See, e.g. Groenendijk and Stokhof (1990), Kanazawa (1994), Chierchia (1995), and references therein, a.o.. Cf. also Barker and Shan (2008) for a way of having something analogous to Dynamic Generalized Quantifiers in a continuation framework.

related work) and I have no doubt that the idea sketched above could also be developed with continuations. However, in so far as I can see, the approach developed here differs non-trivially, both conceptually and empirically, from the approaches to anaphora just mentioned, whether situation or continuation based, and I will try to indicate some ways in which this is so (throughout, but especially in Section 5).

The plan is as follows. In Section 2 we will work out the basic idea and explore its consequences. This will be done by presenting the version of DS that is to act as our background framework and by marrying it with an independently motivated event based semantics. In Section 3, we will explore the consequences of the mapping hypothesis in (10)-(11), as spelled out in Section 2, more broadly against the traditional data set for which DS was articulated in the first place, namely donkey sentences. In Section 4, we will look at cases of A and A'movement that bleed WCO, and formulate a concrete hypothesis as to how and why they do so. In Section 5 we will draw some comparisons with available situation and continuation based approaches to crossover phenomena and conclude.

2. Dynamic Semantics *plus* Event Semantics

The view that typically predicates introduce DRs resonates deeply with (and, in fact, was directly inspired to me by) an idea put forth in Büring (2004). He argues that there are *two* systems of indices in syntax: one for A'-binding, and one for A-binding. Büring adopts the standard view of scoping as movement but with a twist: the binder associated with QR binds only its own trace. Pronoun binding is dealt with in terms of a separate binder to be (optionally) inserted at A-positions as illustrated below:

(12) a. Every cat licks its whiskers.
b. Every cat_i [t_i β_3 licks its_3whiskers]
c. Every cat λ_i [t_i λ_3 [t_3 likes t_3's whiskers]]

According to Büring, a sentence like (12a) requires two steps to yield a bound pronoun interpretation. The first is the insertion of a pronoun binder β, which can be inserted at any A-position. The second is QR, which assign scope to the subject DP by adjoining it to its scope site (string vacuously, in the case at hand). These two operations yield the structure in (12b), which is interpreted as in (12c). The operator β in (18a) links the A-position to the embedded pronoun (in a manner similar to how the Geach-rule works).[11] This is admittedly very close to our claim that predicates (i.e. things that determine A-positions) are what creates antecedents for anaphora. Büring argues that his approach provides us with a way of deriving some of the basic WCO effects:

(13) a. Its whiskers bother every cat.
b. Every cat_i [its_3 whiskers bother t_i]
c. * Every cat_i [its_3 whiskers β_3 bother t_i]
d. * Every cat_i β_3 [its_3 whiskers bother t_3]

[11] Cf. Geach (1970).

The canonical A'-binder in (13) can never 'see' pronouns, a way of (re)stating the view that pronouns cannot, in general, be A'-bound.[12] The β-operator in (13c) is correctly inserted in an A-position, but it is too low to bind the pronoun embedded within the subject. In (13d), on the other hand, the β-operator is high enough to link the pronoun within the subject to the object position, but it is not in an A-position. In sum, there is no way of getting the undesired binding. While this approach provides us with an interesting take on WCO, it remains unclear where these two systems of indices come from. Büring suggests (quoting E. Ruys) that his proposal should be grounded in a semantic difference between traces and pronouns, but doesn't pursue this suggestion. It seems to me that DS + event semantics provides us with a way of pursuing Büring's suggestion and ground his double indexing idea in an independently needed semantic difference between traces and pronouns: traces are (standard) Tarskian variables, pronouns are pointers to accessible Discourse Referents.[13]

Be that as it may, the main problem on Büring's account, as on any of the classical accounts of anaphora, is how to deal with the many cases of pronominal co-variance that are not subject to the C-command requirement, including, e.g., donkey anaphora. The two main candidates on this score are situation based approaches and DS. Büring opts for situations. While both situation based approaches and dynamic ones have their strength and weaknesses, it seems to me that there are specific reasons not to marry situation theory with the double indexing approach Büring advocates, which I will outline in the next subsection. This should provide us with preliminary motivation to go the other way and marry something like Büring's double indexing with a dynamic semantics instead.

2.1. Issues with situations

Following Heim (1990), Elbourne (2005, 2010) and others, Büring analyzes a typical donkey sentence like (14a), informally, as in (14b):

(14) a. Every farmer that has a donkey beats it.
b. Every minimal situation s which contains a man and a donkey he owns is part of a situation s' in which **the man in s** beats **the donkey he owns in s**.

The subject DP is associated with minimal situations containing donkey owning men that provide the basis for interpreting the E-type pronouns in the scope of the subject DP. Consider now any case of donkey crossover, such as those pointed out in Section 1.

(15) a. * Its_j strength impresses every farmer who owns a donkey_j.
b. [every farmer who owns a $\text{donkey}_j]_k$ [its_j strength impresses t_k]
c. Every minimal situation s which contains a man and a donkey he owns is part of a situation s' in which **the strength of the donkey in s** impresses **the man s**.

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[12] A highly important class of cases where this generalization does not hold concerns resumptive pronouns (cf., e.g., McCloskey 2002, 2006 among many others). Resumption is a huge topic in its own right and we certainly won't be able to address it within the limits of this paper. However, Clitic Left Dislocation in Italian does make use of resumption and we will show how at least that case can be handled in a reasonably principled manner within the present framework.

[13] For the interpretation of traces, I follow Fox's (1999) trace convention. See also Sauerland (2004).

The object in (15a) will undergo scope assignment as in (15b). Given Büring's assumption the raised object won't be able to directly bind the pronoun its embedded within the subject. But the strategy adopted in (14) should be available, and yield the reading in (15c), where the pronoun *its* winds up co-varying with the object. Something extra, not spelled out in Büring (2004), is needed to prevent this from happening.

Contrast this with the main idea put forth in this paper: only predicates can introduce DRs. This entails that neither the object DP as a whole nor any DP embedded within it will be able to offer a DR to the pronoun embedded in the subject position. That should be more or less the whole story. No extra condition is needed for donkey crossover cases.

As a matter of fact, use of situations risks to jeopardize the very heart of Büring double indexing idea in a more fundamental way. Consider a basic WCO case again, like (13) above reproduced here:

(16) a. Its whiskers bother every cat
b. Every cat_i [its_3 whiskers bother t_i]
c. * Every cat_i [its_3 whiskers β_3 bother t_i]
d. * Every cat_i β_3 [its_3 whiskers bother t_3]
e. Every minimal situation s which contains a cat is part of a situation s' in which **the whiskers of the cat in s** bother **the cat in s**.

Use of the β-operator for pronoun binding prevents the object in (16a) from binding directly the pronoun embedded within the subject. But then, again, what is to prevent the indirect binding strategy from kicking in, yielding the unwanted reading in (16e)? One can try to say that indirect binding is available only when a DP is in its base position. But that would limit donkey anaphora to the subject position, as that is the only place where a quantified DP needn't be assigned scope. This is surely too constraining: donkey anaphora happens out of any sort of positions.

These considerations are not in any way to be taken as knock down argument against a situation based approach to anaphora, nor against Büring's basic insight. But they do provide preliminary support in favor of exploring an alternative venue. Rather than marrying the idea *pronouns are bound from A-positions* (which is what Büring's double indexing does) with situation based accounts, let us translate Büring's idea in *DRs can only be introduced by predicates*. That should not take us into the same kind of trouble illustrated by (15) and (16) at all.

2.2. Basics of dynamics: DRs introduction, pronouns and accessibility.

In the present subsection, I am going to introduce the version of DS that I will use to explore the idea that anaphora is regulated by predicates.[14] The bite of the dynamics comes from the operation that activates discourse referents and passes them along onto accessible domains, employing the notion of accessibility common to all approaches that have developed out of Kamp's (1981) Discourse Representation Theory and Heim's (1982) File Change Semantics. Of course, the precise characterization of accessibility is

[14] This system is closely based on Heim (1982), and Dekker (1996, 2012). But adopts a notation more similar to Muyskens (1996) and Champollion et al, (2018).

open to many questions. But for us here the details of accessibility matter less than its existence and some of its general, fairly uncontroversial characteristics. In particular, I will follow Heim in assuming that DR-introduction is subject to a novelty conditions (i.e. a 'fresh' DR, not present in previous discourse, must be used) and that the interpretation of definites, including pronouns, is subject to a familiarity condition requiring that at the moment of evaluation of the definite, its antecedent must be available/active. Pronouns can only get their antecedents from active DRs (i.e., they can never be directly A'-bound). Readers that are willing to go along with these assumptions need not go through the present subsection, which is necessary only if one wants to probe the details of the implementation (and the sample derivations in the Appendix).

In DS the meaning of a sentence is viewed as a way of updating an input context or information state. Since we are not dealing with intensional phenomena, the semantic value of sentences can be represented as a relation between assignments, generally of the form $\lambda\omega\lambda\omega'.\ \phi$ (cf. Groenendijk and Stokhof 1991), where ω, ω',… are variables over assignments and ϕ is some expression of type t (i.e., truth value denoting). Assignments are *partial* functions from numbers n into individuals (of type e). For example, a sentence like (17a) will be represented as (17b), ignoring for the time being the event argument.

(17) a. he_3 runs $\Rightarrow$ [run](he_3)
b. $\lambda\omega\lambda\omega'.\ \omega = \omega' \wedge run_{<e,t>}(\omega_3)$
where ω_n is an abbreviation for $\omega(n)$ and the formula to the right of the double arrow in (a) is to be understood as an abbreviation for the formula in (b).

The formula in (17b) takes as input some assignment ω and returns the same, if ω_3 is defined and the individual in the 3rd coordinate runs. Our basic types are e, t, and n (the type of numbers). The type of assignments is <n,e> = $\boldsymbol{\omega}$ (boldface $\boldsymbol{\omega}$) ; the type of sentence values is T = <$\boldsymbol{\omega}$,<$\boldsymbol{\omega}$,t>>, which we will call 'Context Change Potentials', following Heim (1982). CCPs can be evaluated relative to an assignment as follows:

(18) a. $\downarrow_\nu \phi = \exists\omega[\phi(\nu)(\omega)]$ (ϕ is true relative to ν)
b. Example: $\downarrow_\nu$ he_3 runs $= \exists\omega[\ \nu = \omega \wedge run_{<e,t>}(\nu_3)]$ (ν satisfies $run_{<e,t>}(\nu_3)$)

The formula in (18b) is defined iff ν has a value in its 3rd slot; if defined, it is true if the individual ν_3 runs and false otherwise. The '$\downarrow$' operator extracts from CCPs their corresponding (traditional) truth-conditions, relative to an assignment.

In this setting, basic logical functors operate over CCPs. The following is a standard way of defining them, based again on Groenendijk and Stokhof (1991):

(19) Basic logical operators:

a. $\neg\phi = \lambda\omega\lambda\omega'.\ \omega = \omega' \wedge \neg{\downarrow_\omega}\ \phi$
b. $(\phi \wedge \psi) = \lambda\omega\lambda\omega'.\ \exists\omega''\ [\phi(\omega)(\omega'') \wedge \psi(\omega'')(\omega')]$
c. $\phi \rightarrow \psi = \neg\ (\phi \wedge\neg\ \psi)$
d. $\phi \vee \psi = \neg\ (\neg\ \phi \wedge\neg\ \psi)$
e. $\exists\alpha_a\ \phi = \lambda\omega\ \lambda\omega'.\ \exists\alpha_a\ [\phi(\omega)(\omega')]$
f. $\forall\alpha_a\ \phi = \neg\exists\alpha_a\ \neg\ \phi$

The above logic does not countenance yet DR introduction ($\exists$, as defined in (19e), is static). DR introduction is an operation that takes as input an assignment undefined over some coordinate n and returns as output an assignment, where that coordinate is now anchored to some specific individual u. Given that we want to pursue the idea that only predicates introduce DRs, we might as well couch DR introduction as an operation on predicates:

(20) For any $P_{<e,t>}$, and any n, […] is that function such that:
i. $[P_{<e,t>}] = \lambda u[\ \lambda\omega\lambda\omega'.\ \omega = \omega' \wedge P(u)]$
ii. $[P_{<e,t>}]^n = \lambda u[\ \lambda\omega\lambda\omega'.\ \omega =^{n/u} \omega' \wedge P(u)]$
where $\omega =^{n/u} \omega'$ is an abbreviation of $\omega' = \omega \cup <n,u>$, defined only if the the input assignment is *un*defined for the n^{th}-coordinate.

[P] without superscripts simply lifts the type of P to <e,T>, by tacking onto it a trivial input/output assignment pair; $[P]^n$ does the same but also activates a novel DR n linked to whatever P will take as argument. Recall that assignments, being partial functions from numbers into individuals, are generally of the form {<1,u>, …, <n, u'>,…}. For example, {<1, John>, <3, Mary>} is a partial assignment that maps the 1^{st} slot into John and the 3^{rd} slot into Mary. DR-introduction adds a new pair to partial assignments of this sort (only if the result of this addition is still a function).

Finally, pronouns denote functions from assignments into the individual hosted at a specific 'address' or coordinate (see 21a).[15] They combine with dynamic predicates (of type <e,T>) via a rule that uses function composition, specified in (21b); (21c) illustrates.

(21) a. $he_n \Rightarrow \lambda\omega.\ \omega_n$ Type: $<\boldsymbol{\omega},e>$
b. If P is of type <e,T>, then: $P_{<e,T>}\ (\lambda\omega.\ \omega_n) =_{df}\ \lambda\nu\ \lambda\nu'.\ P(\lambda\omega.\ \omega_2\ (\nu))(\nu)(\nu')$
c. i. $[run]^3\ (\lambda\omega.\ \omega_2) = \lambda\omega.\lambda\omega'.\ [\omega =^{3/\ \omega_2} \omega' \wedge run(\omega_2)]$
ii. $[run](\ he_2)$

The predicate *run* in (21c) is taken to introduce a DR (in the coordinate 3), on the assumption that dynamic predicates generally do, and applies to ω_2, using the operation in (21b). Thus the input to (21c) must be defined on its 2^{nd} coordinate. The introduction of a new DR by $[run]^3$ is in this case without effect, since such DR is equated, via

[15] Definites in general are of the same types as pronouns and combine in the same way. For example:
(a) His_3 father $\Rightarrow \lambda\omega.\iota x[\text{father of}(\omega_2)(x)]$

predication, to ω_2., which must be known at the point of evaluation. This justifies abbreviating (21c.i) as (21c.ii).

This system delivers, basically, the approach to indefinites that is the red thread common to all versions of DS. A sequence of sentences like (22a) gets the interpretation in (22b) in a completely standard way. The magic of the dynamics makes (22b) have the same truth conditions as (22c). The only difference in the compositional mapping is that DR introduction is built into the main predicate of the clause along the lines sketched in Section 1.1, rather than in the subject *someone* (Cf. the Appendix for a complete derivation).

(22) a. Someone [walked in]^2. He$_2$ was [tall]^3.
b. $\exists$x [walked in]^2 (x) $\wedge$ [tall] (he$_2$)
c. $\exists$x [walked in(x) $\wedge$ tall(x)]

Superscripts indicate DR-introduction. The first sentence in (22a) introduces a new discourse referent in the second coordinate of the input assignment and passes it along to the second conjunct. The second conjunct contains the pronoun *he$_2$*, which requires that at the point of evaluation of *he$_2$*, the second coordinate of the input assignment must have a value. In this case this presupposition is satisfied. So the second sentence checks whether ω_2 is tall, and if so, it passes this value further along.

The semantics in (19) encodes the (standard) accessibility relation informally characterized in (23):

(23) **Accessibility:**
A is accessible to B = a DR active in A can co-vary with a pronoun in B

a. [A and B]	i. A is accessible to B (but not viceversa)
	ii. B is accessible to whatever may follow B
b. [If A, B]	i. A is accessible to B (but not viceversa)
	ii. A, B are *not* accessible to what follows B
c. [not A]	Nothing in A is accessible to what follows A
d. [A or B]	A is not accessible to B, nor is B to A. Neither is accessible to what follows.

Examples of how accessibility affects anaphora are provided in (24); each example is accompanied by a rough break down of the sentence in macro-constituents, plus the aspect of the relation in (23) responsible for the (im)possibility of anaphoric binding:

(24) a.i. John saw a cat$_i$ and fed it. Mary fed it$_i$ some more.
ii. [[A and B] and C]; A is ACCESSIBLE-TO C (it follows from (23a))
iii. * I saw it$_i$ and fed a cat$_i$.
[A and B]; B is not ACCESSIBLE to A
b. i. * If there was someone in the house, I'll be scared. My dog attacked him.[16]
ii. [[if A then B] and C]; A is not ACCESSIBLE-TO C
(it follows from (23b.ii))

[16] This holds modulo 'Modal Subordination' phenomena. See Roberts (1987).

c. i. John didn't buy a new car$_i$. ?? He borrowed it$_i$ from me.
ii. [[Not A] and B]; A is not ACCESSIBLE-TO B
d. i. ?? Either John has a new car for us to borrow, or it$_i$ is parked in that garage.
ii. [A or B]; A is not ACCESSIBLE-TO B

The infelicitous cases in (24) all involve unresolved anaphora, i.e. occurrences of *it*$_i$ with no accessible antecedents.

This system contains no major non-standard features, in so far as dynamic systems go. But when it comes to logical notations idiosyncrasies are hard to avoid, and I am solely responsible for any annoying one I may have introduced.

2.3. Events in a dynamic setting.

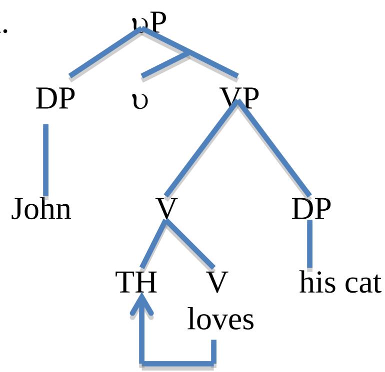
Event semantics, which has proven so useful in a variety of domains,[17] yields a semantic analysis of sentences like (25a) along the line of logical forms like (25b):

(25) a. John loves his cat
b. $\exists$e [EX(e)(j) $\wedge$ TH(e)(j's cat) $\wedge$ love(e)]
c. There is an eventuality e (a state, in the case at hand) such that John is the EX(periencer) of e and John's cat is the TH(eme) of e and e is a state of loving.

Verbs are viewed as unary predicates true of eventualities, and arguments are 'fed in' using thematic roles. Thematic roles, ultimately relations between eventualities and individuals, are generally introduced in the compositional interpretive system via some system of applicative heads. The latter can be analyzed either as functions that apply to individuals and make them capable of combining with the verb (e.g. Champollion 2015) or viceversa as functions that apply to the verb and make them combine with the relevant argument (cf., e.g. the discussion of *voice* in Kratzer 2003). Nothing hinges on this choice, in so far as we are concerned. For concreteness, we are going to choose the second option. Accordingly, a sentence like (25a), is going to have the structure in (26a), where *voice* (or 'little V') and TH are the applicative heads. In particular, TH is an 'object creating' head into which the V incorporates. TH is abstract in English but overtly realized in many languages;[18] the main steps of the compositional interpretation of (26a) are schematically summarized in (26b):

[17] A standard reference in this connection is Parsons (1990), who develops an original insight from Davidson (1967). For an important more recent contribution, see e.g. Kratzer (2003) a.o.
[18] Cf., e.g., Alsina and Mchombo (1990) a.o.

(26) a.



b. i. TH(love) = $\lambda u\lambda e[TH(e)(u) \wedge love(e)]$

ii. TH(love)(his cat) = $\lambda e[TH(e)$(j's cat) $\wedge love(e)]$

iii. υ (TH(love)(his cat)) = $\lambda u\lambda e[EX(e)(u) \wedge TH(e)$(j's cat) $\wedge love(e)]$

iv. υ (TH(love)(his cat))(j) = $\lambda e[EX(e)(j) \wedge TH(e)$(j's cat) $\wedge love(e)]$

Each applicative head applies to its sister (a predicate of events) and turns it into a function that looks for an individual. So, in particular, TH applies to V and adds an argument to it, as indicated in (26b.i). The result applies to the object *his cat*, yielding, a new predicate of events, with the theme argument now 'discharged'. The interpretation then goes through a second cycle. Little υ applies to its sister, adding the EX-argument to it. The outcome is a new property of events (26.b.iv) that eventually undergoes existential closure to deliver the meaning in (25b). These are simple compositional proceedings, that readers should feel free to replace with their favorite way of getting from the lexical components of sentences like (25a) to their meaning (25b).

We are now ready to go dynamic and to implement the view that every basic/lexical predicate can introduce a DR. The relevant basic pieces here are *love*, TH and EX. Predicates in a dynamic setting are of type <e,T>, i.e. functions from individuals into Context Change Potentials, and *love*, TH and EX need to be lifted accordingly. In the framework of Section 2.2, the lifting is going to be accomplished by the $[\ldots]^n$ operator, that also activates a discourse marker linked to its argument. Here is an example:

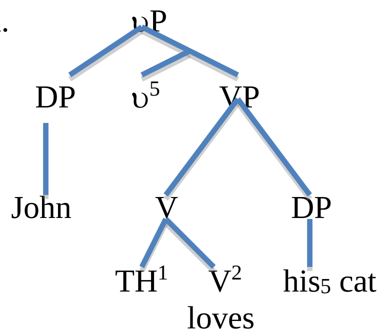
(27) a. V^2 | loves $\Rightarrow \lambda e.[love]^2(e)$ Type: <e,T>

b. i. $\lambda e \exists x_2\, [e = x_2 \wedge love(e)]$

ii. $\lambda e\, [\lambda\omega\lambda\omega'.\ \omega =^{2/e} \omega' \wedge love(e)]$

As already mentioned, I am going to mark with numerical superscripts in the syntax the site at which the lifting of the predicate and the introduction of the corresponding DR is realized. In (27a), we have the interpretation of the V node. The formula to the right of the double arrow signifies that the event variable *e* is linked to the now active DR in the second slot of the output assignment. This corresponds to what in the informal notation of Section 1 we have represented as in (27b.i) (notation to be abandoned heretofore in favor of the formally explicit (27b.ii), when necessary). *TH(e)* and *EX(e)* (which are both of type <e,t>) will be lifted in a similar manner to $[TH(e)]^1$ and $[EX(e)]^5$ respectively (with indices picked at random, but subject to novelty). Consequently, the whole of the structure in (26), reproduced in (28) will yield the interpretation in (28b), using the very same modes of composition used in (26b) adjusted for type as indicated:

(28) a.



b. λe [$[EX(e)]^5(j) \wedge [TH(e)]^1(his_5\ cat) \wedge [love]^2(e)$]

Everything here is as in (26b) but for the fact that formulae are now of the type T of Context Change Potentials, rather that the type t of truth values. Lifting and DR activation is uniformly obtained through the $[\ldots]^n$ operator. The formula in (28b) contains three active DRs (<5, 1, 2>), with accessibility arising deterministically. In this instance, the pronoun *his* contained in the second formula in (28b) has only DR 5 accessible and picks it up in the way in which pronouns do in a dynamic setting (cf. again Section 2.2 for our implementation). In interpreting a structure like (28) we are implicitly assuming that conjunctions are interpreted following their surface order (which, for English, coincides with the base S V O ordering). What is crucial is the relevant order of the subject vs. the object. Had we interpreted (28a) as (29), where the subject is interpreted to the right of the object, we would make the opposite predictions, namely that the object is accessible to (pronouns within) the subject:

(29) $\lambda e\ .\ [TH(e)]^1(his_5\ cat) \wedge [love]^2(e) \wedge\ [EX(e)]^5(j)$

In DS, conjunction is NOT commutative and (29) is not equivalent (28b). The mode of interpretation in (29) might well be relevant in analyzing, e.g., VOS languages. If the object in such languages turns out to be accessible to a pronoun or anaphor embedded in a subject, it might be taken as evidence for a basic constituency of the form [[V O] S], interpreted as in (29).[19] If, instead, binding from the object into the subject turns out to be impossible, it might because the VOS order is derived from a more basic structure in which the subject is accessible to the object (say, a basic [S [V O]] structure with fronting of the VP). As things may go either way depending on specifics, a mix of approaches may be called for. While settling matters won't be easy, the hope is that the present perspective on clause structure might grow into an interesting tool for crosslinguistic semantic investigations of order variation.

Be that as it may, we do not have such complications in English, where basic constituent left-to-right order is clear and tells us unequivocally that (28b) is the right

[19] In other words something like (a) gets interpreted as (b):
(a) love Mary-ACC her mother-NOM
(b) Her mother is loved by Mary

interpretation. This observation immediately gets us the basic WCO facts in a Büring-style way:

(30) a. i. Everyone loves his cat
ii. [every one$_i$ [t$_i$ υ^5 TH^1 loves his$_5$ cat]]
iii. every one (λx_i . $\exists e$ [[EX(e)]^5(x_i) $\wedge$ [TH(e)]^1(his$_5$ cat) $\wedge$ [love]^2(e)])
b. i. His cat loves everyone
ii. [every one$_i$ [his cat υ^5 TH^1 loves t$_i$]]
iii. every one (λx_i $\exists e$ [**[EX(e)]^5(his cat)** $\wedge$ [TH(e)]^1(x_i) $\wedge$ [love]^2(e)])[20]

Sentence (30a.i), after scope assignment, has the (linearized) syntactic structure in (30a.ii) annotated with a grammatically well-formed set of indices. Its interpretation is as in (30a.iii). The quantifier in subject position binds its trace, which is linked to the DR 5 introduced by little υ. This happens in a position accessible to the pronoun contained within the object. Per contrast, in sentence (30b.i), the syntactic structure we get after scoping is as in (30b.ii). The raised quantifier cannot directly bind the pronoun, because, as on Büring's approach, the indices associated with QR and those associated with pronouns belong to different circuits. Moreover, here the pronoun in subject position doesn't have *any* accessible antecedent. (See, again, the Appendix for an explicit derivation).

We should underscore that while on Büring's approach the double indexing is not rooted in a different semantics of pronouns vs. say traces, in our approach it is, as per the system developed in Section 2.2, where pronouns and traces have different semantic types. To bear witness that treating traces (i.e. ordinary variables) differently from pronouns (DRs) is an essential feature of DS, it's worth considering the following quote by two of its critics:

> DMG (Dynamic Montague Grammar *NdA*) thus sports two binding strategies. On the one hand it provides a stock of variables that are evaluated with respect to an assignment function in the usual way. On the other, it provides a separate system in which the role of variables is played by discourse markers, which are evaluated with respect to a state. (Shan and Barker 2008, p. 37)[21]

While we are at it, there is a second difference with Büring that is also important to note. Büring (2004) remains silent on the issue of binding from the object position into an adjunct. Clearly, binding into adjuncts is beyond the reach of his β-operator, and it is far from obvious how his or any approach that adopts a similar perspective can address this question. The present proposal, unmodified, does predict it, at least for all adverbs that act as event modifiers. The reason is simple: adverbs that modify the main event argument of the verb (as per Parson's (1990) proposal) are composed with the rest of the sentence intersectively, via conjunction, and, they are base generated to the right of the

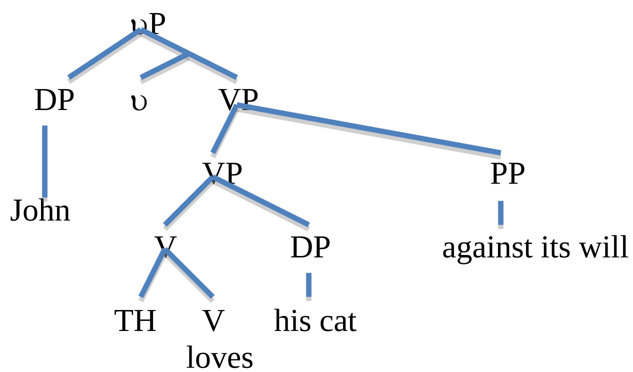
[20] Strictly speaking, the formula in (29b.iii) should be:
(a) every one (λx_i $\downarrow_\omega$ $\exists e$ [**[EX(e)]^5(his cat)** $\wedge$ [TH(e)]^1(x_i) $\wedge$ [love]^2(e)])
where maps CCPs into expressions of type t, as per Section 2.2.
[21] Barker and Shan make this point because in the notation that Groenendijk and Stokhof (1990) use, the point is not obvious.

main predicate in English.[22] As usual, to see what is involved, let us consider first how things work from a static perspective, by looking at an example like (31a), which following Parsons, will get the interpretation in (31b)

(31) a. John loves his cat against its will
b. $\exists e$ [EX(e)(j) $\wedge$ TH(e)(j's cat) $\wedge$ love(e) $\wedge$ against(e)(j's cat's will)]
c. There is an eventuality e of which John is the experiencer and John's cat is the theme which is a state of love and this state holds against the will of John's cat.

The syntactic structure of (31a) is roughly as in (32a), while (32b) illustrate its main interpretive steps:

(32) a.



b. i. Lower VP: λe[TH(e)(j's cat) $\wedge$ love(e)] (from 26.ii)
ii. Upper VP: λe[TH(e)(j's cat) $\wedge$ love(e) $\wedge$ against(e)(its will)]
iii. υ(λe[TH(e)(j's cat) $\wedge$ love(e) $\wedge$ against(e)(its will)]) =
$\lambda u \lambda e$[EX(e)(u) $\wedge$ TH(e)(j's cat) $\wedge$ love(e) $\wedge$ against(e)(its will)]
iv. υP = λe[EX(e)(j) $\wedge$ TH(e)(j's cat) $\wedge$ love(e) $\wedge$ against(e)(its will)]
c. If α and β are both of type <e,t>, then the interpretation of [$_{XP}$ α β] is:
$\lambda x[\alpha(x) \wedge \beta(x)]$

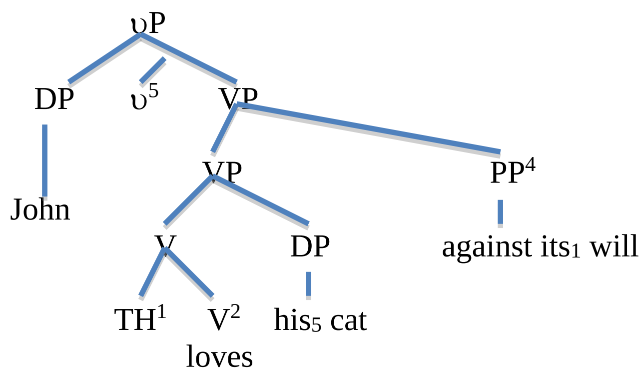
I am assuming that the modifier *against its will* is adjoined to VP, but absolutely nothing changes if, instead, it is adjoined higher up. The interpretation of the lower VP *loves his cat*, on the basis of the procedure outlined in (26) is (32b.i). The interpretation of the PP *against his will* is that of a predicate of events, namely *λe.against(e)(x)*, where *against(e)* is true of an individual x iff e happens or holds against x. Adjunction involving *two* properties of events (as in the upper VP) is interpreted following an intersective schema like roughly the one in (32.c). This give rise to a new property of events, namely (32b.iii), which then is operated on by the applicative head associated with the subject in the usual way (cf. (32b.iii)) and results in (32b.iv). I've tried to stick as closely as possible to textbook style ways of interpreting structures of this sorts. Details do not matter much in

[22] Right adjoined adjuncts can of course be fronted, as in (a):
(a) Next to him everyone saw a snake [next to him]
In this case, the semantics will presumably work off the trace, i.e. in terms of the reconstructed structure. Cf. e.g. Fox (1999) a.o. See also Section 3.3.

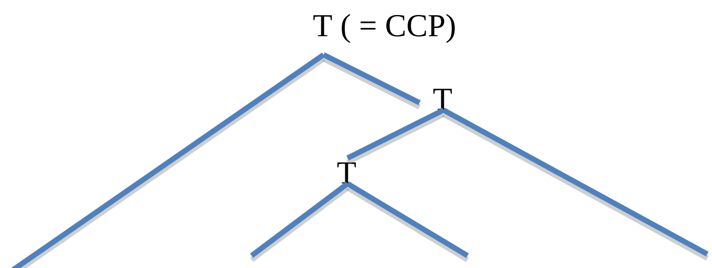
so far as the modes of combination are compositionally determined by the structure in question.

Now it should be clear that by suitably lifting all the predicates from <e,t> to <e,T> via the operator that introduces DR and using modes of combinations parallel to those in (32) adjusted for type, we get the interpretation we want, namely (33b):

(33) a.



b.



i. $\exists e[[[EX(e)]^5(j) \wedge [[TH(e)]^1(his_5\ cat)(e) \wedge love(e)\ ] \wedge [against(e)]^4(its^1 will)]]]$
ii. $\exists e[\ [EX(e)]^5(j) \wedge [TH(e)]^1(his_5\ cat) \wedge love(e)\ \wedge [against(e)]^4(its_1 will)\ ]$
iii. Accessibility hierarchy: <5,1,2,4>

The tree in (33b.i). reflects how the various conjuncts (of type T) are put together (and is, thus, isomorphic to the syntactic tree in (33a), minus irrelevant stuff). In DS coordination is not commutative, hence the left-to-right order matters. However, dynamic conjunction *is* associative.[23] Hence the complicated internal bracketing can be ignored, and (33b.i) can be equivalently expressed as (33b.ii). The set of DRs introduced, and their accessibility hierarchy is represented in (33c). The pronoun *its* in the adjunct is in a position where the DR associated with the object of the main clause *is* accessible to it. Nothing changes if we switch to a quantified object as in (34a-b):

(34) a. John loves every cat against its will.
b. i. every cat_i[John υ^5 TH^1 loves t_i [against his_1 will]
ii. $\forall x_i[cat(x_i) \rightarrow \exists e[\ [EX(e)]^5(j) \wedge [TH(e)]^1(x_i) \wedge love(e)\ \wedge [against(e)]^4(its_1 will)]]$
iii. $\forall x_i[cat(x_i) \rightarrow \exists e[\ EX(e)(j) \wedge \exists x_1\ [x_i = x_1 \wedge TH(e)(x_i) \wedge love(e)\ \wedge$ $against(e)(x_1\text{'s will})]]]$

[23] Both properties follow from the fact that conjunction in DS is defined as composition of relations; cf. Section 2.2., (19b)

Here, the raised quantifier binds the only thing it can bind, namely its own trace. Such trace is equated in the formula $[TH(e)]^1(x_i)$ to the DR 1, introduced by TH. This DR is passed on and gets picked up by the pronoun embedded in the adjunct. Formula (34b.ii) is truth-conditionally equivalent to (34b.iii), which yields the right interpretation for (34a).

It is evident at this point that switching from Büring's β-operator to the thesis that lexical predicates introduce DR is not just a different way of putting the same idea. It brings along at least a conceptual difference and an empirical one. The conceptual difference is that my proposal derives the necessity of a dual system of indices from a dual semantics for dependencies at a distance (variable binding vs. DR activation). The empirical difference, which is a consequence of the conceptual one, is that we predict that an internal argument (i.e. a direct or indirect object) can antecede a pronoun in an adjunct as a consequence of how accessibility plays out.

These are consequences so far of twisting classical DS by shifting the operation of DR introduction from DPs (i.e. individuals and Generalized Quantifiers) to lexical (for the time being) predicates. Now it is time to point out how this change of perspective is independently necessary. There are cases that have nothing to do with WCO where it can be shown that DR introduction *has* to take place in the predicate.

2.4. Further evidence for predicate level DR introduction.

Bare Plurals (BPs) are known to have a noun like behavior: [24]

(35) a. i. Dinosaurs are extinct
ii. * A dinosaur is extinct
b. ii. Anteaters are so called because they eat ants
iii. ?? An anteater is so called because it eats ants

The paradigm in (35) follows if we assume that BPs are just names of kinds (to be regarded as things of type e) and that the *so called*-construction only works with noun like (referential) constituents. However, BPs also display quantificational force in ways that broadly speaking varies with the aspect (generic vs. episodic) of their environment:

(35) a. i. Raccoons are systematically chased away $\forall$
ii. Raccoons were chased away yesterday $\exists$

Let us focus in what follows on episodic contexts, so as to avoid the complexities of generics. The sentences in (36a) systematically differ in interpretation from those in (36b):

[24] Cf. Carlson (1977), Chierchia (1998), Dayal (2004), Krifka et al. (1995) a.o.

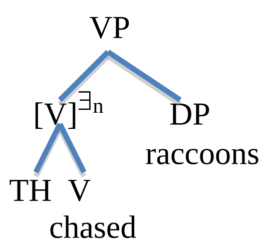
(36) a. i. A raccoon was not chased away yesterday $\exists\neg$
ii. Some raccoons were not chased away yesterday $\exists\neg$
iii. A raccoon was chased away repeatedly yesterday $\exists$ ADV
b. i. Raccoons were not chased away yesterday $\neg\exists$
ii. Raccoons were chased away repeatedly yesterday ADV $\exists$

The sentences in (36a) display a quantified subject and either negation or a Q(uantificational)-adverb and the subject seems to have to take wide scope with respect to them. In contrast with this, in (36b), the existential force of the bare plurals has to be construed with narrow scope with respect to both negation and the Q-adverb. The very same paradigm holds with respects to objects:

(37) a. i. I didn’t chase away a raccoon/some raccoon yesterday $\exists\neg$
ii. I chased away a raccoon/some raccoons repeatedly yesterday $\exists$ ADV
b. i. I didn’t chase away raccoons yesterday $\neg\exists$
ii. I chased away raccoons repeatedly yesterday ADV $\exists$

In the sentences in (37b) both negation and the Q-adverb unambiguously have *wide* scope over the existential associated with the bare plural. For the sentences in (37a), the opposite is the case. These systematic contrasts would make no sense if bare plurals had the option of being interpreted as quantified DPs. We would expect no contrast in this case. Notice how robust the facts are: there is simply no way of interpreting *a raccoon* in (37a.ii) under the scope of *repeatedly*, as there is no way of interpreting *raccoons* in (37b.) as having wide scope relative to *repeatedly*. Thus the quantifier associated with *raccoons* in (37b.ii) seems to have an ‘ultra narrow’ scope that no overtly quantificational indefinite has (including the weakest ones like the determiner *a*). This phenomenon, known since Carlson (1977) as *Differentiated Scope*, has led to the conclusion that whatever quantificational force bare plurals may acquire must come from the predicate, at the point when it combines with its argument (let us call it the ‘first merge’ site). Let me spell this out.

(38) a.



b. i. $\lambda e.$ **TH(e)(raccoons)** $\wedge$ chase(e)
ii. $\lambda e.\ \boldsymbol{\exists x_n\ [x_n \leq \text{raccoons} \wedge \text{TH(e)}(x_n)}\ \wedge$ chase(e)]
iii. $\lambda e.\ [\text{TH}(e)]^{\exists_n}(\text{raccoons}) \wedge \text{chase}(e)]$
iv. $[\text{TH}(e)]^{\exists_n} = \lambda y\ .\ \exists x_n\ [x_n \leq y \wedge \text{TH}(e)(x_n)]$

When we merge the V with the object what the standard interpretation procedure affords us is (38b.i), where the whole raccoon-kind is the theme of a (particular) chasing event e.

The way we actually interpret this, however, is as in (38b.ii), where the chasing event involves some instances of the raccoon-kind. Thus, there must be some operation on the predicate that introduces instances of the argument, as in (38b.iii-iv) for example. If this operation takes place, Q-adverbs, negation etc. will have to take scope over it. Moreover, quantified DPs have to undergo scope assignment to some higher site, yielding the observed wide scope constural. This readily explains the contrasts in (36)-(37) while retaining a uniform analysis of bare plurals as kind denoting.

It is important to note that the operation of introduction of instances laid out in (38) must be prevented from applying at scope sites. To see this, consider (37b.ii) again, repeated below as (39a). Imagine assigning scope to the object as in (39b) and applying the instantiation operation as (39c):

(39) a. I chased away raccoons repeatedly yesterday
b. raccoons$_i$ [I chased away t_i repeatedly yesterday]
c. raccoons$_i$ [I chased away t_i repeatedly yesterday]$^{\exists n}$

The interpretation of (39c) would be ‘there are raccoons x such that I chased away x repeatedly yesterday.’ Wrong. But if DPs *never* ‘introduce instances’, as we have claimed in Section 2.2-2.3, neither on their own not when scoped out, then the construal in (39c) will not be available.

It should be clear at this point that the operation of ‘instance introduction’ necessary to make sense of the scope behavior of bare plural is virtually identical to the DR-introduction rule discussed in Section 2.3, modulo the fact that we are dealing with kinds. In his discussion of kind reference, Chierchia (1998) presents it as a local ‘sort adjustment’ operation necessary when we want to say something about kinds (‘*Derived Kind Predication’* – DKP). Obviously, it is a better option to maintain that there is a fully general mechanism of instance introduction freely available on predicates (but not at scope sites). If the argument of a predicate is a singular individual, then its instance can only be itself; if the argument is a kind, individual instances of it will be introduced.[25]

The way in which ‘instance introduction’ works with bare plurals has been motivated so far purely on the basis of scope considerations. But it clearly has consequences for anaphora. The instances introduced at the predicate level (i.e. the activated DRs) should be able to provide antecedents to anaphors and pronouns occurring in accessible positions (both within and outside of the C-command domain of the predicate, modulo accessibility). This is indeed so.

(40) a. I walked out and saw raccoons that were chasing their own tails
b. I walked out and saw raccoons in my garden. I took my gun and shot them all.

Notice that, e.g., (40a) does not mean ‘raccoons were chasing raccoon’s tails’. It means that each raccoon was after its very tail. Similarly, (48b) says that I shot the instances of the raccoon-kind I saw offending my garden. This signifies that we cannot get by just

[25] There are many ways to formalize DKP as part of the general mechanism for DR introduction explored in the present paper and integrate it in a dynamic setting. Here is one:

(a) $[P]^n = \lambda u \lambda \omega \lambda \omega'.\ \exists u'\ [u' \leq u \wedge \omega =^{n/u} \omega' \wedge\ P(u')]$, where ‘≤’ is the *instance of* relation.

with reference to kinds (i.e. with something like (38b.i)) without instance introduction at the appropriate level.

It seems to me that the behavior of bare plurals, while having little to do *per se* with WCO, introduces evidence of the strongest kind in favor of, essentially, the very same idea we have proposed in connection with WCO and anaphora in general: DRs are introduced at the predicate level, not at scope sites.

2.5. Interim summary and further perspectives

We have adopted a standard DS and twisted it according to the following mapping hypothesis:

(41) Only predicates can introduce DRs
 a. DRs are introduced as an operation on predicates
 b. DPs (i.e., arguments) never introduce DRs, neither inherently nor at their scope sites.

This seems to afford a variant of Büring's situation based approach in which his 'double indexing' is derived from a semantic distinction between simple variable binding and DR introduction / transmission. The approach we have outlined affords essentially the same treatment as Büring's for basic WCO facts, but goes beyond it, in that it extends to binding into adjuncts. So far, we have dealt with DR introduction at the level of basic predicates (basic verbs, and their theta roles). But this is not going to be enough. DRs have to also be introduced at the level of some derived predicates and we will want to see how and when that happens. We also need to probe further how DS is affected by the proposal in (41). For example, we haven't discussed the staples of donkey anaphora, namely conditionals and relative clauses:

(42) a. If a farmer owns a donkey he beats it.
 b. No/every man that owns a donkey beats it.

Concerning, in particular, (42b) we have argued that DPs never introduce or transmit DRs. This means that the pronoun *it* in (42b) cannot receive its antecedent via dynamic binding from *a donkey*, for the latter, by hypothesis, is not accessible to the pronoun; the pronoun must get its antecedent indirectly via the subject, by being interpreted as a description like *the donkey or donkeys he owns*. It is in this connection that Büring goes with situations, and this leads his system, prima facie, to overgenerate, as we saw in Section 2.1. Is there a way of integrating the present dynamic approach with a take on E-type pronouns that is descriptively adequate and doesn't overgenerate? To these issues we now turn.

3. Broader issues in DS

In this section we will explore how the hypothesis on DS have adopted in Section 2 plays out in the broader scheme of things dynamic. We will start out with Generalized Quantifiers (GQs), then move on to relative clauses and E-type pronouns and conclude with a glimpse at conditionals and generics. Readers who are inclined to believe that some version of DS tailored to these traditional topics can be made to work compatibly with the perspective we are adopting, should feel free to skip this section on a first pass and move onto the newer linguistic consequences of our proposal in Section 4.

3.1. The (non) dynamic character of quantificational DPs

The claim that quantificational DPs do not introduce/transmit DRs means essentially that they should be interpreted in the traditional way as relations between sets. Predicates in a dynamic setting are in general interpreted as functions from individuals into CCPs; so some type adjustment, if of the simplest kind, will be called for in analyzing determiners. We will first deal with GQs in general; then we will discuss indefinite DPs (*a man*, *two horses*, etc.) more in particular, as they have a broader range of options than non-indefinite, quantificational DPs (*every man*, *no horse*, etc.).

The standard move in a dynamic setting is to treat GQs as 'tests', i.e. a way of probing the input for certain properties, which if met, lead to passing the input along unchanged. This is illustrated in (39) for a basic quantificational sentence.

(39) a. No donkey smokes.

b. i. $[\text{donkey}]^2 = \lambda u\ \lambda\omega\lambda\omega'.\ \omega =^{2/u} \omega' \wedge \text{donkey}(u)$

ii. $[\text{smokes}]^5 = \lambda u\lambda\omega\lambda\omega'.\ \omega =^{5/u} \omega' \wedge \text{donkey}_{<e,t>}(u)$

c. no $([\text{donkey}]^2)([\text{smokes}]^5) =_{df}$

$\lambda\omega\ \lambda\omega'.\ \omega = \omega' \wedge \{u: \downarrow_\omega \text{donkey}_{<e,T>}(u)\} \cap \{u: \downarrow_\omega \text{smoke}_{<e,T>}(u)\} = \varnothing$

The DRs in the restriction and scope of *no* in (39b) are chosen randomly. Also, I am ignoring the event argument, to simplify the exposition. Basically, what goes on in (39c) is that we look at the extension of restriction and scope, using the $\downarrow$ operator, check whether the current state of the world verifies the relevant relation among them, and if so proceed on to the next state. This approach generalizes to all determiner meanings. For any determiner meaning D of type <<e,t><<e,t>,t>>, we can define the corresponding test D' in a general way:

(40) $D'(P_{<e,T>})(Q_{<e,T>}) = \lambda\omega\ \lambda\omega'.\ \omega = \omega' \wedge D\ (\lambda u.\ \downarrow_\omega P(u))(\lambda u. \downarrow_\omega Q(u))$

Note that use of the $\downarrow$ operator effectively wipes out access to all DRs that may be active in the restriction or in the scope of D. It also prevents dynamic transfer of antecedents from the restriction to the scope. Quantificational determiners are taken to be, in other words, both externally and internally static.

Indefinite determiners have a broader range of options. They can take scope non locally and are externally dynamic (i.e. accessible to subsequent discourse). For the non-local character of their scope, I favor the approach in Reinhart (1996), Winter (1997), according to which indefinites are associated with choice functions, subject to (possibly non local) $\exists$-closure. One question that comes up in this connection is whether the operation of existential closure of a choice function activates a DR or not.[26] The answer is unclear to me. Saying that it does implies that long distance indefinites may obviate crossover, for the DR introduced at the site of the closure will be able to act as antecedent to pronouns in domains accessible to it. Now, indefinites generally display cross-over phenomena. But so called specific ones show significant improvement:

(41) a. *His father hates a boy
b. His father hates a boy I know/a friend of mine/a certain boy
c. His father hates John

Sentences like (41b) are significantly better than sentences like (41a); the same holds of definites like (41c). So perhaps the deviance of (41a) is due the fact that *a boy* is treated like a regular quantifier; the improved character of (41b) is due to the fact that the indefinites there are construed as existentially closed choice functions, where a DR is introduced at the site of the closure. While this looks like a good angle, it also leads to a series of questions that while frequently discussed, are still poorly understood. The choice function reading is clearly not readily available in (41a) (for otherwise that DR would be able to provide an antecedent to the subject). Thus, the choice function reading (or at least the DR introduction associated with it) must be somehow triggered or motivated by appropriate discourse conditions, having to do with making the indefinite more prominent, and hence more specific, and/or linking it to something the speaker has in mind (as *a certain* seems to suggest), etc. Clearly more research is needed in this connection. For the time being, I will assume that the existential closure of choice functions may lead to the introduction of DR, if the relevant discourse conditions are met.

A complementary way to go is generalizing the approach developed in connection with bare plurals. We have assumed than when a kind denoting term combines with a predicate, the operation of DR introduction is allowed to look at instances so that *dogs are barking* winds up meaning something like “instances of the dog-kind are barking”. Now, indefinites are known to have predicative uses, in which they must be property-denoting:

(42) a. John is a linguist
b. Those are two friends of mine

It is easy to extend to properties our treatment of kind-predication. For any theta role θ and event e, we know what $[\theta(e)]^n(u)$ means, when u is of type e (cf. (20) in Section 2). We can generalize $[\theta(e)]^n$ to the case of predicative DPs occurring in argument positions as follows:

[26] Notice that a yes answer is perfectly compatible with the motto that DPs as such never introduce a DR: existential closure is designed to take place at a distance from where the rest of the DP meaning is interpreted.

(43) For any thematic role θ, any eventuality e, and any (dynamic) property α,
a. $[\theta(e)]^n (\alpha) = \exists u [\alpha(u) \wedge [\theta(e)]^n(u)]$
Example:
b. A dog waked in $\Rightarrow \exists e [\ [TH(e)]^2([dog]^3) \wedge [walk\ in]^1(e)\ ]$
c. $\exists e\ \exists u[\ [dog]^3(u) \wedge [TH(e)]^2(u)]\ \wedge [walk\ in]^1(e)\ ]$ by (43a)

In a way, an approach that relies solely on choice functions is more appealing, as it falls back on an independently needed device. However, given the not well understood character of the discourse conditioning on ∃-closure of choice function indefinites, we may want to keep a few other options open, and this is why I brought (43) up. Be that as it may, ultimately, there is no question that any dynamic framework will have more than one natural way of keeping indefinites open to accessible domains.

In conclusion, non-indefinite quantificational DPs work just as on the classic theory of GQs. And in a way, the treatment of indefinites is also fairly traditional; they combine into their argument positions in a way that keeps DRs accessible. Choice functional construals of indefinites are subject to discourse conditionings that are yet to be fully understood and may obviate cross over.

3.2. Relative clauses and E-type pronouns.

A consequence of the view that DPs never introduce DRs is that relative clause anaphora must be indirect (as in Büring 2004). We should check two issues in this connection. The first is whether there is an empirically adequate, situation-free approach to indirect, E-type pronouns. The second issue is whether such an approach avoids the issues of over-generation that threaten situation based approaches.

As is well known, donkey pronouns display a range of readings (from ∀ to ∃) with a systematic pattern of preference, which in the small sample of the most familiar quantifiers in (44), can be roughly summarized as follows:[27]

(44) a. *Every*: ∀ > ∃
i. Every man that has a donkey beats it ∀
= Every man that has a donkey beats all the donkeys he owns
ii. Every man who had a dime put it in the meter ∃
= Every man who has a dime puts one dime he owns in the meter
b. *No*: ∃ > ∀
i. No one with a teen age son lends him the car on weekdays ∃
ii. No one who has an umbrella leaves it home on a rainy day ∀
c. *Some/a*: ∃ > ∀
i. A friend who had a car lent it to me ∃
ii. A friend who had a car refused to lend it to me ∀

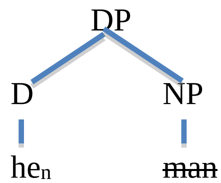
To get to the bottom of this pattern is impossible within the limits of this paper. All I want to do is give a plausibility argument: by picking and choosing freely from the literature on this topic, we should be able to outline approaches that enable us to stay

[27] Cf. Kanazawa (1994), Chierchia (1995), Guerts (2002), Champollion et. al (2018), among many others.

optimistic about coming up with a principled, situation free theory of indirect pronominal dependencies that accounts for the paradigm in (44).

For the syntax of pronouns, we are going to adopt an ellipsis based analysis along the lines of Elbourne (1995) a.o.

(45) a.



b. A man [walked in]^3. He$_3$ ~~man~~ was tall.

Pronouns are viewed as Ds with an anaphoric index (*n* in (45a)). Their sister node is elided under identity with some NP present in the structure. I am going to assume that a structure like (45a) is going to be interpreted as a function from a DR with index n, ω_n, into a member of the set of men, which I am going to denote as $f_{man}(\omega_n)$.[28] But which function? That depends. There are two main cases. The first is when the NP that triggers the elision is linked to a DR accessible to the pronoun, as in (45b) above or (46a) below:

(46) a. i. Everyone fed his cat
ii. everyone$_i$ [t_i υ^3 fed [he$_3$ ~~one~~ 's cat]] Rough LF
b. i. $f_{one}(\omega_n) = \omega_n$, if $\omega_n \in$ person Abbreviated as ID_{one}
ii. $\forall x\, [person(x) \rightarrow \exists e[\, [AG(e)]^3(x) \wedge [TH(e)](ID_{one}\,(\omega_3)\text{'s cat}) \wedge fed(e)]$
$= \quad \forall x\, [person(x) \rightarrow fed\,(x\text{'s cat})(x)$

In such a case, the function f_{person} is just interpreted as a restricted identity map, following, again Elbourne. Where I depart from him is in the second case, i.e. when the NP that triggers the ellipsis is *not* accessible to the pronoun as in (47a):

(47) a. [Everyone$_i$ who has a cat]$_i$ t_i υ^3 fed it$_3$ ~~cat~~
b. i. $\forall x\, [person\text{-}etc.(x) \rightarrow \exists e[\, [AG(e)]^3(x) \wedge [TH(e)](\, f_{cat}(\omega_3)\text{'s cat}) \wedge fed(e)]$
ii. $f_{cat}(x) = a$, where a is the/one of the cats x owns

In such a case, f_{cat} is construed as a variable ranging over some/any contextually salient function from individuals into the appropriate range (namely, cats), along the lines indicated in (47b). [29]

[28] Technically, these are 'Skolemized' choice functions. Recall that in the 'official' framework of Section 2.2, pronouns are of type <ω,e>. I.e. the denotation of the pronoun in (45) actually is:
(a) he$_n$ ~~man~~ $\Rightarrow \lambda\omega.\ f_{man}(\omega_n)$
[29] A common feature to ellipsis based approaches like Elbourne's is that they are designed to rule out sentences like:
(a) i. * Every cat owner fed it
ii. [Every cat owner]$_i$ t_i fed [it$_i$ ~~NP~~]
While sentence (a.i) arguably brings to salience a function from people to cats, there is no NP around to trigger a proper ellipsis. Constituents of N-N compounds like [$_N$ cat$_N$ owner$_N$] cannot license NP elision. Only the whole compound *cat owner* projects as an NP. But then the whole complex would have to be

What does this get us? Suppose that everyone has just one cat; then there is just one function f_{cat} around that fits the bill, and the interpretation of sentences like (47a) is straightforward. This is maybe why speakers seem to have their strongest intuitions about donkey sentences, in presence of uniqueness presuppositions. If, on the other hand, we are in a context where the possibility of owning more than a cat is countenanced, then there will be more than one function f_{cat}, f'_{cat} ,…that have to be considered. The natural move in this connection is to regard (47a) as true, if the sentence is satisfied by any way of selecting functions of the relevant type (in the spirit of supervaluation theory). For sentences like (47a) or (44b.i) above repeated here as (48b) this tantamount to interpreting them as follows:

(48) a. $(\forall f_{cat})\ \forall x\ [person(x) \rightarrow fed\ (\ f_{cat}(x))(x)$

b. $(\forall f_{son})$ [No one with a teen age son]$_i$ [t_i υ^3 lends f_{son} (ω_3) the car on weekdays]

Notice that (48b) gets interpreted as saying that no father with a teen age son lends *any* son of his the car on weekdays.[30] So for quantificational determiners like *no* or *every* we are getting the preferred truth conditions. Secondary interpretations arise, presumably, via Domain restriction. Rather than considering all possible choice functions of the right type, we limit ourselves to some subdomain, whatever suffices to address the 'Question under Discussion'. For example, if the issue is avoiding tickets when parking, we will restrict the domain of dimes to those sufficient to remain law obedient. This is all rather sketchy, but not so differently from what happens on any other available alternatives.

For indefinites, we have more options. Since indefinites leave DRs in their restriction accessible, the donkey pronoun can be bound directly. So besides the indirect strategy, outlined in (49a), which would yield a default $\forall$-reading, we also get the interpretation (49b):

(49) a. $(\forall f_{car})$ [A friend with a car]$_i$ t_i υ^3 lent $f_{car}(\omega_3)$ to me]

b. $\exists u[\text{friend with [a car]}^3]^1(u) \wedge \text{lent}(it_3\ \cancel{car})(me)(u)]$

The subject in (45b) contains two active DRs, one associated with *a friend*, the other with *a car*, and they are accessible to the pronoun *its*. The result is an $\exists$-reading. The reason why this reading turns out to be the preferred one for donkey pronouns in (49) is likely to be the simple fact that direct binding is simpler than indirect binding (it requires no appeal to the context, to supervaluations, etc.).

The present proposal extends to the other cases of non C-command binding mentioned in Section 1, like inverse linking and possessor binding. We illustrate how the present theory works for inverse linking:

interpreted as the identity function, Principle B of the Binding Theory would kick in, and the sentence would be ruled out.

[30] The parentheses in (48) are a reminder that the universal quantification over choice functions is not part of the actual logical form of the relevant sentence, but rather part of its evaluation (in the spirit of supervaluation theory), very roughly along the following lines:

(a) A formula $\psi(f)$, where f occurs free in ψ, is true in a world w iff for any appropriate, salient assignment function g, such that g(f) is defined, $\psi(f)$ is true in w relative to g.

(50) a. The mayor of no city despises it/its population.

b. no city$_i$ [[the mayor of t_i] υ^3 despises $f_{city}(\omega_3)$]
where, for any u, $f_{city}(u)$ = the city of which u is mayor.

c. i. $No([city]) (\lambda u_i \exists e[AG(e)]^3((u_i\text{'s mayor}) \wedge [TH(e)]^1(f_{city}(\omega_3)) \wedge despise(e)]$

ii. $\neg\exists u_i \exists e[city(u_i) \wedge AG(e)(u_i\text{'mayor}) \wedge TH(e)(f_{city}(u_i\text{'s mayor}) \wedge despise(e)]$
$= \neg\exists y \exists e \exists x\ [city(y) \wedge mayor(y)(x) \wedge AG(e)(x) \wedge TH(e)(y) \wedge despise(e)]$

Only to simplify things, I am assuming here that the quantifier *no city* can be scoped out of the DP that hosts it (as nothing changes for the purpose of pronoun binding, from making alternative assumptions).[31] The schematic Logical Form of (50a) is given in (50b), where the subject *the mayor of t_i* is linked to the 3rd DR, activated by υ; this DR is accessible to the (indirect) pronoun in object position, which results in the interpretation given in (50c.i.), whose truth conditions are in in (50c.ii).

The present approach to indirect, E-type pronouns does what it is supposed to do. It constitutes an existence proof for a situation free take that predicts the distribution of preferred readings of donkey pronouns in relative clauses. It is not immediately obvious how the distribution of preferences in (44) can be derived from a situation theoretic account. The latter could certainly accommodate the readings with determiners like *no* or *every*, by appealing to something like the strongest meaning hypothesis. But how would it account for the clear reversal of preference that indefinites like (44c) display? The strongest meaning hypothesis would predict preference for the $\forall$-reading with indefinites as well, which is clearly wrong. The present account relies crucially on the distribution of active DR and accessibility, to explain the latter case; but these notions that have no status in a situation based approach.

It is also important to underscore that when crossover phenomena come into consideration, the present approach stands at no risk of over generation, unlike a situation based one. I will illustrate this with a basic example in (51a-e); the way in which this accounts extends to cases of donkey crossover (51f) will become, then, immediately clear

(51) a. His cat loves everybody.
b. everybody$_i$ [his cat loves t_i]
c. Every minimal situation s with someone in it is part of a situation s' in which *the cat of the person in s* loves s.
d. everybody$_i$ [his cat υ^3 TH^1 $loves^2$ t_i]
e. i. everybody$_i$ [$f(\omega_4)$'s cat υ^3 TH^1 $loves^2$ t_i] no antecedent for ω_2
ii. everybody$_i$ [$f(\omega_2)$'s cat υ^3 TH^1 $loves^2$ t_i] presupposition clash
f. i. * its$_j$ strength impresses every farmer who owns a donkey$_j$
ii. [every farmer who owns a donkey]$_j$ [$f(\omega_2)$'s strength υ^3 TH^1 $impresses^2$ t_i]

The object in (51a) is raised as in (51d). In a situation based approach , this leads to the (undesired) reading in (51c). But on the present approach, which relies on a structure

[31] For a more adequate treatment of these cases in terms of DP adjunction, c.f. Rooth (1985, pp. 112 ff) or Heim and Kratzer 1998, pp. 230 ff).

like (51d), the E-type pronoun has no active DR accessible to it. If we pick any of the active DRs, e.g. as in (51e.ii), we get a presupposition clash. The pronoun requires that the input assignment to the whole clause be defined on its second coordinate; but the operation of DR introduction associated with the V head requires that the input assignment be *not* defined over that coordinate, because of novelty. Thus the sentence comes out undefined.[32] Obviously, this line of explanation extends to donkey crossover cases, for the object DP in (51f.i), scoped out in (51f.ii), doesn't activate or transmit active DR to its scope any more than the one in (51a) does. And picking any of the antecedents active in the clause leads to a presupposition clash.

In conclusion our new mapping hypothsis for DS not only is compatible with, but it in fact *requires* a theory of indirect pronouns for DPs with relative clauses. We have sketched one, which readers should feel free to replace with any other of their liking, provided that it accomplishes the two key things that the present one accomplishes, namely (i) to account for the distribution of ∀/∃-preferences for donkey pronouns within DPs and (ii) to prevent crossover from resurfacing through the window of indirect pronominal dependencies.

3.3. A glimpse into conditionals and generics

Once more, the spirit of the present section is not that of giving a full blown account of these much debated topics, but more modestly to orient the reader towards strategies in handling them compatible with the present non standard mapping from DS into syntax. In the areas of conditionals, there are fewer surprises than in the one of relative clauses (where we had to abandon the idea predominant in DS that there is dynamic transfer of DRs in Generalized Quantifiers). When it comes to conditionals, pretty much any of the standard DS approaches will do, for all that matters here. I will illustrate this claim by sketching (and updating bit) the (controversial) line of inquiry developed in Chierchia (1995a,b), in the spirit of the motto "if you are going to follow someone's prejudices, you might as well follow your own". But the one below is by no means the only way to go.

On everyone's take, a conditional sentence like, say, (52a) is generally going to have a semantic structure, roughly of the form in (52b), where the Q-adverb operates on the indefinites contained in the antecedent, and the main clause constitutes its scope:

(52) a. If a bishop meets a bishop, he always/often/never blesses him.
b. Q-ADV (a bishop meets a bishop)(he blesses him)

In any version of DS, the antecedent of a conditional like (52a) is going to contain two active DRs, in correspondence with to the subject and the object DPs. In traditional DS, this activation is done by the indefinites themselves, in the present incarnation of DS, it is done by the predicate via its theta roles. But let us put that internal dispute aside for the time being, and let us represent the two active DRs as numerical superscript on the whole sentence as in (53a). Now, the quantificational force of indefinite DPs associated with active DRs can be, as it were, 'renegotiated'. I.e. such DPs can effectively be turned into

[32] If we can link the pronoun in subject position to the event, the sentence can wind up meaning "for every person x, there is some event e, which is a state of love of which x is the theme and such that the cat of the theme of e is the experiencer," i.e. the crossover reading.

variables and get bound over again. Dekker (1993) dubbed the DS operation that does that '*Existential Disclosure*'. The operation in question is informally sketched in (53b). Its formal definition in the framework of Section 2 (for the unary case) is given in (53c) and a worked out example can be found in the Appendix.

(53) a. [a bishop meets a bishop] $^{<2,1>}$
b. $D_{2,1}$ ([a bishop meets a bishop] $^{<2,1>}$ =
= $\lambda u \lambda u'$ [[a bishop meets a bishop] $^{<2,1>} \wedge \omega_2 = u \wedge \omega_1 = u'$]
= $\lambda u \lambda u'$ [bishop(u) $\wedge$ bishop(u') $\wedge$ u meets u'] $^{<2/u,1/u'>}$
c. For any $[\phi]^n$ of type T, with active DR n: $D_n([\phi]^n) = \lambda u. [[\phi]^n \wedge \lambda\omega\lambda\omega'. \omega_n = u]$

Since active DRs reach into continuations, we can dynamically conjoin to (53a) an equation $\omega_n = u$, where u is an ordinary variable, and and then abstract over u so as to re-open the sentence, as in (53b). Then we can use the Q-adverbs to quantify over the result in any way we want, as per the general schema in in (54a), where ϕ is the if-clause/restriction and ψ the main clause/scope:

(54) a. $Q(D_n(\phi))(D_n(\phi \wedge \psi))$
b. $\forall(\lambda u \lambda u'$ [bishop(u) $\wedge$ bishop(u') $\wedge$ u meets u'] $^{<2/u,1/u'>}$)($\lambda u \lambda u'$. [bishop(u) $\wedge$ bishop(u') $\wedge$ u meets u'] $^{<2/u,1/u'>} \wedge \omega_2$ blesses ω_1)
c. Every pair <u,u'> such that both u and u' are bishops and u meets u's are also pairs such that both u and u' are bishops, u meets u' and u blesses u'.

Notice that the pronouns in the main clause (i.e. the scope) are *directly* dynamically bound (because of the use of conjunction in the second argument of Q in (54a)); no E-type/indirect binding is involved here. Also, we are ignoring modalization/quantification over worlds, but bringing it into the picture is no more complex in this than in any other framework. Ultimately, then, the idea is that Q-adverbs are n-ary quantifiers that can "disclose" active DRs in their restriction. A pretty simple take, in so far as these things go. The main alternative to it (or any variant thereof) are situation based approaches. In particular, Elbourne (2010) develops an ingenious way of making situations fine grained enough so as to derive the same truth conditions as (54c), by resorting to a metaphysics of 'thin particulars'.

The disclosure based approach just sketched that gets indefinites to act as variables under Q-adverbs, justifies talking of them as being variable-like (Kamp 1981, Heim 1982), a metaphor that carried a lot of weigh in the 80s, when the term 'unselective binding' was coined. However, it was soon discovered that while Q-adverbs do get indefinites to act as variables, they do not necessarily do so unselectively, on all the indefinites in their restriction. For example, a sentence like (55a) can have either of the truth-conditionally distinct readings in (55b-c), depending on the context, on focus, etc.:

(55) a. If a painter lives in a village, it is usually pretty
b. Most painters live in pretty villages
c. Most villages in which painters live are pretty

This entails that the Q-adverb usually is free to target ('disclose') any or all or just several of the DRs active in their restriction. The present account to conditionals and Q-adverbs makes this a free option for any Q-adverb. But there are alternative ways to go achieve similar effects (see, e.g., Diesing 1992).

The main point of all this is that when it comes to conditionals, our approach, in spite of its non standard stance on DR activation, is completely main stream dynamic, and its sides decidedly with DS on the treatment of bishop sentences, asymmetric readings and the like.

Generics add to this general picture further interesting turns. The Gn-operator forms derived predicates that activate DRs, and for this reason it might be worth of a quick look. As is well known, in presence of a Gn-operator, indefinites acquire a quasi-universal (highly modalized) force, in a wide variety of ways, depending again on the context, the lexical meaning of the items involved, their presuppositional structure, etc. The following paradigm illustrates:[33]

(56) a. A cowboy carries a gun — Subject: ∀; Object: ∃
every cowboy usually, tipically, etc., carries a gun
b. A cat chases a mouse — Subject: ∀; Object: ∀
For every cat and every mouse (the cat sees), the cat chases the mouse
c. A computer routes a modern plane
For every modern plane, a computer routes it — Subject: ∃; Object: ∀

The basic line on this, developed in Krifka et al. (1995) a.o., is that the Gn operator, hosted in the Aspect-projection of the clause, induces a splitting of the clause in a restriction and a scope, roughly along the following lines for the sentences in (56):

(57) a. a cowboy_i Gn $[_{\upsilon P}$ t_i carries a gun$]$

b. a cat_i a mouse_j Gn $[_{\upsilon P}$ t_i chases $t_j]$

c. a modern plane_j Gn $[_{\upsilon P}$ a computer routes $t_j]$

In the Logical Forms in (57), the restriction vs. scope of Gn are identified structurally: Gn assigns universal force to the indefinites in its restriction (the Spec region of AspP, on the implementation in (57)), while indefinites in the scope (i.e. within the υP) retain their default existential force. DPs can get into the restriction via standard syntactic operations, i.e. covert movement (or, in languages like German, overt movement, according to e.g. Diesing 1992), while subjects may be reconstructed back into their first merge site. This structuring is basically free, modulo presuppositions, etc. Interestingly, the restriction of Gn can be further modified by an if-clause, which can occur to the left or to the right of the main clause:

(58) a. If it is really hungry, a cat eats lizards
b. A cat eats lizards, if it is really hungry

[33] Interestingly, bare plurals in generic environments work in a wholly parallel way.

This is a complex and interesting paradigm. Notice that (58a) looks, prima facie, like a case of WCO obviation.

To see how the semantics associated with these Logical Forms can be cashed in, consider, for starters, an object generic like (59a):

(59) a. I love a good cup of coffee

b. a good cup of coffee$_j$ Gn$_j$ [$_{\upsilon P}$ I love t$_j$]

c. i. Restriction: λx. good cup of coffee(x)

ii. Scope: λx. I love x

iii. (Rough) truth conditions:

Gn^j([$_{\upsilon P}$ I love t$_j$])(a good cup) =
$\forall_{GN}$(λx. good cup of coffee(x), λx. I love x]
where $\forall_{GN}$ is a modalized universal quantifier

The splitting algorithm outlined in (57) tells us that the Logical Form associated with (58a) must be something like (58b). In this situation, Gn takes two arguments: the υP (as scope) which contains the subject, and the object, dislocated in the Spec of region (as restriction). Notice that the standard Heim/Kratzer rule for interpreting dislocated DPs cannot be operative here, for it would not get us the intended meaning, viz. (59c.iii). To notate this fact, I copy the index of the raised object onto Gn (as a case of Spec-Head agreement, say). The idea is that the index on Gn abstracts over the scope (i.e. the υP), creating the meaning in (58c.ii), while at the same time, Gn operates on the indefinite in its restriction to yield the final outcome in (58a.iii).

Consider now (60a), in which a right adjoined if-clause is added:

(60) a. I like a good cup of coffee, if it is really hot

b. a good cup of coffee$_j$ Gn$^{3/j}$ [$_{\upsilon P}$ I love t$_j$] [if it$_3$ is really hot]

c. [Gn $_i$]$^{3/j}$ ([$_{\upsilon P}$ I love t$_j$])([if it$_3$ is really hot])(a good cup of coffee)
=$_{df}$ $\forall_{GN}$[(λx.[good cup of coffee]^3(x) $\wedge$ hot(it$_3$), λx$_i$ I love x$_i$)

d. For any ϕ, ψ of type T, and any P of type<e,T>,
[Gn$_i$]$^{3/i}$(ϕ)(ψ)(P) =$_{df}$ $\forall_{GN}$(λx.[P]^3(x) $\wedge$ ψ, λi. ϕ))

The right adjoined if-clause must be incorporated in the restriction of Gn in an LF of the form in (60b); in other words, Gn here takes three arguments as indicated in (60c); and among other things, it introduces a new DR associated with *a cup of coffee* in a way that makes it accessible to the pronoun in the if-clause. This seems necessary because the DR introduced in the object position of *love* is not accessible to the if-clause, given that the latter is not an intersective modifier.

This line of analysis can be extended to preposed if-clause with cataforic pronouns such as (61), by assuming they result from fronting, and by working out the semantics off the base position:

(61) If it is really hot, I love a good cup of coffee ~~[if it is really hot]~~

If this is correct, sentences like like (61) are not real obviations of WCO, after all. The present approach also predicts, however, that sentences (62a) should be OK, while in fact they are degraded:

(62) a. i. ?? His department must support a good student
ii. ? His department must support a good student, when he is in trouble
b. Un bravo studente, il suo dipartimento lo deve promuovere e mandare avanti
A good student, his department him must promote ad push forward

I don't know why (62a) is degraded. The addition of a right adjoined *when*-clause improves things a bit. I also note that the Italian counterpart of (62a), namely (62b), which involves Clitic Left Dislocation, is perfect, and this seems to constitute a genuine case of crossover obviation. We shall return to Clitic Left Dislocation in Section 4.

The purpose of this quick excursion in the area of generics was to show further facets of how the dynamics works, compatibly with our main thesis. The generic operator seems to drive the creation of complex derived predicates that lead to the activation of DRs.

3.4. Outcome

In conclusion the panorama that emerges from this perusal of the landscape of classical dynamics should leave us optimistic. Basically, our modified mapping hypothesis for DS ("Predicates introduce DR, DP-arguments don't") forces us to abandon the theory of Dynamic Generalized Quantifiers. This entails that donkey dependencies involving relative clauses must be indirect (E-type) and we have sketched a theory that enables us to get the various relevant readings, in a way that does not overgenerate when it comes to WCO. For conditionals, generics and like, on the other hand, one can plug in one's favorite theory. The architecture I've sketched for these constructions seems promising enough for us to get on with our main thesis.

4. Further issues: when movement bleeds WCO

We have proposed that DR-introduction is an optional, predicate level operation. It maps a predicate into a new one whose argument is linked to a newly activated DR. This operation must be allowed to apply to lexical predicates, e.g. verbs and their thematic roles, for otherwise anaphora would have no fuel, given that DPs as such do not have the power of DR activation.

While this derives the basic cases of WCO, it does not entail by any means that DR introduction should *always* be prevented from applying to *any* derived predicate. And in so far as movement, overt or covert, *creates* derived predicates, one might well expect there to be cases of movement that bleed WCO. In Section 3.3, we have begun to explore this area in connection with the generic operator; in this section we explore two more such cases: A-movement, and Clitic Left Dislocation (CLLD) in Italian, which constitutes a form of topicalization. This will give us a chance to also take a look at issues like "weakest crossover" (Lasnik and Stowell 1991), resumption and at further interactions with the Binding Theory (BT). The general question in the background is what common traits predicates that allow DR introduction may have.

4.1. The subject position[34]

A-movement is known to bleed WCO. To see what this means from the present point of view we shall discuss the 'outermost' subject position, also known as the Extended Projection Principle (EPP)-subject position. It is a familiar result that the EPP- subject position is not necessarily thematic. The existence of expletives and raising verbs is one of the traditional pieces of evidence for this view:

(63) a. It rains
b. It seems to John that every athlete is ready to compete
c. Every athlete$_i$ seems to his coach [t$_i$ to be ready to compete]

Verbs like *rain* or *seem* does not assign an 'external' theta-role. *Seem* assigns an 'experiencer'-theta role (realized as an oblique argument marked by the preposition *to*) and a propositional one (realized in (63b) as a *that*-clause, and in (63c) as an infinitival clause). The absence of an external theta role for *seem* is confirmed by the possibility of raising the embedded subject as in (63c). The subject *every athlete* in (63c) receives its theta role from the embedded predicate *ready to compete*, and it is then promoted to subject of the matrix clause, where it activates a DR, as the anaphoric link in (63c) illustrates. Thus, movement to the EPP subject position creates a (derived) predicate which allows DR activation. What this requires in the present framework is that the operation $[\ldots]^n$ of DR application be licensed at the level of the EPP head, say T:

(64) a. every athlete$_i$ [$_{TP}$ t$_i$ $[T]^4$ [seems to his$_4$ coach [t$_i$ to be in good shape]]]
b. $= \lambda\phi\lambda u\, [\, \lambda\omega\lambda\omega'.\ \omega =^{4/u} \omega' \wedge \phi]$

T takes a propositional argument and returns something of type <e,T> that applies to the subject. It does whatever it is that T does to propositions, and adds a fresh DR linked to the subject (as per (64b)).

Let us step back, and compare predicates that do and predicates that don't introduce DRs so far. QR yields no semantic effects on the moved DP as such. Theta marking, instead, obviously does, i.e. it marks them as agents or themes in an event structure. What about EPP-movement ? Does it semantic effects on DPs, like theta marking? Or is it more like QR? Rizzi (2005), Rizzi and Shlonsky (2007) a.o., argue that EPP movement does have semantic effects on the DP. They claim that the EPP position is associated with a semantic property they call 'aboutness'. Its empirical manifestation is illustrated by the following paradigm:

[34] The present section summarizes a line of argumentation developed more extensively in Chierchia (2017).

(65) a. *Background question:* What happened to John's truck?
b. John's truck hit a car.
c. i. ?? A car hit John's truck.
ii. A CAR hit John's truck.
d. i. * Una macchina ha urtato il camion di Gianni.
a car AUX hit the truck of Gianni
ii. * Una MACCHINA ha urtato il camion di Gianni.
a car AUX hit the truck of Gianni
iii. Una macchina lo ha urtato, (il camion di Gianni).
A car it AUX hit the truck of Gianni

Against a background like (65a), sentence (65b) is fine,[35] but (65c.i) is deviant, as is its Italian counterpart. In English, this deviance can be rescued by placing the nuclear stress on the subject. But in Italian, it cannot (cf. (65.d.ii)); cliticization of the object is necessary, with optional right dislocation of the object. This suggests, according to Rizzi, that the EPP position may come with a specific information-structure requirement on the subject, having to do with the default presence of a background question like (65a). To spell this out remains difficult,[36] also in view of cross-linguistic variation on this score, witnessed by the contrast between Italian and English. But the possibility that specific conditions on information structure may be linked to the EPP position seems very real.

To sum up, the EPP position provides us with a clear instance of a derived predicate that introduce a DR, to be added to the case of Gn. In both instances, the heads that drive the movement impose specific requirements not only on their clausal sisters but also on the DPs they attract: an as of yet not fully understood information structure requirement, for EPP subjects, and quantificational/modalization requirements in case of Gn. This is not so for QR. This suggests that the derived predicates that introduce DRs are those that share with the lexical ones the property of affecting semantically their argument. Let us pursue this more.

4.2. Topics

Lasnik and Stowell (1991) show that English Topicalization (ET) obviates WCO:

(66) This book$_i$ [I would expect its$_i$ author to disavow t$_i$], but that book$_j$ [I wouldn't __].

ET is restricted to referential expressions and therefore the dependency in (65) could in principle just be a case of coreference. However, Lasnik and Stowell observe that ET licenses sloppy readings in VP ellipsis constructions, as shown in (65), which suggests that the pronoun-antecedent relation in (65) cannot be just a matter of coreference. This state of affairs is in a way expected in light of the considerations in Section 4.1. Topic-positions share at least some information structure features with prototypical subjects, so much so that in some languages (like Mandarin, and other so called 'Topic oriented' ones) it is hard to distinguish the two. It is therefore not surprising that a Top-head (null

[35] This is expected on any theory of question/answer congruence, such as, e.g., Rooth (1992).
[36] However we try to spell out Rizzi's aboutness (cf. Chierchia 2017 for an attempt), it cannot entail that subjects cannot be focused, for that they clearly can be.

in English, but overt in many languages), as it attracts a DP to its Spec position, is endowed with a DR-introducing semantics, exactly like the EPP-subject head.[37]

While ET obviates WCO, Principle C effects are never obviated:

(67) * That man_i $[TOP]^2$ [he_2 would expect me to disavow t_i]
= That man is such that he would expect me to disavow him

In the present set up, Principle C takes on the following form:

(68) Principle C:
a. A trace cannot be co-bound with a C-commanding pronoun.
b. A trace is co-bound with a pronoun in the following configuration:
[…DP_i H^n …pro_n…t_i…] , where H^n C-commands pro_n and pro_n C-commands t_i

As all BT-principles, Principle C is a syntactic constraint with semantic consequences, i.e. blocking semantic co-variance of a trace with a C-commanding pronoun. The principle in (68) can be viewed as a case of minimality or 'attract closest': H^n probes in its domain for its target (to be attracted to its Spec); pro_n is clearly a closer potential target than t_i, and hence the presence of pro_n blocks movement out of the t_i position.

This is perhaps the occasion to point out that on the present approach, 'canonical' Principle C violations, such as those in (69), are not ruled out in terms of Principle C, but just along side with WCO violations:

(69) a. * He_i criticizes every new $author_i$'s book
b. i. * [$Whose_i$ book]$_j$ does he_i criticize t_j?
ii. * Who_i does he_i believe that Mary will meet t_i?

What happens here is that the pronoun he_i fails to have a clause internal accessible antecedent. We'll try to make a case below that our re-formulation of Principle C in terms of predicates has some advantages over the traditional ones.

The basic line on ET appears to be confirmed by CLLD in Italian,[38] a construction that shares key properties with ET. Syntactically, CLLD involves dislocation of a constituent to the left periphery, with a resumptive clitic pronoun (obligatory for arguments) in the base position, subject to island effects:

[37] Lasnik and Stowell examine other cases of WCO obviation, involving tough-movement and parasitic gaps, such as the following:
(a) Which employee did you talk to __ before his boss had a chance to brief __
A parasitic gap construction such as (a) is generally taken to involve an (abstraction) operator and a form of co-predication of the adjunct with the object of *talk to* as schematically indicated in the following Logical Form:
(b) Which $employee_i$ [did you talk to t_i O^i [before his boss had a chance to brief t_j]]
In our framework this obviation effect would follow simply from the fact that the object theta role of *talk to* introduces a DR accessible to the pronoun *his* embedded in the adjunct clause.

[38] See, e.g. Cinque (1977), Cecchetto and Chierchia (1999), Cecchetto (1999) and references therein.

(70) a. Francesco, io *(lo) amo __molto.
Francesco, I him love a lot
b.* Francesco, Maria è uscita prima di incontrarlo.
Francesco, Maria went out before meeting him

Cecchetto (1999) and Cecchetto and Chierchia (1999), building Torrego's (1994) approach to clitic doubling, argue that CLLD is the result of extracting a DP out of a 'Big DP' configuration, illustrated in (71a)

(71) a. [$_{DP}$ Francesco [$_{DP}$ lo]] 'Big DP'
b. Francesco$_i$ TOP^n [I [~~Francesco~~$_i$ him$_n$] love [~~Fracesco him$_i$~~]]
c. [t$_i$ him$_n$] $\Rightarrow \lambda\omega$: ω_n= t$_i$. ω_n

(71b) illustrates how the derivation works. First the Big DP is moved preverbally to the canonical clitic position; then the DP is sub-extracted out it. The interpretation of the resumptive pronoun is given in (71c). Pronouns in a configuration like (71c) are interpreted as triggering a presupposition that their n-coordinate is linked to the value of their sister. The TOP head will introduce a DR for n, in the same manner as its English counterpart and EPP-heads do. As expected on this analysis, CLLD obviates WCO but not Principle C:

(72) a. Uno studente così$_j$ TOP$_{3/j}$ [mi aspetterei che il suo$_j$ advisor lo$_3$ sosterrebbe __ ad oltranza].
'A student like that[I would expect that his advisor him would support__ strongly]'
b.* Un bravo studente$_j$ anche lui$_j$ crede che Gianni lo$_j$ aiuterebbe.
A good student also he believes that Gianni him would help
c. [A good student]$_j$ **TOP^3** also **he$_3$** believes that Gianni [t$_j$ **him$_3$**] would help

Sentence (72b) has a structure like (72c) on the analysis just sketched, and is ruled out by our version of Principle C, viz. (68).

So far, CLLD basically corroborates the generalizations about topics (and EPP subjects). An interesting novelty comes from consideration of CLLD of oblique arguments (locative and dative PPs), which differs from the CLLD of direct arguments in several ways. For example, the clitic double is optional with obliques (cf. 73a), and Scope Reconstruction is only possible with direct arguments (cf. 73b):

(73) a. In quel cassetto Leo (ci) mette ogni carta importante.
In that drawer Leo (there) puts every important paper
b. i. Qualche compito di fonologia, Leo lo assegna ad ogni student. $\exists\forall$; $\forall\exists$
Some phonology problem Leo it assigns to every student
ii. In qualche cassetto, Leo ci tiene ogni carta importante. $\exists\forall$; $*\forall\exists$
in some drawer, Leo there keeps every important paper
c. In palestra [ci+va T^n[Leo t $_{V+CL}$ [VP….]]

These and other related facts lead Cecchetto to conclude that CLLD of PPs has a different syntax than CLLD of direct arguments, which involves base generation of the PP in a TOP-head in the left periphery; the TOP head, in this case, attracts the complex V+CL head, as shown in (73c). The details of the proposal do not matter here, but it is clear that a base generation hypothesis would immediately account for the absence of Scope reconstruction (along, Cecchetto argues, with other differences). What is interesting for us is that both CLLD of DPs and of PPs display very strong 'disjoint reference' effects, typical of Principle C violations:

(74) a. * [Il padre di Gianni]$_i$ T^n [lui [t_i lo_n] ama molto]
The father of Gianni he him loves much
b. * [A casa di Gianni]$_i$ T^k pro_n ci_k va volentieri
To Gianni's home he there goes willingly

In both (74a-b) the pronouns in subject positions cannot corefer with the DP *Gianni* embedded within the DP or PP in Topic position.[39] When movement is involved, this is to be expected. But with base generation, it is not clear how the traditional Principle C would work. On the present account, the only antecedent accessible to any pronoun in the main clause in (74) is the one linked to the whole DP or PP. The material embedded within the dislocated constituent (i.e. *Gianni*) is *not* accessible. Hence, in both cases the pronoun in subject position lacks an accessible antecedent.

In the present section we have explored a variety of predicates derived via a kind of movement that results in DR introduction: EPP movement, ET and CLLD. The inventory is surely larger. [40] What do they have in common? How do they compare to the cases of movement that instead do display crossover effects? These are hard questions. One thing is clear, though. QR has fairly specific properties: it driven by a type mismatch in the base positions, and it does not condition semantically the moved DP in any way. The very same is arguably true for wh-movement. Wh-movement is driven (on language particular basis) by a designated head (the interrogative Comp). But the moved wh-item is not semantically affected otherwise. To clarify this contention, here is a sketch of the compositional steps in the interpretation of a question, on the basis of Karttunen's (1977) classic approach.

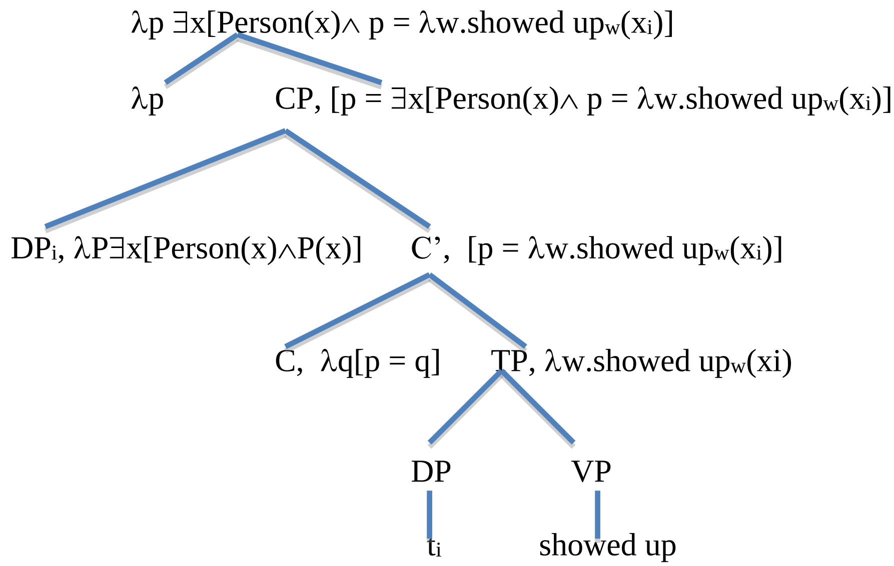
[39] The DP in Topic position in (74a) must associate with the object because the pronoun in subject position is not a clitic.

[40] I believe that the present line of analysis might also be useful in analyzing A- vs. A'-scrambling, much discussed in the literature. The following Russian example, from Baylin (2001), illustrates a case of A-scrambling, which obviates WCO:

(a) ?? ee_1 sobaka nravitsja kazhdoj $devochke_1$
NOM-her dog appeals DAT-every girl 'Her dog appeals to every girl.'
(b) kazhdoj $devochke_1$ nravitsja ee_1 sobaka
DAT-every girl appeals NOM-her dog

But to it is impossible to pursue this within the limits of the present paper.

(75)



On this analysis, which has to be sure many variants,[41] the interrogative C transform its sister b turning into a question. The meaning of wh-words is that of ordinary quantificational indefinites. Wh-words are attracted to their scope site by C, overtly so in languages like English, and are simply quantified in. While the interrogative C affects the semantics of its clausal sister (by creating the core of the question meaning), the meaning of the wh-word as such is not affected by the movement.

So it seems that we can conclude that both QR and wh-movement share the property that the moved item is not affected in its meaning. Both kinds of movement are, arguably 'pure' forms of scope assignment. This is not so for the kinds of movement that obviate WCO: They affect the moved DP. Generics, where the movement determines the quantificational force of the indefinite and its modalization, clearly do; Topics are only partially understood, but when a DP becomes a topic its meaning *is* affected: the topic must be selected from a set of familiar alternatives, a topicalized DP sets specific conditions on information structure that typically prevent quatificational DPs from being topicalized, etc. Something similar, perhaps, is true even of the EPP position.

On this basis, we arrive at the following conjecture: derived predicates that lead to the introduction of DRs share with lexical predicates a kind of 'conditioning' semantic quality. In both cases, the head with which a DP combines (directly, via merge for theta marking heads, indirectly via movement for non theta marking ones) affects or conditions the meaning of the DP, and the introduction of DRs is part and parcels of that conditioning. Scope assigning movement doesn't:

(76) **Condition on DR-introduction**

a. Derived predicates [DP_i ϕ] that do not condition semantically the dislocated DP do not introduce DR.

b. Derived predicates that condition semantically the dislocated DP may introduce DRs.

---

[41] Cf. Dayal (2016). The syntax-semantics mapping in (61) corresponds to what she calls "the base line theory" of questions.

We have thus arrived at the formulation of a specific, falsifiable hypothesis on when derived predicates introduce DRs: they do, when they share with lexical predicates a ‘semantic conditioning’ property. Along the way to the formulation of this hypothesis, we have discussed some consequences of the present approach for the Binding Theory, and illustrated one way in which the present approach to crossover phenomena may extend to some cases of resumption. The suggestion, for CLLD, is that the resumptive clitics should be treated semantically as ordinary pronouns. But the phenomenology of resumption, like that of topic-hood, is much broader and very diverse. For example, Demirdache and Percus (2011) argue that resumption in Jordanian Arabic involves movement of the resumptive pronominal element, and obviously this would require a different semantics for such elements (vis-à-vis non resumptive pronouns), regardless of whether the present take is on the right track or not.

5. Comparisons and conclusions

It is time to take stock. We will do so by first briefly comparing the present approach with two other approaches that are as semantically explicit as the present attempt, the situation theoretic line explored by Büring and the continuation approach developed by Barker and related work. Then we will briefly summarize our results and point out a few lines of further developments.

In a way, the comparison with Büring’s proposal is already done, as we have used his lead idea as inspiration. Just quick reminders may be, therefore, called for at this point. The basic architecture of his proposal is simple. There are two systems of indices, one to deal with binding, the other to deal with scope. There is, however, no semantic difference between pronouns and traces as such. For non C-command binding, Büring adopts a situation theoretic approach. He does not address the issue of binding into adjuncts from internal arguments. It also remains unclear why and how the situation theoretic approach in place to derive donkey sentences does not/cannot kick in in basic WCO situations (*his mother likes everyone*) or donkey crossover situations. The approach developed here, in contrast, treats traces as ordinary variables and pronouns as pointers/addresses to active DRs, and a double syntactic tracking system flows from this assumption. The DS apparatus coupled with the idea that only predicates introduce DRs (an analogue of Büring’s pronoun binding rule) delivers non C-command binding, and offers an arguably principled treatment of binding into adjuncts. Moreover, it seems at no risk of overgenerating, not even when indirect binding (= E-type pronouns) are put in place. Plus, the present approach forces us to ask which derived predicates (whether they involve A or A’- positions) could affect anaphora by obviating WCO and to formulate a conjecture, however preliminary, in this regard, namely (76) above. Büring’s proposal may certainly be modified and augmented in various ways, but it remains to be seen whether this can be done in a way that is significantly different from the proposal worked out here.

The comparison with continuations based approaches will be necessarily preliminary and incomplete, but even so it calls for a subsection of its own.

5.1. To continuize or not to continuaze?

Continuations are a powerful computational device that can be put to many different uses. Barker (2002), Shan and Barker (2006), Barker and Shan (2008) put it to the service of providing a direct compositional, variable free interpretation for language that bypasses as much as possible abstract syntax and, in particular, a level of Logical Form. We can't, obviously, say much about meanings in continuation theory, except for noting that when it comes to sentences, they bear some similarity to the notion of CCPs. Here is how Barker puts it:

> In fact, dynamic interpretation constitutes a partial continuization in which only the category S has been continuized (rather than continuizing uniformly throughout the grammar, as is done here) (Barker, 2002: p. 236)

The architecture of Shan and Barker's (2006) proposal on WCO (henceforth S&B) is based on leftness. The continuation approach affords a way for quantifiers embedded in object position to get scope over the whole sentence, including the subject. While scope is a prerequisite for pronoun binding, it doesn't automatically determine it. And so we can build into binding a constraint that prevents 'binding to the left' with respect to the surface position of the binder. This is viewed as a processing constraint embodied in the motto "Evaluate expressions from left to right" (S&B, p. 94). This calls for an immediate *distinguo*. Crossover cannot be a matter of left to right relative to what we actually hear, for otherwise crossover cases with quantifiers (*his mother likes everyone*) vs. the case of wh-movement (*who does his mother like*) should pattern differently. It must be left-to-right with respect to some structure where wh-movement is, as it were, reconstructed. Rather than 'linear order' what matters is 'evaluation order' (ibid. pp. 97 ff), which in case of wh-words must look at the phonologically empty base positions.

S&B's proposal is thus conceptually very different from ours, which makes no use of directional constraints. Now, as is well known, there are pronouns that systematically 'look to their right' for their interpretation, originaly studied in Jacobson's (1977) classic work:

(77) a. Every student that red it enjoyed the text assigned to him.
b. Every student that red it ~~text assigned to him~~ enjoyed the text assigned to him.

Of course, an ellipsis analysis is availabe on any framework. But why should pronouns, qua bound elements, be subject to a directional processing constraint, while ellipsis pronouns are not? Why should there be this fundamental difference between binding and ellipsis?

Just to mark the conceptual differences even more starkly, abstractly speaking one could build into S&B's system a mirror image 'rightness' constraint: do not bind to the right of the base position of the binder. One might want to ban 'rightness' as senseless from a processing point of view, but then we just saw that processing cannot be just left to right surface scanning, even in a word order rigid languages like English; moreover VOS languages do exists, etc. Be that as it may, the theory we are adopting envisions no directional constraint/parameter on anaphora.

Having said that it is quite hard to tease apart empirically the two proposals, at least on the basis of the familiar anglocentric data set we are considering here. The main reason for it, is that conjunction figures prominently in determining accessibility. In DS, conjunction is function composition, an asymmetric, associative operation. However, surface order is obviously a key factor in determining how constituents are conjoined/composed with each other. This is not so with conditionals, however. The antecedent of a conditional is syntactically marked: if-clauses must be semantically construed as antecedents, wherever they occurs linearly. So here there is some potential for distinguishing empirically directional vs. non directional approaches. On Barker and Shan's approach, a right adjoined if-clause stands no chance of yielding antecedents for pronouns in the main clause. On the other hand, for us, right adjoined if-clauses should remain accessible to the main clause, for accessibility is semantically, not linearly determined. An thus cataphora into right adjoined if-clauses should be in principle possible, in spite of the fact that cataphora is in general disfavored on processing grounds.

Barker and Shan (2008 – B&S, henceforth) extend the continuation framework to donkey sentences and offer the following in favor of their directional view of if-clauses.

(78) * He beats it, if a farmer owns a donkey. B&S, p. 36

They rule (76) out as a case of donkey crossover. However, there is a confound here. As is well known,[42] right adjoined if-clauses occur in a position where they are C-commanded by the subject. There is much evidence in favor of this view, including, e.g., VP-anaphora and (traditional) Principle C effects:

(79) a. John sings in the shower, if he is happy, and Mary does ~~[$_{VP}$ sing in the shower if she is happy]~~ too.
b. *He$_i$ sings in the shower, if John$_i$ is happy.

If we eliminate the confound of strong crossover, things immediately and dramatically change:

(80) a. I am sure that you'll like him$_i$, if you get to meet John$_i$.
b. *I am sure that you'll like him$_i$ and you'll get to meet John$_i$.

The contrast between (79b) and (80a) is stark, as is the contrast between (80a) and (80b), where we replace the conditional with conjunction. The latter contrast strongly suggests that the semantics of these two connectives must be playing a role. Let us look, next, at indefinites in right adjoined if-clauses. While indefinites may well be finicky, for all sort of processing and pragmatic reasons, we would expect that cataphora to indefinites into right adjoined if-clauses should be sometimes acceptable, for if-clauses are in principle accessible to the corresponding if-clause. The following data (adapted from Chierchia (1995a)) suggests that this is indeed so:

[42] Cf. Chierchia (1995a) and references therein.

(81) a. [CONTEXT: Teachers are very sensitive to the prices of textbooks]
i. A teacher will never adopt it_i, if a $textbook_i$ is too expensive.
ii. *A teacher will never adopt it and a textbook is too expensive.
b. [CONTEXT: John is rich, and fanatic about cars]
i. He always buys it_i on the spur of the moment, whenever he falls in love with a car_i.
ii. *He always buys it_i on the spur of the moment, and he does fall in love with a car_i.
c. [CONTEXT: John was hit by something in the street]
i. I hope he got its_i plate, if it was a car_i.
ii.* I hope he got its plate, and probably it was a car.

The first two example are generic 'multi-case' conditionals; the last is an epistemic 'one case' conditional. They contrast systematically in acceptability with cataphora in conjunction (and with B&S's (78), which is however fraught by a confound). These examples seem to be out of reach for an approach based on leftness. On a DS approach, on the other hand, once strong crossover and processing/pragmatic factors are controlled for, we expect cases like those in (81) to be possible (see Section 3.3 for an implementation).

Finally, the present approach gives us ways of addressing the very difficult problem of A'-dependencies that bleed WCO, if in a preliminary and tentative way. It remains to be seen what the analogue of that would be in the continuation framework and how that could be made consistent with leftness.

Be that as it may, the continuation framework is an extremely powerful formalism, and does have points of contact with dynamics. Surely the idea developed in the present paper could be reconstructed within it, if one feels so inclined. For the time being, it seems fair to conclude that the approach developed in this paper differs conceptually and empirically from the available continuation theoretic approaches and the available evidence favors the former over the latter.

5.2. Final remarks and future perspectives

Any basic version of DS (not just the one adopted here), would enable one to explore our core idea, a somewhat unorthodox mapping between DR-introduction and basic syntactic constitutents:

(82) a. DPs never activate DRs (either inherently, or when scoped).
b. Only predicates activate DRs.

What we have done in this paper is make (82) precise and worked out its consequences. Part of making (82) precise involves spelling out something that is already implicitly contained in its first part (81a), namely that derived predicates/λ-abstracts created at scope sites (as per, e.g., Heim and Kratzer's convention on the interpretation of QR) cannot activate DRs. Every other predicate in principle can. The idea that QR does not allow DR-introduction is a stipulation, if you wish to put it that way. But I think it is the only stipulation of the approach we have developed. Note, for example, that (82b) kind of follows from (82a): If anaphora works the dynamic way, via DR activation, and DPs do not cut it, then what does?

To get things going, we must assume that lexical predicates (i.e., verbs and their theta roles) be allowed to activate DRs. We have seen that there are independent empirical reasons for assuming this, unrelated to crossover phenomena, in the behavior of bare plurals. For reasons that have nothing to do with anaphora, it clearly seems necessary to posit an operation of DR introduction at the first merge site for bare plurals. We have then shown in detail that the basic WCO facts flow from the assumptions in (82), including an explanation of when and why binding from an internal argument into a higher adjunct is possible.

Nothing whatsoever in (82) should lead one to expect that *only lexical* predicates can introduce DRs. And indeed, the fact that some derived predicates, i.e. predicates created by movement, do introduce DRs and therefore bleed WCO, has always been in plain sight. It has been long known that A-movement as well as some cases of A'-movement (both of which create derived predicates) do not yield WCO effects. In the present framework, this question takes the form of which specific predicates introduce DRs and under what conditions they do. DR-introducing derived predicats should have some property in common with the lexical predicates, in a way that sets them both apart from QR. This question has led us to formulate a novel, explicit hypothesis on what may cause derived predicates to introduce DRs.

(83) **Semantic conditioning on DR-introduction**

a. Derived predicates [DP $_i$ ϕ] where λ_i ϕ does not condition semantically the dislocated DP cannot introduce DR.

b. Derived predicates that condition semantically the dislocated DP may introduce DRs.

To 'condition semantically' a constituent means to impose on it tangible semantic requirements that go beyond the lexical meaning of DP. This happens if, e.g., the predicate assigns to its DP argument a new theta role, or it turns it into a topic, or it assigns generic force to it , and the like (none of which QR or wh movement do). For the time being, this list must be left open ended; but in time we may be able to arrive at interesting and constrained typologies. The case of wh-movement is very telling in this connection. Unlike QR, wh-movement is language specific and driven by a specific head, the interrogative Comp, that has a patent and unmistable semantic effect on its scope (namely that of turning it into a question). However, the interrogative C-head does not alters the semantic contribution of the moved DPs: the latter are simply indefinites quantified into the question meaning.

The hypothesis we have arrived at does not entail that if a derived predicate semantically conditions its argument (the dislocated DP) it *must* introduce a new DR and bleed WCO. This is a point that only future research can clarify. Scrambling phenomena and resumption are prime areas to explore, in this new light. The present perspective should provide a useful tool for cross linguistic inquiries in those areas.

We have often times remarked that while the version of DS we have used in the present paper is standard, the mapping hypothesis embodied in (82) is not. Some of the canonical hunting grounds for DS (e.g., conditionals) are not significantly affected by the new mapping. Others (e.g., DPs with relative clauses) are: if the mapping in (82) is right, there are no Dynamic Generalized Quantifiers. Be that as it may, we have provided evidence that the account of WCO explored here, while descending from a simple hypothesis that has antecedents and paralles in the literature, is in no way equivalent, either conceptually or empirically, to any of the known treatments, and its consequences go beyond the familiar crossover phenomena.

Appendix

1. Summary of the formal theory

(1) Types.

a. Basic: e, t, **n**; where: D_e = U (domain of individuals, including events), $D_t = \{0,1\}$, $D_{\mathbf{n}}$ = N (the set of positive integers)

b. $D_{<a,b>} = [D_a \Rightarrow D_b]$ (the set of all total or partial functions from D_a into D_b)

c.i. $\boldsymbol{\omega} = <\mathbf{n}, e>$ Assignments

ii. $<\boldsymbol{\omega},e>$ Pronouns

iii. $T = <\boldsymbol{\omega}, <\boldsymbol{\omega},t>>$ Context Change Potentials

The set of meaningful expressions, models, etc. for a formal language with these types are to be defined as for TY2 (Gallin 1975).

(2) DR-introduction and type shifing

For any P, of type <e,t>:

a. $[P_{<e,t>}] = \lambda u\, [\, \lambda\omega\lambda\omega'.\ \omega = \omega' \wedge P(u)]$

b. $[P_{<e,t>}]^{n} = \lambda u\, [\, \lambda\omega\lambda\omega'.\ \omega =^{n/u} \omega' \wedge P(u)]$

where $\omega =^{n/u} \omega'$ is an abbreviation of $\omega' = \omega \cup <n,u>$, defined only if the input assignment is *un*defined for the nth-coordinate.

Pronouns, of type $<\boldsymbol{\omega},e>$, combine with predicates of type <e,T> via function composition:

(3) Pronouns.

a. $he_n = \lambda\omega.\omega_n$

b. If β is of type <e,T>, and α is of type $<\boldsymbol{\omega},e>$, then

$\beta\, (\alpha_n) = \lambda\omega\, \lambda\omega'.\ \beta\, (\alpha(\omega)(n))(\omega)(\omega')$

(4) The logic.

For any ψ, ϕ of T, any variable ω, ω' of type $\boldsymbol{\omega}$ and any variable α_a of type a:

a. $\downarrow_\omega \phi = \exists\omega'\, [\phi(\omega)(\omega')]$ 'ϕ is true relative to ω;' $\downarrow$ is of type $<\boldsymbol{\omega},<T,t>>$

b. $\neg\phi = \lambda\omega\lambda\omega'.\ \neg{\downarrow_\omega}\, \phi \wedge \omega = \omega'$

c. $(\phi \wedge \psi) = \lambda\omega\lambda\omega'.\ \exists\omega''\, [\phi(\omega)(\omega'') \wedge \psi(\omega'')(\omega')]$

d. $\phi \rightarrow_\forall \psi = \neg (\phi \wedge \neg \psi)$
e. $\phi \vee \psi = \neg (\neg \phi \wedge \neg \psi)$
f. $\exists \alpha_a \phi = \lambda\omega\, \lambda\omega'. \exists \alpha_a [\phi(\omega)(\omega')]$
g. $\forall \alpha_a \phi = \neg \exists \alpha_a \neg \phi$

2.Examples

(5) a. Someone [walked in]^2. He$_2$ was [tall]^3
b. Interpretation of (a): $\exists x$ [walked in]^2 (x)] $\wedge$ [tall]^3(he$_2$)
Abbreviations: walked in = WI; tall = TA
Reduction steps.
Reduction of the first conjunct of (5b):
c. $\exists x[\ \lambda u.\lambda\omega\lambda\omega'.\ \omega =^{2/u} \omega' \wedge WI(u)]\ (x)]$ — Def. of $[\ldots]^n$
d. $\exists x[\lambda\omega\lambda\omega'.\ \omega =^{3/x} \omega' \wedge WI(x)]$ — λ-conv.
e. $\lambda\omega\lambda\omega'.\ \exists\ x[\lambda\omega\lambda\omega'.\ \omega =^{2/x} \omega' \wedge WI(x)]$ — Def of $\exists$
Reduction of the second conjunct of (b):
f. $[TA]^3(he_2) = \lambda\omega\lambda\omega'.\ \omega = \omega' \wedge TA(\omega_2)$
(5b) in primitive notation:
g. $\lambda\omega\lambda\omega'.\ \exists\ x[\lambda\omega\lambda\omega'.\ \omega =^{2/x} \omega' \wedge WI(x)] \wedge \lambda\omega\lambda\omega'.\ \omega = \omega' \wedge TA(\omega_2)$
h. $\lambda\omega\lambda\omega'\ \exists\nu\ [\exists x[\ \omega =^{3/x} \nu \wedge WI(x)] \wedge\ \ \nu = \omega' \wedge TA(\nu_2)]]$ — Def. $\wedge$
i. $\lambda\omega\lambda\omega'\ \exists x[\ \omega =^{3/x} \omega' \wedge WI(x) \wedge TA(x)]$ — Elementary logic
j. $\downarrow_\nu \lambda\omega\lambda\omega'\ \exists x[\ \omega =^{3/x} \omega' \wedge WI(x) \wedge TA(x)]$
$= \exists\omega'\ \exists x[\ \nu =^{3/x} \omega' \wedge WI(x) \wedge TA(x)]]$ — Def. $\downarrow$
(5j) is true in a world w iff:
k. $\exists x$ [walked in(x) $\wedge$ tall(x)]

(6) A crossover case.
a. i. His cat loves everyone
ii. Logical Form: [every one$_i$ [his cat υ^5 TH$_1$ t$_i$]]
iii. Interpretation: every one($\lambda x_i\ \exists e$ [**[EX(e)]^5(his cat)** $\wedge$ [TH(e)]^1(x$_i$) $\wedge$ [love]^2(e)])
We focus on the subformula in boldface and show how if we resolve *his* to the index 5, we get a presupposition violation. Given the definition of conjunction, the same happens if we resolve his to any of the indices declared to the right of the subformula
b. **[EX(e)]^5(his$_5$ cat**) = $\lambda u\ .\ \lambda\omega\ \lambda\omega'.\ [\omega =^{1/u} \omega' \wedge EX(e)(u)]\ (f_{cat}(\omega_1))$
By λ-conv. And definition of ' =n/u' we get:
c. $\lambda\omega\ \lambda\omega'.\ [\omega' = \omega \cup \langle 1/\ f_{cat}(\omega_1)\rangle \wedge EX(e)(\ \omega_1)]$
For $\omega \cup \langle 1/\ f_{cat}(\omega_1)\rangle$ to be defined, *1* must not be in the domain of the input assignment ω; but then $f_{cat}(\omega_1)$ cannot be determined and (c) is undefined.

(7) A case of 'Disclosure'
In what follows we apply the disclosure operator to *someone walked in*:
a. D$_5$ (someone [walked in]^5)
b. $D_5\ (\lambda\omega\lambda\omega'\ \exists x[\ \omega =^{5/x} \omega' \wedge WI(x)])$ — Cf. (5.i)
c. $\lambda u\ [(\lambda\omega\lambda\omega'\ \exists x[\ \omega =^{5/x} \omega' \wedge WI(x)] \wedge \lambda\omega\lambda\omega'\ \omega_5 = u]$ — Def of D$_n$

d. $\lambda u\ .\ \lambda\omega\lambda\omega'\ \exists x[\ \omega =^{5/x} \omega' \wedge WI(x) \wedge \omega_5 = u]$ Def. $\wedge$

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