Cross-categorial donkeys

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Abstract. Data from surprising sloppy readings of verb phrase ellipsis constructions argue that ellipsis sites can partially or totally consist of dynamically bound pronouns. I give an account, integrating Muskens' [11] CDRT with a focus-based theory of ellipsis and deaccenting (Rooth [14, 15]). The result is essentially a hybrid of Hardt [6] and Schwarz [19] but manages greater empirical coverage than either.

1 Surprisingly sloppy

An influential theory of verb phrase (VP) ellipsis has it that elided VPs ('ε') and their antecedents ('α') must share an interpretation/LF (Keenan [8]; Sag [17]; Williams [25]). If pronouns have bound and referential uses, this correctly predicts that (1a) is ambiguous between a *strict* reading (Chris thinks Simon is smart: $[\![\alpha]\!]^g, [\![\varepsilon]\!]^g \equiv \lambda x.\, x$ thinks Simon is smart) and a *sloppy* reading (Chris thinks Chris is smart: $[\![\alpha]\!]^g, [\![\varepsilon]\!]^g \equiv \lambda x.\, x$ thinks x is smart). But requiring α and ε to mean the same thing, though appealing, turns out to be too restrictive. Sloppy pronouns are sometimes bound only *outside* of ε (cf. 1b) and sometimes lack a c-commanding antecedent altogether (cf. 1c).

(1) (a) Simon [$_\alpha$ thinks he's smart], and CHRIS$_\mathrm{F}$ does ε too.

(b) [$_{\mathrm{S}_\alpha}$ Bagels λ_i I [$_\alpha$ like t_i]]
[$_{\mathrm{S}_\varepsilon}$ DONUTS$_\mathrm{F}$ λ_j I DON'T$_\mathrm{F}$ [$_\varepsilon$ like t_j]] (Evans [4])

(c) [$_{\mathrm{S}_\alpha}$ the cop who arrested John$_i$ [$_\alpha$ insulted him$_i$]]
[$_{\mathrm{S}_\varepsilon}$ the cop who arrested BILL$_{\mathrm{F},j}$ DIDN'T$_\mathrm{F}$ [$_\varepsilon$ insult him$_j$]] (Wescoat [24])

To deal with cases like (1b), Rooth [14] proposes a two-part theory of ellipsis: (i) α and ε must be syntactically identical, *but only up to variable names (and F-marks)*. (ii) A node dominating ε is must also CONTRAST with a node dominating α, in the sense of Definition 1.[1] (CONTRAST prevents rank over-generation: "John likes him, and BILL does too" can't mean John likes Steve, and Bill likes Bill.)

Definition 1. CONTRAST(ϕ, ψ) at g iff: $[\![\phi]\!]^g \neq [\![\psi]\!]^g$, and $[\![\psi]\!]^g \in \langle\!\langle \phi \rangle\!\rangle^g$, with $\langle\!\langle \cdot \rangle\!\rangle^g$ the standard Roothian (1985) function into focus sets:

- · Focus values for non-F-marked terminals: $\langle\!\langle \phi \rangle\!\rangle^g = \{[\![\phi]\!]^g\}$
- · Focus values for F-marked nodes: $\langle\!\langle \phi_\mathrm{F} \rangle\!\rangle^g = \{x : x_{\tau(\phi)}\}$
- · For any non-F-marked branching node ϕ dominating γ and δ, if $[\![\gamma]\!]^g([\![\delta]\!]^g)$ is defined, $\langle\!\langle \phi \rangle\!\rangle^g = \{c(d) : c \in \langle\!\langle \gamma \rangle\!\rangle^g \wedge d \in \langle\!\langle \delta \rangle\!\rangle^g\}$

This accounts for (1b)—α and ε are structurally identical modulo indices, and $[\![\mathrm{S}_\alpha]\!]^g \in \langle\!\langle \mathrm{S}_\varepsilon \rangle\!\rangle^g = \{f(\text{I like } x) : x_e, f_{tt}\}$—but not for (1c). While, clearly, (1c)'s α

[1] An idealization. Relations besides CONTRAST are often apt (Asher & Lascarides [1]).

and ε are identical up to indices, no choice of any two nodes satisfies CONTRAST: since *him*$_j$ isn't c-commanded by a co-indexed expression, it must—assuming Reinhart's [12] view of the syntax-semantics interface, anyway—be interpreted referentially. This entails that, e.g., $\langle\!\langle \mathrm{S}_\varepsilon \rangle\!\rangle^g = \{$the cop who arrested x insulted Bill: $x_e\}$. $[\![\mathrm{S}_\alpha]\!]^g$ is not in this set. CONTRAST fails.

Yet CONTRAST *must* be satisfiable! Sentence (2) has a reading entailing that, for all x other than Bill, I didn't say that the cop who arrested x insulted x (Tomioka [22]). Given a standard semantics for *only* (Definition 2), some LF for (2)'s S-node, call it '$\mathcal{L}$', must be such that $\langle\!\langle \mathcal{L} \rangle\!\rangle^g = \{$the cop who arrested x insulted $x : x_e\}$. But $\mathcal{L}$ must also be available as an LF for (1c)'s S_ε, the elliptical variant of S. Since (1c)'s $[\![\mathrm{S}_\alpha]\!] \in \langle\!\langle \mathcal{L} \rangle\!\rangle^g$, CONTRAST must be satisfiable, after all.

(2) I only heard that [$_\mathrm{S}$ the cop who arrested BILL$_{\mathrm{F},i}$ insulted him$_i$]!

Definition 2. $[\![\text{only VP}]\!]^g = \lambda x\!:\![\![\mathrm{VP}]\!]^g(x).\, \forall Q \in \langle\!\langle \mathrm{VP} \rangle\!\rangle^g.\, Q(x) \rightarrow Q = [\![\mathrm{VP}]\!]^g$

Sloppy elliptical VPs. Surprising sloppiness is cross-categorial. Sentence (3) can mean that when John has to clean, he doesn't want to clean (Hardt [6]; Schwarz [19]). But treating ellipsis as simple non-pronunciation of LF material yields the LFs in (3b), where α_2 and ε_2 aren't even identical up to indices! Nor is CONTRAST satisfiable; (3b)'s S_ε, for example, is associated with the focus set $\langle\!\langle \mathrm{S}_\varepsilon \rangle\!\rangle^g = \{$if John has to P, f(he wants to clean) : $P_{et}, f_{tt}\}$.

(3) (a) If John has to cook, he doesn't WANT to. If he has to CLEAN, he doesn't either.

(b) [$_{\mathrm{S}_\alpha}$ if John has to [$_{\alpha_1}$ cook] he doesn't [$_{\alpha_2}$ [WANT to]$_\mathrm{F}$ [$_{\varepsilon_1}$ cook]]]
[$_{\mathrm{S}_\varepsilon}$ if he has to [$_{\alpha_3}$ CLEAN$_\mathrm{F}$] he doesn't [$_{\varepsilon_2}$ want to [$_{\varepsilon_3}$ clean]]]

Yet, like (2), "I only heard that if John has to CLEAN he doesn't want to" has a covarying reading—such that for all P_{et} other than clean, I didn't hear that if John has to P, he doesn't want to P (cf. related claims in Kratzer [9]). So again there is reason to believe that, potentially, (3b)'s $[\![\mathrm{S}_\alpha]\!]^g \in [\![\mathrm{S}_\varepsilon]\!]^g$. But, again, how?

The scoping theory. Schwarz [19] argues that (a) *syntactic binding* (i.e. with LF c-command) underlies all sloppy readings, and (b) elided VPs are sometimes (but not always) null variable pro-VPs ('P_n'). Moreover, he suggests, VPs can QR to positions of sentential scope. So, according to Schwarz, LFs like (4) underlie the sloppy reading of (3) (analogous LFs can be mooted for (1c) and (3)).

(4) [$_{\mathrm{S}_\alpha}$ cook λ_1 [if John has to t_1 he doesn't [$_\alpha$ [WANT to]$_\mathrm{F}$ P_1]]]
[$_{\mathrm{S}_\varepsilon}$ CLEAN$_\mathrm{F}$ λ_2 [if he has to t_2 he doesn't [$_\varepsilon$ want to P_2]]]

Here, α and ε are identical up to indices and F-marks. Moreover, $[\![\mathrm{S}_\alpha]\!] \in \langle\!\langle \mathrm{S}_\varepsilon \rangle\!\rangle = \{$if John has to P, he wants to $P : P_{et}, f_{tt}\}$. So the sloppy reading is generated.

But there are issues. (i) The proforms in (4) get bound from an $\bar{\mathrm{A}}$-position, something Reinhart [12] deems possible only for *traces.* (ii) The account requires covert movement out of scope/extraction islands—including asymmetric QR out of conjunctions (against the Coordinate Structure Constraint), cf. (5). (iii) To explain (5b), NPs—not subject to overt movement—must QR, again across potentially unbounded distances (Elbourne [3]). (iv) Pro-VPs, if instantiated as variables, lack internal syntax; so it should be impossible to extract out of them, inconsistent with the grammatical sloppy reading of (5c) (Tomioka [23]).

(5) (a) If I'm stressed and John says something awful, I get mad at him.
If I'm stressed and BILL does, I DON'T.

(b) If you lose your visa, you get another.
If you lose your PASSPORT, you DON'T.

(c) I bought everything I was SUPPOSED to and SOLD everything I WASN'T.

But most troubling for the scoping theory is that it fails to generate the *correspondence reading* of constructions like (6)—the one entailing that Sue waves to whoever Mary does (Rooth & Partee [16]; Stone [20]). Just as no amount of QR gives donkey truth conditions for sentences like "if someone$_i$ knocked, she$_i$ left", no amount of QR yields the correspondence reading of sentences like (6).

(6) If Mary waves to John or Bill, then SUE does too.

Hardt's dynamic theory. Hardt [6] gives a dynamic account of surprising sloppy readings using Muskens's [11] Compositional DRT (CDRT). I'll postpone the details of CDRT until the following section. For now, it suffices to note that Hardt assigns (3) the LF in (7), with P_n, as before, a phonologically null pro-VP.

(7) if John^1 has to cook^{*,2} he doesn't [want to P_*]^3
if he$_1$ has to clean^{*,4} he doesn't P_3

Superscripted indices correspond to the introduction of a discourse referent (dref); subscripted items denote previously introduced drefs. There is a dedicated index '$*$' which Hardt allows to be overwritten and dubs the "center". Informally, in (7) both α and ε denote the property of wanting to σ, with σ the *current value of the center*. Since *clean*^{*,4} overwrites $*$ with clean (roughly), P_3 evaluates to the property of wanting to clean, and the sloppy reading is derived.

Like the theory we began with, Hardt requires semantic identity of α and ε. This is why destructive update is crucial: for surprising sloppy configurations, it seems like the only way, in a dynamic theory, for α and ε to denote identical properties! But this creates problems. For one, Hardt is forced to posit *two* indices on items U that update the center. The reason: though $*$ may subsequently be overwritten, this shouldn't preclude subsequent "ellipsis" of U. But even with this complication, problems remain. As Sauerland [18] points out, there can be multiple surprising sloppy things of a single type (cf. 8, after Sauerland's ex. 10; NB: the indexing here merely indicates the intended reading). So Hardt's theory actually needs, in principle, an infinity of rewritable indices $*_1, *_2$, etc.

(8) When a woman$_i$ buys a blouse$_j$ we [$_\alpha$ ask that she$_i$ try it$_j$ on]
When a MAN$_k$ buys a SHIRT$_l$ we DON'T [$_\varepsilon$ ask that he$_k$ try it$_l$ on]

Hardt's account also makes heavy use of structure-less pro-VPs (again, this is difficult to square with extraction cases like (5c)) and lacks an account of correspondence readings (though one could be added). But the biggest issue with the theory is that focus is not implicated (remember, Hardt simply requires α and ε to mean the same thing). There's at least two problems with this: (i) A story about surprising sloppy readings should also have something to say about surprising covarying association-with-focus readings. (ii) Sentences like *John likes* *his mom, and Bill does too, but Sam doesn't* utterly lack a reading on which Bill likes John's mom, and Sam likes Sam's mom ('strict–sloppy') (Fiengo & May [5]). But Hardt generates that reading straightaway with the LF in (9a). Similarly, *Mary's dad thinks she's smart, and Sue does too* lacks a sloppy reading (Bos [2]). And again, Hardt over-generates with the LF in (9b).

(9) (a) John^{*,1} [likes his$_*$ mom]^2. Bill^3 does P_2 too. Sam^{*,4} doesn't P_2.
(b) Mary^{*,1}'s dad [thinks she$_*$ is smart]^2, and Sue^{*,3} does$_2$ too.

The unavailability of these readings falls out of a CONTRAST–based theory. In the first case, the strict reading of the *Bill*-clause corresponds to a proposition (viz. that Bill likes John's mom) not in the focus set associated with the sloppy reading of the *Sam*-clause—viz. $\{x \text{ likes } x\text{'s mom} : x_e\}$. So if CONTRAST is operative here, the strict–sloppy reading is predicted bad. Likewise for the second example: the proposition that Mary's dad thinks Mary is smart isn't in $\{x \text{ thinks } x \text{ is smart} : x_e\}$ (cf. also Bos [2]). So CONTRAST rules out that sloppy reading, as well.

Summing up. Schwarz's account of surprising sloppy readings incorporates focus but relies on an ad hoc variant of QR and fails to explain correspondence readings. Hardt's solution is dynamic and avoids these worries. But his reliance on semantic identity and (thus) destructive update in lieu of a focus-based theory means his account needs an infinity of rewritable indices and struggles with over-generation. Both theories have a paucity of structure at or inside ellipsis sites, making it difficult to see how extraction happens. What we need is a theory that references CONTRAST (or something like it), achieves covariation across focus alternatives despite a lack of syntactic binding, and allows "extraction out of" surprisingly sloppy items. I sketch such a theory in the next section.

2 A theory

The fragment. Following Hardt [6], I adopt a higher-order variant of Muskens' [11] Compositional DRT (CDRT). The underlying system is classical type logic with three primitive types: e, t, and s (for 'states'). DRT boxes are syntactic sugar for λ-terms encoding the usual dynamic relations on states, as follows:

Definition 3. From DRT conditions to type logic formulae:
- $R_{\tau_1 \to \ldots \to \tau_n \to t}(\alpha_{s \to \tau_1}) \ldots (\Omega_{s \to \tau_n}) \rightsquigarrow \lambda i.\, R(\alpha(i)) \ldots (\Omega(i))$
- $K \Rightarrow K' \rightsquigarrow \lambda i.\, \forall j.\, K(i)(j) \to \exists k.\, K'(j)(k)$
- $\neg K \rightsquigarrow \lambda i.\, \neg \exists j.\, K(i)(j)$
- $\alpha = \beta \rightsquigarrow \lambda i.\, \alpha(i) = \beta(i)$ or
$\alpha = \beta \rightsquigarrow \lambda i.\, (\lambda \hat{x}.\, \alpha(\hat{x})(i) = \lambda \hat{x}.\, \beta(\hat{x})(i))$, whichever's defined ('=' only defined for 2 arguments of identical types; $\hat{x}$ a possibly empty sequence of arguments).[2]

Definition 4. Box sequencing (relational composition):
- $K; K' \rightsquigarrow \lambda ij.\, \exists k.\, K(i)(k) \wedge K'(k)(j)$

Definition 5. Interpretation of boxes:
- $[\nu_1 \ldots \nu_m \mid \kappa_1, \ldots, \kappa_n] \rightsquigarrow \lambda ij.\, i[\nu_1, \ldots, \nu_m]j \wedge \kappa_1(j) \wedge \ldots \wedge \kappa_n(j)$
- $i[\nu_1, \ldots, \nu_m]j$ iff i and j differ at most in the values they assign to $1, \ldots, m$.

[2] The baroqueness here is due to variable dynamic properties (Definition 8).

Definition 6. Merging lemma (ML): if $\nu'_1, \ldots, \nu'_m$ do not occur free in $\kappa_1, \ldots, \kappa_l$:
· $[\nu_1 \ldots \nu_k \,|\, \kappa_1, \ldots, \kappa_l] \,;[\nu'_1 \ldots \nu'_m \,|\, \kappa'_1, \ldots, \kappa'_n] = [\nu_1 \ldots \nu_k \; \nu'_1 \ldots \nu'_m \,|\, \kappa_1, \ldots, \kappa_l, \kappa'_1, \ldots, \kappa'_n]$

Definition 7. Truth in CDRT:
· K is *true* at i ('$\mathsf{True}_i(K)$') iff $\exists j.\, K(i)(j)$. K is true *simpliciter* iff $\forall i \exists j.\, K(i)(j)$.

I add two pieces to Muskens' basic system (call the extension 'CDRT$^+$'). The first is the notion of a *variable dynamic property*—a box parametrized both to the usual arguments and incoming states (Hardt [6], Stone & Hardt [21]). The second is a (externally) dynamic entry for disjunction—relational union, i.e. an instance of generalized disjunction (Rooth & Partee [16]). Variable dynamic properties are an important part of the account of surprising sloppy readings. Dynamic disjunction is crucial for the account of correspondence readings (Stone [20]).

Definition 8. Variable dynamic properties:
· For any ν_n of type $s \to \tau_1 \to \ldots \to \tau_m \to s \to s \to t$, and any (possibly empty) sequence of arguments $\hat{x}$ of length m: $\nu_n(\hat{x}) = \lambda ij.\, \nu_n(i)(\hat{x})(i)(j)$

Definition 9. Box disjunction (externally dynamic):
· $K \sqcup K' \rightsquigarrow \lambda ij.\, K(i)(j) \vee K'(i)(j)$

Table 1. CDRT$^+$ fragment

Expression(s)	**Translation**	**Type**
a^n	$\lambda PQ.\, [u_n \,|\,]; P(u_n); Q(u_n)$	`(et)(et)t`
the$_n$	$\lambda PQ.\, P(u_n); Q(u_n)$	`(et)(et)t`
another^n_m	$\lambda PQ.\, [u_n \,|\, u_n \neq u_m]; P(u_n); Q(u_n)$	`(et)(et)t`
every^n	$\lambda PQ.\, [\,|\, ([u_n \,|\,]; P(u_n)) \Rightarrow Q(u_n)]$	`(et)(et)t`
John^n	$\lambda P.\, [u_n \,|\, u_n = \mathsf{john}]; P(u_n)$	`(et)t`
man	$\lambda v.\, [\,|\, \mathsf{man}(v)]$	`et`
met	$\lambda \mathcal{Q} v.\, \mathcal{Q}(\lambda v'.\, [\,|\, \mathsf{met}(v')(v)])$	`((et)t)et`
he$_n$, t_n	$\lambda P.\, P(u_n)$	`(et)t`
P_n	P_n	s`(et)`
R_n	R_n	s`(eet)`
$\mathsf{X}^{\uparrow n}$	$\lambda \hat{x}.\, [\nu_n \,|\, \nu_n = [\![\mathsf{X}]\!]]; \nu_n(\hat{x})$	$\tau_{\mathtt{t}}\tau_{\mathtt{t}}$
if, when	$\lambda pq.\, [\,|\, p \Rightarrow q]$	`ttt`
and, C$_0$	$\lambda f g \hat{x}.\, f(\hat{x}); g(\hat{x})$	$\tau_{\mathtt{t}}\tau_{\mathtt{t}}\tau_{\mathtt{t}}$
or	$\lambda f g \hat{x}.\, f(\hat{x}) \sqcup g(\hat{x})$	$\tau_{\mathtt{t}}\tau_{\mathtt{t}}\tau_{\mathtt{t}}$
want to	$\lambda P.\, \mathbf{want}(P)$	`(et)et`
doesn't	$\lambda P v.\, [\,|\, \neg P(v)]$	`(et)et`

Table 1 gives the lexicon. The notational conventions are as follows: '`e`' abbreviates '$s \to e$', and '`t`' abbreviates '$s \to s \to t$' (the type of boxes). Types associate to the right; $\tau_1\tau_2\tau_3 := \tau_1(\tau_2\tau_3)$. '$\tau$' is used both as a function into types and a variable over types; '$\tau_{\mathtt{t}}$' stands for any type ending in `t`. As before, '$\hat{x}$'

stands for a (possibly empty) sequence of arguments. Finally, subscripted terms are variable functions from states, sans serif proper names like 'john' are constant functions from states to individuals, and sans serif predicates like 'man' or 'met' are the familiar functions from individual(s) to truth values.

Much in Table 1 is as in Muskens, but there are several important add-ons (along with a couple minor embellishments like dynamic entries for *John*, *the*, and *another*). Variable dynamic properties—e.g. P_n and R_n—were discussed above. Additionally, I've defined a family of $^{\uparrow n}$ operators which type-shift constituents into dynamic binders. $^{\uparrow n}$ is essentially a polymorphic dynamicizing identity function: $[\![\mathsf{X}^{\uparrow n}]\!]$ introduces a variable dynamic property ν_n, ensures $\nu_n = [\![\mathsf{X}]\!]$, and otherwise behaves the same as $[\![\mathsf{X}]\!]$. I've also added a *generalized* entry for dynamic disjunction which disjoins any two expressions so long as they have the same type-ending-in-$\mathtt{t}$. (Rooth & Partee [16]). As for the syntax: it's implicit but straightforward (cf. Muskens [11]). For now, I assume with Muskens that object QPs needn't QR (cf. our entry for transitive verbs), although they can. (I'll come back to this when I consider extraction cases.)

(10) shows how the system treats a simple donkey anaphora case. As expected, the type logic translation is true (Definition 9) iff every man who knocked left.

(10) If a^1 man knocked, he$_1$ left.
$[\![\text{a}^1 \text{ man knocked}]\!] = [u_1 \,|\,]; [\,|\, \mathsf{man}(u_1)]; [\,|\, \mathsf{knocked}(u_1)]$
$=_{\mathsf{ML}} [u_1 \,|\, \mathsf{man}(u_1), \mathsf{knocked}(u_1)]$
$[\![\text{he}_1 \text{ left}]\!] = [\,|\, \mathsf{left}(u_1)]$
$[\![\text{if a}^1 \text{ man knocked he}_1 \text{ left}]\!] = [\,|\, [u_1 \,|\, \mathsf{man}(u_1), \mathsf{knocked}(u_1)] \Rightarrow [\,|\, \mathsf{left}(u_1)]]$
$\rightsquigarrow \lambda ij.\, i[\,]j \wedge \forall k.\, (j[u_1]k \wedge \mathsf{man}(u_1(k)) \wedge \mathsf{knocked}(u_1(k))) \rightarrow (\exists l.\, k[\,]l \wedge \mathsf{left}(u_1(l)))$

Quiet VPs. I assume with Schwarz [19] that there are two ways for an XP ε to go missing. The first ('DELETION') is the usual Roothian condition: ε has a salient antecedent α with which it's syntactically identical up to indices and F-marks. The second ('BINDING') applies when ε is a phonologically null or deaccented pro-XP (on this theory, English happens to lack non-pronominal pro-XPs).

We've seen ample reason to suppose that something like CONTRAST regulates DELETION. I haven't yet discussed whether unstressed (i.e. silent or deaccented) pro-XPs need to be licensed by CONTRAST, but it's clear they do. As noted previously, CONTRAST explains why "John likes him, and BILL does too" requires coreferential pronouns. But the *exact same facts* pertain to deaccented pro-forms (Rooth [14]). Neither "John likes him, and BILL *likes him* too" nor "Simon thinks he's smart, and CHRIS *thinks he's smart* too" has more interpretations than its elliptical counterpart. This follows if CONTRAST must relate a node dominating the unstressed pro-XP with some other node in the discourse.

So CONTRAST is relevant for both BINDING and DELETION. But it needs a dynamic reformulation: the version of CONTRAST I've been working with pulls the things it wants to compare out of their contexts of evaluation, in effect unbinding any dynamically bound variables (and CONTRAST is, in any case, defined for a system without assignments in the model). Moreover, as defined, CONTRAST(ϕ, ψ) requires *exact* semantic identity between $[\![\psi]\!]$ and some $\kappa \in \langle\!\langle \phi \rangle\!\rangle$. But boxes yield extremely fine-grained denotations; two truth-conditionally equivalent boxes K

and K' can nevertheless differ in context change potential (cf. also Hardt's [6] fn. 12). But (11) indicates that CONTRAST should care only about truth-conditional import, not context change potential. So requiring semantic identity is too strict.

Together, these facts suggest a reformulation of contrast as a compositionally integrated presuppositional operator $\sim_n$ (after Rooth's [15] $\sim$) which is sensitive only to truth conditions and which *itself* gets dynamically bound.

(11) John met a^1 man. Then BILL *met a^2 man.* / Then BILL did $[_\varepsilon$ meet a^2 man$]$.

Definition 10. Local, dynamic reformulation of CONTRAST:
$[\![\mathsf{X} \sim_n]\!] = \lambda \hat{x} i : [\exists \Gamma \in \{\delta(\hat{x}) : \delta \in \langle\!\langle \mathsf{X} \rangle\!\rangle\}.\, \mathsf{True}_i(\nu_n(\hat{x})) \rightarrow \mathsf{True}_i(\Gamma(\hat{x}))]\,.\, [\![\mathsf{X}]\!](\hat{x})(i)$

For $[\![\mathsf{X} \sim_n]\!]$ to be defined, all incoming states i must be such that $\nu_n(i)$ entails (after being fed a possibly empty sequence of arguments $\hat{x}$) some value Γ in $\langle\!\langle \mathsf{X} \rangle\!\rangle$ (after also being fed $\hat{x}$).[3,4] Assuming definedness, $[\![\mathsf{X} \sim_n]\!]$ does not differ from $[\![\mathsf{X}]\!]$. Note that $\sim_n$ *has to be* bound (free variables are prohibited in (C)DRT) and that Definition 10 leads us to expect that it may even be *donkey* bound. We'll shortly see that correspondence readings offer instances of precisely that.

Let's see how the definition works in a simple case of pronominal deaccenting, (12a). (12b) is only defined for incoming states i such that if S_2 is true at i, then some alternative in $\langle\!\langle \mathrm{S}_{\delta'} \rangle\!\rangle$ is true at i. But box sequencing (Definition 4) guarantees that the only states fed to (12b) are those output by (12c)—so they will all necessarily make u_1 a man who entered and S_2 the box $[u_1 \,|\, \mathsf{man}(u_1), \mathsf{entered}(u_1)]$.[5] Since presumably $\langle\!\langle \mathrm{S}_{\delta'} \rangle\!\rangle = \{[\,|\, P(u_1)] : P_{et}\}$ (or something equivalent), $[\,|\, \mathsf{entered}(u_1)] \in \langle\!\langle \mathrm{S}_{\delta'} \rangle\!\rangle$. And since all the states output by (12c) already assign u_1 to a man who entered, they will necessarily assign u_1 to someone who entered. So at all relevant i, it's impossible for $\mathsf{True}_i(S_2)$ to be true and $\mathsf{True}_i([\,|\, \mathsf{entered}(u_1)])$ to be false. The presupposition is met.

(12) (a) $[_{\mathrm{S}_\alpha}$ a^1 man entered$]^{\uparrow 2}$; $[_{\mathrm{S}_\delta}\, [_{\mathrm{S}_{\delta'}}$ he$_1$ SAT$_\mathrm{F}] \sim_2]$

(b) $[\![\mathrm{S}_\delta]\!] = \lambda i : [\exists \Gamma \in \langle\!\langle \mathrm{S}_{\delta'} \rangle\!\rangle.\, \mathsf{True}_i(S_2) \rightarrow \mathsf{True}_i(\Gamma)]\,.\, [\![\bar{\mathrm{S}_\delta}]\!](i)$

(c) $[\![[\text{a}^1 \text{ man entered}]^{\uparrow 2}]\!]$
$\rightsquigarrow \lambda ij.\, i[u_1, S_2]j \wedge \mathsf{man}(u_1(j)) \wedge \mathsf{entered}(u_1(j)) \wedge S_2(j) = [\![\text{a}^1 \text{ man entered}]\!]$

Basic cases. I'm now ready to give LFs for (1c) and (3). Temporarily assuming definedness, (14a) derives $[\![\mathrm{S}_{\alpha_{13\mathrm{b}}}]\!]$, and (14b) gives the meaning of $[\![\mathrm{S}_{\varepsilon_{13\mathrm{b}}}]\!]$.[6]

[3] Recall that for variable dynamic properties, $\nu_n(\hat{x}) \rightsquigarrow \lambda ij.\, \nu_n(i)(\hat{x})(i)(j)$.
[4] A simplification. Implicational bridging requires *contextual* entailment (Rooth [14]).
[5] More accurately, at any i, $S_2(i) = \lambda j.\, i[u_1, S_2]j \wedge \mathsf{man}(u_1(j)) \wedge \mathsf{entered}(u_1(j))$.
[6] Two notes: (i) I'm treating *has to* as vacuous. The reason: in DRT, drefs introduced under modals like *has to* are typically inaccessible outside the modal's box. But constant-y things (names, specific indefinites, VP-type meanings, etc.) should be accessible *no matter where they're introduced* (cf. Hardt's [6] fn. 13). It's possible to give a semantic definition of accessibility that handles our cases without outrageous meanings for traditionally externally static items (Stone & Hardt [21]), but this requires a fully intensional semantics—way beyond what I can discuss here. (ii) I'm assuming $\sim_n$ operators can't be nested; hence the pro-form inside ε is never responsible for any presuppositions beyond those due to ellipsis of ε. Though I'm not sure how defensible this is, I see no other way to make the account work.

(13) (a) $[_{\mathrm{S}_\alpha}$ the$_0$ cop who [arrested John$^1]^{\uparrow 2}$ $[[_\alpha$ INSULTED$_\mathrm{F}$ him$_1]$ $\sim_2]]^{\uparrow 4}$
$[[_{\mathrm{S}_\varepsilon}$ the$_3$ cop who arrested (BILL$^5)_\mathrm{F}$ DIDN'T$_\mathrm{F}$ $[_\varepsilon$ insult him$_5]]$ $\sim_4]$

(b) $[_{\mathrm{S}_\alpha}$ if John^1 [has to cook$^{\uparrow 3}]^{\uparrow 5}$ he$_1$ doesn't $[[_\alpha$ WANT$_\mathrm{F}$ to $P_3]$ $\sim_5]]^{\uparrow 6}$
$[[_{\mathrm{S}_\varepsilon}$ if he$_1$ has to (CLEAN$_\mathrm{F})^{\uparrow 4}$ he$_1$ doesn't $[_\varepsilon$ want to $P_4]]$ $\sim_6]$

(14) (a) $\llbracket$John^1 has-to cook$^{\uparrow 3}\rrbracket = [u_1\, P_3 \,|\, u_1 = \mathsf{john}, P_3 = \llbracket\text{cook}\rrbracket]; P_3(u_1)$
$\llbracket$he$_1$ doesn't want to $P_3\rrbracket = [\,|\, \neg P_3(u_1)]$
$\llbracket$if John$^{\uparrow 1}$ has-to cook$^{\uparrow 3}$ he$_1$ doesn't [WANT to]$_\mathrm{F}$ $P_3\rrbracket$
$= [\,|\, ([u_1\, P_3 \,|\, u_1 = \mathsf{john}, P_3 = \llbracket\text{cook}\rrbracket]; P_3(u_1)) \Rightarrow [\,|\, \neg\mathbf{want}(P_3)(u_1)]]$

(b) $\llbracket$if he$_1$ has-to (CLEAN$_\mathrm{F})^{\uparrow 4}$ he$_1$ doesn't want to $P_4\rrbracket$
$= [\,|\, ([P_4 \,|\, P_4 = \llbracket\text{clean}\rrbracket]; P_4(u_1)) \Rightarrow [\,|\, \neg\mathbf{want}(P_4)(u_1)]]$

I omit the translations to type logic formulae here, but it's relatively straightforward to check that the resulting boxes are true iff (a) if John (has to) cook, he doesn't want to cook, and (b) if he (has to) clean, he doesn't want to clean.

So the meanings are correct. Now, I show that the conditions on ellipsis are satisfied. First: every silent XP is either a bound pro-form or has an identical-up-to-indices antecedent, so each is an instance of DELETION or BINDING. Next: the presuppositions introduced by $\sim_5$ and $\sim_6$ are both met. The case of $\sim_5$ is like (12): in both, a dynamically bound pro-form contrasts with a constituent dominating the binder. Now $\langle\!\langle \alpha_{13\mathrm{b}} \rangle\!\rangle = \{f(P_3) : f_{\mathtt{(et)et}}\}$. I assume $\mathbf{has\text{-}to}(P_3) \in \langle\!\langle \alpha_{13\mathrm{b}} \rangle\!\rangle$. Since $\sim_5$ is bound by a constituent denoting $\mathbf{has\text{-}to}(\llbracket\text{cook}\rrbracket)$, and the definition of $\Rightarrow$ guarantees that in every state fed to $\mathbf{has\text{-}to}(P_3)$, P_3 evaluates to $\llbracket\text{clean}\rrbracket$, the presupposition must be satisfied. As for $\sim_6$, I assume that $\llbracket\text{cook}\rrbracket \in \langle\!\langle \text{CLEAN}_\mathrm{F} \rangle\!\rangle$, from which it follows that $\llbracket\text{cook}^{\uparrow 4}\rrbracket \in \langle\!\langle (\text{CLEAN}_\mathrm{F})^{\uparrow 4} \rangle\!\rangle$, from which it follows that $[\,|\, ([P_4 \,|\, P_4 = \llbracket\text{cook}\rrbracket]; P_4(u_1)) \Rightarrow [\,|\, \neg\mathbf{want}(P_4)(u_1)]] \in \langle\!\langle \mathrm{S}_{\varepsilon_{13\mathrm{b}}} \rangle\!\rangle$. Since (i) $\sim_6$ is bound to $\llbracket \mathrm{S}_{\alpha_{13\mathrm{b}}} \rrbracket$, (ii) sequencing entails that the u_1's free in S_ε always evaluate to john, and (iii) the two boxes in (15) have identical truth conditions, the presuppositions of $\sim_6$ must be satisfied at all possible incoming i.

(15) $[\,|\, ([u_1\, P_3 \,|\, u_1 = \mathsf{john}, P_3 = \llbracket\text{cook}\rrbracket]; P_3(u_1)) \Rightarrow [\,|\, \neg\mathbf{want}(P_3)(u_1)]]$
$[\,|\, ([P_4 \,|\, P_4 = \llbracket\text{cook}\rrbracket]; P_4(\mathsf{john})) \Rightarrow [\,|\, \neg\mathbf{want}(P_4)(\mathsf{john})]]$

Mutatis mutandis, deriving truth conditions and checking definedness for (13a) works in an exactly analogous fashion.

Extraction. (16) gives LFs generating (5c)'s sloppy reading (I've split it into two sentences). Note that I've QR'ed the object. This (standard) move is forced by the (standard) assumption that the only possible antecedents for DELETION/BINDING are XPs: since the object starts in VP, the only way to generate ACD as DELETION of or BINDING by an XP is to scope the object out of VP (Sag [17]).

(16) $[_{\mathrm{S}_\alpha}$ I [[every^{0}thing λ_2 I was $[_\alpha$ SUPPOSED$_\mathrm{F}$ to $R_3\ t_2]]$ $[\lambda_1$ bought $t_1]^{\uparrow 3}]]^{\uparrow 9}$
$[[_{\mathrm{S}_\varepsilon}$ I [[every^{8}thing λ_5 I WASN'T$_\mathrm{F}$ $[_\varepsilon$ supposed to $R_4\ t_5]]$ $[\lambda_6$ [SOLD$_\mathrm{F}$ $t_6]]^{\uparrow 4}]]\sim_9]$

Object QR is to a position under the subject, rather than to S. This is independently motivated. Merchant [10] notes NPIs can participate in ACD, e.g. "I didn't read a damn thing you asked me to". Since the NPI needs to stay in the scope of VP-negation, ACD QR must at least potentially target VP rather than S.

How are the LFs in (16) interpreted? First, we need a way to quantify into VP. I'll adopt the following flexibly-typed rule for translating syntactic λ-operators:

Definition 11. $[\![\lambda_n\, \mathsf{X}]\!] = \lambda \mathcal{Q}\hat{v}.\, \mathcal{Q}(\lambda u_n.\, [\![\mathsf{X}]\!](\hat{v}))$

In S_α, $[\![\lambda_1$ bought $t_1]\!]$ translates to $\lambda \mathcal{Q}v.\, \mathcal{Q}(\lambda u_1.\, [\,|\, \mathsf{bought}(u_1)(v)])$. The $^{\uparrow 3}$ operator shifts this to $\lambda \mathcal{Q}v.\, [R_3 \,|\, R_3 = \lambda \mathcal{Q}v.\, \mathcal{Q}(\lambda u_1.\, [\,|\, \mathsf{bought}(u_1)(v)])]; R_3(\mathcal{Q})(v)$. So since R_3 is accessible inside $\mathcal{Q}$, the R_3 subsequent to "supposed to" is bound. The same goes, *mutatis mutandis*, for S_ε. So adequate interpretations are generated. As for licensing: all silent material is either an instance of DELETION or BINDING. And $\sim_9$'s presupposition is satisfied, which the reader is invited to check.

But, wait. Doesn't CONTRAST also have to license the silent pro-form R_3? Absolutely, which brings me to a slightly uncomfortable matter: since QR targets S_α's *VP*, it's hard to see which two nodes in S_α could possibly be related by $^{\uparrow n}/\!\sim_n$: the smallest constituent in which t_2 is bound already contains the subject pronoun "I"! Note that, while troubling, this doesn't seem like an issue for my proposal *per se*: QR to VP is what's creating the difficulty here, but Merchant's NPI ACD case shows that non-sentential QR is necessary.[7]

Correspondence readings, donkey $\sim_n$ binding. Here, finally, are the LF and interpretation of (6) (following Stone's [20] informal discussion):

(17) (a) If [[John or Bill] λ_4 [Mary [meets $t_4]^{\uparrow 3}]^{\uparrow 6}$] [[SUE$_\mathrm{F}$ does P_3 (too)] $\sim_6$]

(b) $[\![$Mary [meets $t_4]^{\uparrow 3}]\!] = [P_3 \,|\, P_3 = \lambda v.[\,|\, \mathsf{meets}(u_4)(v)]]; P_3(\mathsf{mary})$

$[\![$[Mary [meets $t_4]^{\uparrow 3}]^{\uparrow 6}]\!] = [S_6 \,|\, S_6 = [\![$Mary [meets $t_4]^{\uparrow 3}]\!]]; S_6$

$[\![\lambda_4$ [Mary [meets $t_4]^{\uparrow 3}]^{\uparrow 6}]\!] = \lambda \mathcal{Q}.\, \mathcal{Q}(\lambda u_4.[S_6 \,|\, S_6 = [\![$Mary [meets $t_4]^{\uparrow 3}]\!]]; S_6)$

$[\![$John or Bill$]\!] = \lambda P.\, P(\mathsf{john}) \sqcup P(\mathsf{bill})$

$[\![$[John or Bill] λ_4 [Mary [meets $t_4]^{\uparrow 3}]^{\uparrow 6}]\!]$

$= ([S_6 \,|\, S_6 = [P_3 \,|\, P_3 = \lambda v.[\,|\, \mathsf{meets}(\mathsf{john})(v)]]; P_3(\mathsf{mary})]; S_6) \sqcup$

$([S_6 \,|\, S_6 = [P_3 \,|\, P_3 = \lambda v.[\,|\, \mathsf{meets}(\mathsf{bill})(v)]]; P_3(\mathsf{mary})]; S_6)$

So the states output by the antecedent fix P_3 either to the property of meeting John or to the property of meeting Bill (this happens in slightly convoluted fashion since the introduction of P_3 is actually tucked inside the dynamic variable S_6). This guarantees truth conditions such that if Mary meets John, Sue meets John, and if Mary meets Bill, Sue meets Bill, exactly the meaning we're after.

Lastly, I show that (17a) is defined. The interesting bit here, which I alluded to previously, is is that $\sim_6$ acts like a donkey pronoun! Specifically, the states output by (17a)'s antecedent fix S_6 to one of two boxes: either $[\![$Mary [meets John]$^{\uparrow 3}]\!]$ or $[\![$Mary [meets Bill]$^{\uparrow 3}]\!]$. Now if $[\![\mathrm{Mary}]\!] \in \langle\!\langle \mathrm{SUE_F} \rangle\!\rangle$, then $[\,|\, P_3(\mathsf{mary})] \in \langle\!\langle \mathrm{SUE_F}$ does $P_3 \rangle\!\rangle$. Since at each state i output by the antecedent, $\mathsf{True}_i(S_6) \rightarrow \mathsf{True}_i([\,|\, P_3(\mathsf{mary})])$, the presupposition is satisfied.

3 Conclusion

I've argued for a theory of cross-categorial surprising sloppy readings in which ellipsis sites may consist either in part or in whole of dynamically bound pro-forms. The account has three parts: the conditions regulating the distribution of elliptical sites and pro-XPs, a dynamicizing type-shifter $^{\uparrow n}$, and a presuppositional, dynamically bound, alternative-sensitive CONTRAST operator $\sim_n$. Dynamic binding

[7] One promising way forward is Heim's [7] *formulas*-based Roothian account of ACD. I see no reason to expect that Heim's theory couldn't be recast in to the present framework (quite the contrary), but I have to postpone a real investigation.

is a more natural option for these cases than QR, and integration with a theory of focus avoids over-generation. Extraction cases are within reach (though it is not in the end clear how ACD is licensed), while dynamic disjunction generates correspondence readings and predicts the possibility of donkey-binding $\sim_n$.

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