Extraction in CCG

1 Overview

• Slogan: A remnant of extraction is a constituent.

(1) (the man that) [\(S/\text{NP} \ S/\text{NP} \text{Anna married}\) and \(S/\text{NP} \text{Nana seduced}\)]

(2) I will \([\text{VP/\text{NP}} \text{file without reading}]\), and \([\text{VP/\text{NP}} \text{burn tomorrow}]\), every draft of your dissertation you give me.

Often “noncanonical constituents,” formed by Composition and Substitution.

• Basic prediction: A remnant of leftward preposing can be a remnant of rightward postposing

• Asymetries between leftward and rightward displacement may arise, however, due to stipulated categorial properties of left-extracta.

– Fact: Leftward extraction tends to involve grammatical accoutrements, such as interrogative morphology and syntax.

In particular, relative pronouns (unlike rightward shifted NPs) must be functions over the remnant, different for each case of extraction. This corresponds to their semantics to some degree, in contrast to the original treatment in Ades and Steedman.¹

(3) who, that, which \(\rightsquigarrow\)

a. \((N_{\text{agr}} \setminus N_{\text{agr}})/(S/\text{NP}_{\text{agr}})\) \([\text{(N\\N) who } [S/\text{NP will eat worms}]\])

b. \((N_{\text{agr}} \setminus N_{\text{agr}})/(S/\text{NP}_{\text{agr}})\) \([\text{(N\\N) which } [S/\text{NP he will eat}]\])

c. \((N_{\text{agr}} \setminus N_{\text{agr}})/((S/\text{NP})/\text{NP}_{\text{agr}})\) \([\text{(N\\N)/NP who } [S/\text{NP I fed}]\) a muffin]

d. \((N_{\text{agr}} \setminus N_{\text{agr}})/((S/\text{PP})/\text{NP}_{\text{agr}})\) \([\text{(N\\N)/PP that } [S/\text{NP I mailed}]\) to Philadelphia]

e. \((N_{\text{agr}} \setminus N_{\text{agr}})/((S/\text{VP}_{\text{TO}})/\text{NP}_{\text{agr}})\) \([\text{(N\\N)/VP}_{\text{TO}} \text{whom } [S/\text{NP I persuaded}]\) to leave]

f. \((N_{\text{agr}} \setminus N_{\text{agr}})/$$(S/$$/\text{NP}_{\text{agr}})\)

¹Pied-piping is handled by lifting the relative pronoun, so as to take the pied-piped material as an argument. “Whose” is a function from N into a function over an arbitrary NP-taking function.
• What sources could there be for constraints on extraction?

1. The string-remnant of extraction cannot form a constituent, given:
   (a) The basic principles of CCG (Respect the Slash, Inherit the Slash, etc.)
   (b) The available combinators
   (c) The ad hoc, language-specific restrictions on the domain of the combinators

2. The extracted expression has categorial properties that prevent it from being an argument of the remnant.

3. Wild card: Various pragmatic and, loosely speaking, semantic factors.

2 Extraction of subjects

• Rightward postposing of a subject is excluded by Respect the Slash.

(4) \[ S \_NP Married Manny \] \[ S/(S\_NP) Anna \]

• Leftward extraction is in general forbidden, by excluding from English the rule of Forward Crossing Composition, \( > B \times \).

(5) \* (a man whom) \[ S/S I think that \] \[ S/\NP Dexter likes \].

There are languages with \( > B \times \), but in English it cannot be permitted, even if its domain is restricted to categories that eventuate in S:

(6) \* Kant Hume \[ (S\_NP)\_NP thought that was wrong \].

• But there are grammatical subject extractions:

(7) a philosopher who Kant thought \[ S/\NP was wrong \]

To allow these, Steedman proposes to let certain S-embedding verbs take a special category, one which maps from VPs to a special category of transitive verb:

(8) think \( \sim ((S\_NP)/NP_{\_ANT,agr})/(S\_NP_{agr}) \)
• The feature $+ANT$, called $-LEX$ in the 1996 book, recalling “antecedent government” or “nonlexical,” ensures that this NP argument cannot be instantiated by an actual NP. It is assumed that all ‘lexical’ NPs are marked as $-ANT$ or $+LEX$.

Instead, this must be swallowed by a higher-order function which can digest such features—including the relative pronouns.

For example, whom has category: $(N\backslash N)/(S/\NP)$. Here the NP in $(S/\NP)$ is not specified one way or the other for ANT or LEX. So this whom can take $[s/\NP_{+ANT} \text{ Kant thought was wrong}]$ as an argument.

• Thus the following asymmetry is captured:

(9) a. $[(N\backslash N)/(S/\NP) \text{ whom}] [s/\NP_{+ANT} \text{ I think likes marmalade}].$
b. * $[s/\NP_{+ANT} \text{ I think likes marmalade}] [\NP_{-ANT} \text{ that fat bastard}].$

• Now, are these subject-extracting verbs just a figment of CCG? Well, here is some independent evidence that such subject-extracting categories exist:

(10) Exclusively subject-extracting verbs
a. (This is a tart) which I assure you to be delicious.
b. * I assure you this tart to be delicious.

(11) An exclusively subject-extracting complementizer
a. la femme que je crois qui est venue.
b. * la femme que je crois qui tu connais.
c. * la femme que je crois que tu connais.

• An aside:

There’s a few things to notice about how the subject of subject-extracting “thought” enters the derivation of: “Kant thought was wrong.”

1. If “Kant” has the usual raised type, $S/(S/\NP)$, it could not combine directly with “thought,” $((S/\NP)/\NP_{-LEX})/(S/\NP)$ by Forward Composition.

Why?

Because the domain of the subject’s category does not match the range of the verb’s category. The subject is a function over intransitive verbs, but verb is a function into transitive verbs.
2. Given this, let’s try to raise the noun phrase “Kant” into higher type—T/(T\NP), for some T—which domain is transitive verbs. If this were possible, then “Kant” could combine directly with “thought.”

Could you just set T to S\NP? No, that’s not enough, because Kant’s basic category is NP+LEX, not just NP. The +LEX is important. Setting T to S\NP will yield the type (S\NP)/((S\NP)/NP+LEX)—and the domain of this category does not match the range of the verb.

3. The only possibility, therefore, is to combine the verb with its complement first, and then compose it into the subject, now with ordinary type, S/(S\NP).

(12) [S/(S\NP)Kant] [(S\NP)/NP+ANT thought was wrong]

Notice that doing this by composition is necessary. The VP has the type of a transitive verb. So even if the subject kept its lowest possible type, NP, applying the verb to it would give the wrong interpretation. Furthermore, the first argument of the verb phrase is specified to be −LEX.

Why dwell on this point? Because this analysis entails that, while “Kant thought” can be separable constituent in “Kant thought Hume was wrong” or “Kant thought that Hume criticized,” it is not separable in “Kant thought was wrong.” And this might testable—if, as Steedman later suggests, derivational constituency has significance to prosody and information structure.
3 NP islands

• Composition must be stipulated not to reach into (at least certain) noun phrases. That is, Composition cannot operate on categories which eventuate in NP.

(13)  a. *(the president who) [S/NP I read] [NP/NP Limbaugh’s book about ]
    b. (the president who) [S/NP [S/NP I read] [NP/NP a book about ]].

• Dowty (1988:181) makes the suggestion that, if Composition is forbidden from operating on certain NPs (the “complex” ones), then we simultaneously predict other contrasts:

    b. I read a book about Nixon on Monday and (about) Reagan on Tuesday.

Why’s that?

– The extractions in (13) require that “I read a/Limbaugh’s book about ” be analyzable as a single constituent. Hence they require that “read” or “I read” be able to compose with the partial NP.

– So for (14) to be parallel to (13) it must be that the derivations for in (14) have “(I) read a/Limbaugh’s book (about)” as a single constituent.

That means, it cannot be that the sentences in (14) have anything like the following derivational constituency, which could be completed without composition operating over categories which eventuate in NP.

[VP/NP read ] [VP\(\text{VP/NP}\) a book about Reagan on Monday an Nixon on Tuesday ]

– Now, “on Monday” has to end up modifying “read.”

So the only way to get “Reagan on Monday” to be a constituent (hence, to be coordinate), is to raise the NP “Reagan” to a function that will yield a VP. That will allow “Reagan” and “on Monday” to compose:

<table>
<thead>
<tr>
<th>Reagan</th>
<th>on Monday</th>
</tr>
</thead>
<tbody>
<tr>
<td>NP</td>
<td>VP/VP</td>
</tr>
<tr>
<td>VP/(\text{VP/NP})</td>
<td>VP/VP</td>
</tr>
<tr>
<td>VP/(\text{VP/NP})</td>
<td></td>
</tr>
</tbody>
</table>
Given this result (viz. “Reagan on Monday” is a function over transitive verb-types) what can we do next?

Obviously we cannot combine it directly with “about,” which maps from NPs to N modifiers! Nor can we combine it directly with “a book about,” a function from NPs to NPs.

The following derivation (or a number of equivalent ones) is the only one that’s obvious to me.

<table>
<thead>
<tr>
<th></th>
<th>read</th>
<th>a</th>
<th>book</th>
<th>about</th>
<th>Reagan on Monday</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>VP/NP</td>
<td>NP/N</td>
<td>N</td>
<td>(N\N)/NP</td>
<td>VP(VP/NP)</td>
</tr>
<tr>
<td>1</td>
<td>VP/NP</td>
<td>NP/N</td>
<td>N/(N\N)</td>
<td>(N\N)/NP</td>
<td>VP(VP/NP)</td>
</tr>
<tr>
<td>2</td>
<td>VP/NP</td>
<td>(N\N)</td>
<td>(N\N)/NP</td>
<td>VP(VP/NP)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>VP/NP</td>
<td>NP/NP</td>
<td>VP(VP/NP)</td>
<td></td>
<td>&gt; B</td>
</tr>
<tr>
<td>4</td>
<td>VP/NP</td>
<td></td>
<td>VP(VP/NP)</td>
<td></td>
<td>&lt; (FA)</td>
</tr>
<tr>
<td>5</td>
<td>VP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

And notice what happens in step 3: Composition over a category into NP. This is what (13) shows is OK with indefinites, but bad with “complex NPs.” And that is why Dowty says what he says.

Exercise: Compare what Howard says.

4 Adjunct islands

• It might seem like adjuncts are generally islands:

  (15) * a book which I will walk without reading.

• But then again:

  (16) a book you cannot visit Australia without reading

• Steedman consequently assumes that any such Island effects are, so to speak, ‘semantic.’ The residue has to some describe a ‘natural’ property.
• In other words, Adjunct Islands don’t exist, not as real *syntactic* islands.

5 Rightward Shift and $< B \times$

5.1 Basic cases

• Recall from last week that Backwards Crossed Composition is used to derive rightward shift of arguments over a later argument of the same verb, or over an adjunct:

(17) I will $[\text{VP}/\text{NP} [\text{VP}/\text{NP} \text{read}]] [\text{VP}/\text{VP} \text{today}]],$ and $[\text{VP}/\text{NP} \text{destroy tomorrow}],$ every article Steedman has ever written.

• However, we cannot allow $< B \times$ to combine any old categories. For instance, we cannot allow it to apply to nominal stuff:

(18) a. a curious engraving by Rembrandt
b. * a $[\text{N}/\text{N} \text{curious}] [\text{N}/\text{N} \text{by Rembrandt}] [\text{N} \text{engraving}].$

Thus Steedman restricts its application to only categories that eventuate in S:

(19) $Y/Z : g \ X/Y : f \Rightarrow_B \ X/Z : \lambda x f(gx)$
where $X = Y = S$

• Further restrictions are necessary. Recall from Dowty 1988:

(20) I will give this very heavy policeman a flower.
I will $[(\text{VP}/\text{NP})/\text{NP} \text{give}] [(\text{VP}/\text{NP})/(\text{VP}/\text{NP})/\text{NP} \text{this policeman}] [\text{VP}/(\text{VP}/\text{NP}) \text{a flower}].$

Given these type assignments, we could combine “give” directly with “a flower” by $< B \times,$ yielding a category $\text{VP}/\text{NP}$ for “give a flower.”

(21) $$(\text{VP}/\text{NP})/\text{NP} \text{ VP)/(VP}/\text{NP}) \Rightarrow_{< B \times} \text{ VP}/\text{NP}$$

But this would allow rightward shift of “this very heavy policeman” over “a flower,” incorrectly:

(22) * I will give a flower this very heavy policeman.
It would also allow ungrammatical shifts of the object of a preposition over an adjunct:

(23) * I will \([\text{VP/NP give a flower to}] [\text{VP/VP this afternoon}]\) any brutal fascist I see on the street.

• In response Steedman restricts \(< B \times \) thus:

1. Double object verbs have a feature \(-SHIFT\) imposed on their first argument. So do prepositions.

   (24) a. \(\text{give} \rightsquigarrow (\text{VP/NP})/\text{NP}_{-\text{shift}}\)
   
   b. \(\text{to} \rightsquigarrow \text{PP/NP}_{-\text{shift}}\)

2. The application of \(< B \times \) is restricted as follows:

   (25) Backward crossed composition 1
   \[\frac{Y/Z_{+\text{shift}} \text{X} \backslash Y}{\Rightarrow_B \text{X} / Z_{+\text{shift}}} \quad \text{X, Y} = S\$

   As a consequence, \(< B \times \) cannot combine “give” with type-raised second-object, or combine a VP adjunct with “give a flower to.” For that matter, neither can \(< B_2 \times \) combine “give” with “today,” abstracting over both its arguments to deliver:

   (26) * I gave today a policeman a flower.

• This restriction on \(< B \times \) is too strong, however, since leftward extraction is possible, both for prepositional objects and for the first object of “give”:

   (27) a. a fascist who I gave a flower to
   
   b. a heavy policeman who I gave a flower

   Thus Steedman introduces a second instance of \(< B \times \), where the NP abstracted over must be specified not only as \(+SHIFT\) but, crucially, as \(+ANT\ (= -LEX)\).

   (28) Backward crossed composition \#2
   \[\frac{Y/Z_{-\text{shift},+\text{ANT}} \text{X} \backslash Y}{\Rightarrow_B \text{X} / Z_{-\text{shift},+\text{ANT}}} \quad \text{where X, Y} = S\$

8
In short, \(< B \times 2\) allows leftward extraction, while \(< B \times 1\) forbids rightwards extraction.

- Unfortunately, we will now also have to add a second category for each preposition, (29a), one that permits (only) leftward extraction of prepositional objects, (29b).

(29)  
a. \(to^2: PP/NP_{+SHIFT,-LEX}\)
b. the island [(N\N) that [S/NP\LEX Austin traveled to\(^2\) with Dr. Evil]]
c. *Austin [VP/NP\LEX [VP/NP\LEX traveled to\(^2\)] [VP\VP with Dr. Evil]] [NP\LEX the Isle of Man]

(30)  
a. \(to^1: PP/NP_{-SHIFT}\)
b. * Austin [VP/PP traveled] [PP/NP\SHIFT to\(^1\)] with Dr. Evil the Isle of Man

As Steedman observes in a footnote: all else equal, it should be possible for a language to lack one or the other of these lexical categories for their prepositions. A language that lacked the second one would not allow any extraction from PP (sound familiar?).

- This captures this paradigm:

(31)  
a. Austin traveled to, and Dr. Evil returned from, the Isle of Man.
   (Derivation does not involve \(< B \times\), so no problem with SHIFT feature)
b. * Austin traveled to with Dr. Evil the Isle of Man.
   (Derivation involves \(< B \times\), instance 1, forbidding rightward extr)
c. This is an island you traveled to with Austin.
   (Derivation involves \(< B \times\), instance 2, permitting leftward extr)

- Unlike the first object in a double object VP, the first object in a to-dative can be rightward shifted. Consequently, it must be that the to-PP type-raises, and combines with the verb by \(< B \times\). And this means that the first argument of to-dative verb is not marked \(−SHIFT\).

(32)  
I will send to London a letter cursing the Queen.
   \([\(VP/PP\)/NP send] [VP\(\backslash(VP/PP)\) to London] \Rightarrow_{<B\times} VP/NP\)

Neither is the to-PP itself marked \(−SHIFT\):

(33)  
I plan to send a letter today to every member of the United Nations.
And consequently to-dative verbs allow double shift:

(34) I plan to send today a furious letter of condemnation to every member of the U.N.

- Any rightward extraction out of the to-PP ought to be blocked by assuming that the preposition marks its object as $-SHIFT$:

(35) a. I will give a delicious tart to this beautiful woman.
    b. * I will give a delicious tart to tomorrow this beautiful woman.

(36) a. I will give to this beautiful woman a delicious tart.
    b. * I will give to a delicious tart this beautiful woman.

- But there is actually something much deeper going on in (36b), which will block any rightward or leftward movement out of the shifted-over PP.

(37) Rightward extraction out of shifted-over PP
    a. I will give to this beautiful woman a delicious tart.
    b. * I will give to a delicious tart this beautiful woman.  (NPS:O+NPS:PO)

(38) Leftward extraction out of shifted-over PP
    a. A beautiful woman whom I will give a delicious tart to.  (Relz:PO)
    b. * A beautiful woman whom I will give to a delicious tart.  (NPS:O+Relz:PO)

What’s going on? – There’s no way to combine give to that gets things right.

(39) $\langle \text{VP/PP} \rangle / \text{NP} \ \text{give} \ \text{PP/NP} \ \text{to} \ \text{NP} \ \text{a delicious tart} \rangle$

Here are the options:

1. This straight derivation will give the wrong meaning, with the tart as recipient.

<table>
<thead>
<tr>
<th></th>
<th>[VP/PP $\to$]/NP give</th>
<th>[PP $\to$]/NP to</th>
<th>[NP a delicious tart]</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td>FA</td>
</tr>
<tr>
<td>1</td>
<td>[VP/PP $\to$]/NP give</td>
<td></td>
<td>[NP a delicious tart]</td>
<td>TR</td>
</tr>
<tr>
<td>2</td>
<td>[VP/PP $\to$]/NP give</td>
<td>[PP $\to$] to a delicious tart</td>
<td></td>
<td>$&lt; B \times$</td>
</tr>
<tr>
<td>3</td>
<td>[VP/NP] give to a delicious tart</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. The combinator, call it $\chi C$ that would deliver the desired result by combining the lexical types of *give* and *to* does not exist in our arsenal:

$$
(VP/PP_{TO})/NP : \lambda y\lambda \pi \lambda x.give(x, y, \pi)
$$

$$
+\chi C
$$

$$
PP_{TO}/NP : \lambda z.to(z)
$$

$$
= VP/NP^{po}/NP^{po} : \lambda y\lambda z\lambda x.give(x, y, to(z))
$$

What $\chi C$ does, in effect, is compose *give* over its second argument.

3. There is no category to which we could type-raise the preposition in order to get the effect of $\chi C$ by otherwise available means. For example, this won’t work:

\[
\begin{array}{c|c|c}
& 0 & 1 \\
\hline
[(VP/PP_{TO})/NP^{po} give] & [(PP_{TO}/NP^{po} to)] & TR \\
[(VP/PP_{TO})/NP^{po} give] & [VP/(VP/[PP_{TO}/NP^{po}]) to] & ????
\end{array}
\]

- Steedman notes in a footnote that all this rules out a SC analysis of ECM verbs, since they permit HNPS of the ‘subject’: “I would consider an idiot anybody who voted for Bush in 2004.” If “an idiot” had its ‘subject’ as an argument, the shift would violate the principle “Inherit the Slash!”

6 Parasitic gaps

- The standard parasitic gaps are derived by combining verb and adjunct under $< S \times$.

(40) $[VP/NP [VP/NP slaughter] [(VP\backslash VP)/NP without pausing to humiliate]]$

- Often parasitism on a subject gap is bad:

(41) a. I met an artist who paints pictures of *(himself)

b. We found just one guy who remembered Bundy talking to *(him).

It’s been suggested that this is because the main gap can’t c-command the parasite.
• Steedman observes that at least these first examples, (41), are ruled out by “Inherit the Slash!”

  – The subject-gap is a leftward argument, while the parasitic gap is a rightward argument. So the two arguments could not possibly be identified, by any CCG-approved rule of combination.

    \[ ([S\langle NP^s\rangle/\langle NP^o \rangle] \text{ paints}] \quad [\langle NP/\langle NP \rangle \text{ pictures of}]) \]

This is a rather elegant account of at least these data.

• The analysis ties in interestingly with Steedman’s theory of subject-extraction as being mediated by the embedding verb.

  (42) \( \text{think} \leadsto (VP/\langle NP_{+\text{ANT,agr}} \rangle)/(S\langle NP_{agr} \rangle) \)

The verb has the semantic subject of the embedded clause as a rightward argument. Consequently this argument can unify with other rightward arguments. So in principle, a subject-gap could license lower parasites when they are extracted over an embedding verb.

Engdahl has claimed that exactly such configurations are, in fact, good:

  (43) a. “the Caesar whom Brutus will imply was no good while ostensibly praising.”
      b. ? He’s one of those artists who critics will privately think is no good while publicly praising.

If this data is accepted, it offers what Steedman calls “evidence” for the assumption that subject-extracting verbs have the extractum as rightward argument. Since this argument is \(-\text{LEX}\), and therefore cannot be instantiated by an overt NP, we could not possibly ‘eyewitness’ its directionality directly. We can only infer it indirectly, through the interaction of the verb’s category with the rules of the grammar.

• Steedman cites Koster as saying that the subject-dependent parasitic gaps are much worse than other cases violating the proposed anti-c-command condition. I can’t come up with any very clear examples.

  (44) a. ? a painting I mailed ___ back to the painter of ___.
      b. ? He’s the professor who I persuaded ___ that his students secretly love ___.
      c. * That’s the artist who I persuaded ___ to paint portraits of ___.

• Famously (in this department), there are also parasitic within subjects that are illicit in the absence of a later gap:
(45)  a. Matt is one of those guys who every person who interviews __ immediately hires __.
   b. * Matt is one of those guys who everyone who interviews __ gets the heebie-jeebies.
   c. Matt is one of those guys who everyone who interviews him gets the heebie-jeebies.

**Here’s how we derive the grammatical case:**

<table>
<thead>
<tr>
<th></th>
<th>every person</th>
<th>who interviews</th>
<th>immediately hires</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>NP/N</td>
<td>N</td>
<td>(N\N)/(S\NP)</td>
</tr>
<tr>
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<td>NP/N</td>
<td>N/(N\N)</td>
<td>(N\N)/(S\NP)</td>
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<td>NP/(N\N)</td>
<td>(N\N)/(S\NP)</td>
<td>(S\NP)/NP</td>
</tr>
<tr>
<td>3</td>
<td>NP/(S\NP)</td>
<td>(S\NP)/NP</td>
<td>(S\NP)/NP</td>
</tr>
<tr>
<td>4</td>
<td>NP/NP</td>
<td>(S\NP)/NP</td>
<td>&lt; S×</td>
</tr>
<tr>
<td>5</td>
<td>S/NP</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Question:** what prevents $< B×$ from licensing the ungrammatical case?

<table>
<thead>
<tr>
<th>every person who interviews</th>
<th>gets the heebie-jeebies</th>
</tr>
</thead>
<tbody>
<tr>
<td>NP/NP</td>
<td>S\NP</td>
</tr>
<tr>
<td>S/NP</td>
<td></td>
</tr>
</tbody>
</table>

Answer: The stipulation that $< B×$ has in its domain only categories that eventuate in $S!!$

**Interestingly, the same analysis allows rightward extraction in the parasitic case, but forbids it in the nonparasitic case.**

(46)  a. Everyone who interviews hires, but everyone who marries detests, a person who’s always certain he’s right.
   b. * Everyone who interviews hires someone else, but everyone who marries loves their life, a person who’s never certain he’s right.
• We expect that Substitution can unify an /NP-gap within a subject and an extracted subject gap in the VP—because extracted subjects are /NP-arguments of the extracting verb:

\[(47) \text{a lad whom } [\text{NP/NP every woman who meets } ___] [\text{(S/NP)/NP}_{\text{LEX}} \text{ thinks } ___ \text{ is a cad}].\]

Compare:

\[(48) \text{a lad whom } [\text{NP/NP}_{\text{LEX}} \text{ every woman who thinks } ___ \text{ hates her}] [\text{(S/NP)/NP secretly admires } ___].\]

• We also expect that licit subject-parasites, such as (48), are not acceptable gaps for rightward movement of an overt NP, because they bear the $-\text{LEX}$ feature.

\[(49) * \text{ Every woman who meets thinks is a cad, and every person who smells realizes is disgusting, that geezer from the Department of Informatics.}\]

• Extraction does not always save the parasitic dependency on a subject. For example:

\[(50) \text{a. Every woman thinks that } \boxed{\text{Nigel}} \text{ imagines she loves } \boxed{\text{him}}.\]

\[\text{b. } * (\text{a lad}) \text{ whom every woman } [\text{(VP/NP}_{\text{LEX}})/(S/NP) \text{ thinks } ___] [\text{(S/NP)/NP imagines that she loves } ___].\]

This is predicted, since if you look at the types here, Substitution cannot apply. (Seems to me, this has to do with the fact that the one gap is in the complement of the functor carrying the other gap. But Steedman describes things differently.)

• Challenge

If the following judgments are solid (and if, furthermore, the express syntactic violations), then I don’t see how to explain them with CCG, since the types look right.

\[(51) \text{a. Tomorrow I will shred without reading any subpoenas you serve me.}\]

\[\text{b. } ?? \text{ I will } [\text{VP/NP } [\text{VP/NP shred without reading}] [\text{VP/VP tomorrow}]] \text{ any subpoenas you serve me.}\]

\[\text{c. } * \text{ I will } [\text{VP/NP } [\text{VP/NP shred}] [\text{VP/VP tomorrow}]] [\text{(VP/VP)/NP without reading}]] \text{ any subpoenas you serve me.}\]

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\[2\text{ Notice, for this to work, it must be that verbs do not generally specify their arguments as having one or the other value for } LEX. \text{ Because if the category of “meets” were VP/NP}_{+LEX}, \text{ it would presumably be impossible for Substitution to identify this argument with } -LEX \text{ argument of the main gap.}\]