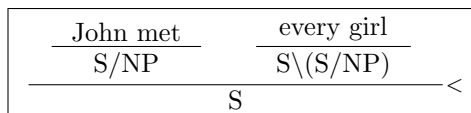


Island Effects in Categorical Grammar

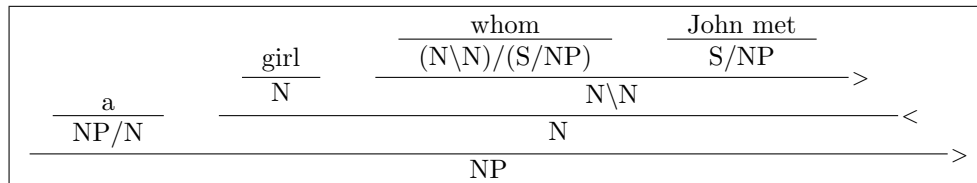
By looking over this stuff you should come away with a basic understanding of the *kinds of ways* we can fine-tune this grammar formalism to rule out ungrammatical sentences. It's not important to remember exactly which restrictions get placed on which rules to account for which ungrammatical sentences, but you should understand the kinds of restrictions we can use in categorial grammar¹ to enforce constraints on “how far holes can be carried”.

- We've seen various cases where certain words “look for things with holes in them”.

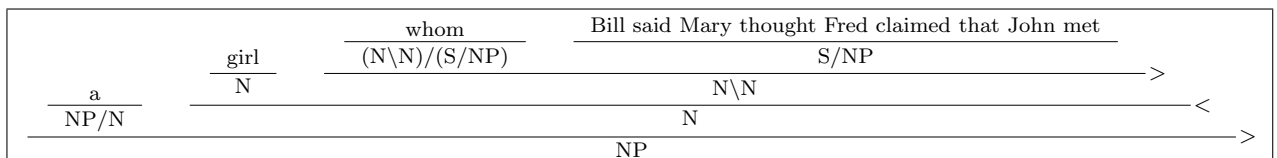
1. The first was **quantificational sentences** like ‘John met every girl’. The phrase ‘every girl’ needs to combine with something of type S/NP, or “an S with an NP-shaped hole in it”. So we did some slightly fancy tricks (type-raising then function composition) to get ‘John met’ into a phrase with this type.



2. Then we saw **relative pronouns**, words like ‘who’, ‘whom’ and ‘which’, which also look to combine with an S which has an NP-shaped hole in it. (See Steedman 1996, chapter 3, page 49.) In the following example I've put the relative clause ‘whom John met’ together with ‘a’ and ‘girl’ to give a bit of context, but the important part for our purposes here is just the way ‘whom’ combines with ‘John met’.



3. And **questions** are another case where something needs to combine with something of type S/NP or S\NP, signifying a property (at least, in English; see the last question of homework 2).
- Sometimes the S/NP or S\NP that we need to construct gets very large, meaning that there are a lot of steps which “hold open” the NP slot. In the following example, the hole indicated by the /NP has been carried all the way up from ‘met’.



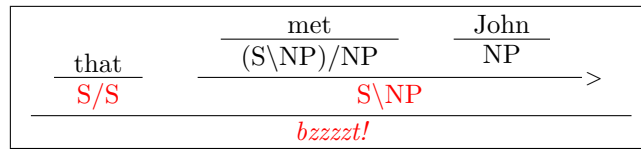
¹More precisely, what we're dealing with here is a specific type of categorial grammar (CG) called Combinatory Categorical Grammar (CCG). All the earlier stuff we've covered was generic enough to be in line with *any* CG, not just CCG, although the books I've been using are in fact CCG books.

Extraction of subjects

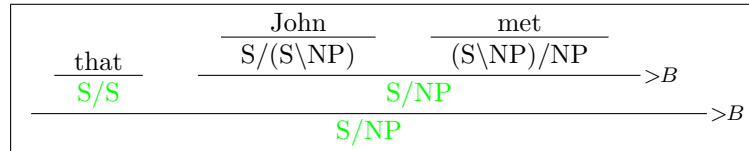
- Carrying the hole a long way, however, sometimes seems to create strange problems. The NP in (1) which we just sketched the derivation of above is fine, but if we change it very slightly into (2), it sounds bad²:

- (1) a girl whom Bill said Mary thought Fred claimed that John met
 (2) * a girl whom Bill said Mary thought Fred claimed that met John

- The basic strategy for ruling out bad sentences like (2) is to ensure that, it *won't be possible* to “carry the hole” all the way up from ‘met’ to a point where we have got ‘Bill said Mary thought Fred claimed that met John’ into an S/NP. Happily, the system we already have correctly blocks this quite elegantly, since the derivation gets stuck at this point:



These two categories, S/S and S\NP, cannot be fit together. In the derivation of the good sentence, (1), this problem does not arise, and we can continue all the way up to get ‘Bill said Mary thought Fred claimed that John met’ into an S/NP:



- We could, if we wanted (i.e. if we were studying some language where the equivalent of (2) was grammatical) propose a grammar which includes a rule for composing S/S with S\NP. Specifically, the relevant rule would be forwards crossing composition ($\rightarrow_{B\times}$); see Steedman 1996, chapter 3, page 53, and chapter 2, pages 42–44. But since (2) is bad in English, we do *not* want to include this rule in our grammar of English.³
- The four versions of the composition rule that Steedman gives on page 43 (in chapter 2) are the ones which languages “choose from”. English uses (106a), (106b) and (106d), but not (106c). Other languages will make different choices, resulting in different word orders.

Extraction from adjuncts

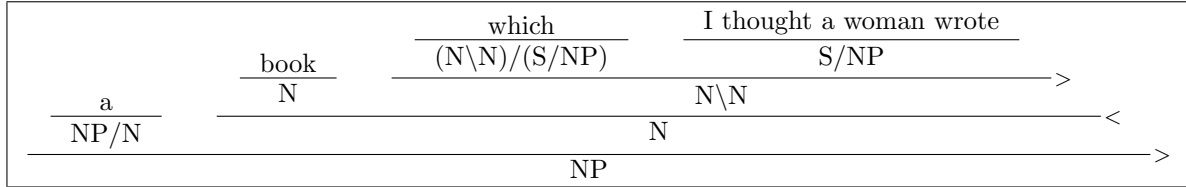
- Other examples where we seem to be limited in where we can carry holes look like (4). The sentence in (3) is here just for comparison, although they don’t make a nice minimal pair like (1) and (2) do.

²Observant readers will have noticed that if we leave out the ‘that’, then both of these sentences are fine. The presence of ‘that’ makes no difference to the story we tell here about these two sentences; in other words, the predictions of the theory as we have it are that you should be able to extract objects but unable to extract subjects, period. If you’re curious about how Steedman goes about allowing extraction of subjects when ‘that’ is not there, see section 3.4.3, pages 57–60. But be warned, it ain’t pretty.

³But recall that we have seen that English does seem to make use of the *backwards* crossing composition rule, at least sometimes; eg. for composing ‘saw yesterday’ in the last question of homework 1.

- (3) a book which I thought a woman wrote
- (4) * a book which I met a woman who wrote

- In order to derive (4) as an NP, we *would* need to get ‘I met a woman who wrote’ into an S/NP, in just the same way as we get ‘I thought a woman wrote’ into an S/NP in the derivation of (3).

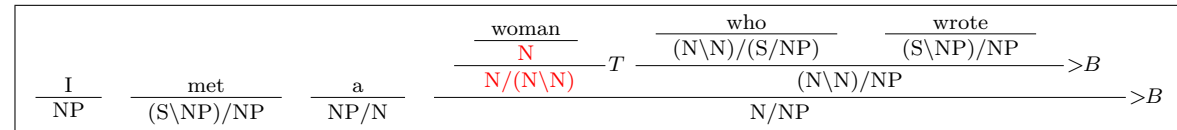


So for our theory to correctly say that (4) is ungrammatical, it must *not* be possible to get ‘I met a woman who wrote’ into an S/NP. Let’s see where we get to:



The relative pronoun ‘who’ eventually wants to make up a $N\backslash N$, something that will modify a noun on its left, and the noun that is meant to be modified by it is of course ‘woman’. But we haven’t got to a $N\backslash N$, so these words won’t fit together, and thus our theory correctly says that (4) is bad. Great, right?

- Wrong. Our theory at the moment *does* have a way to get these words to fit together: we can type-raise ‘woman’ and apply function composition again, as shown below, and from that point on the whole thing can be derived. This is a bad thing! We do *not* want our theory to let us do this, because (4) is in fact bad, so we do not want to be able to fit these words together. So we want the step shown in red to be disallowed.



- So it seems we need to introduce a restriction on our type-raising rule. Specifically, what we do is prevent type-raising from applying to turn something of category X into something of category $X/(X\backslash X)$. This leaves available all the applications of type-raising that we have found to be so useful, such as raising an NP into an $S/(S\backslash NP)$. For more on this, and an example where raising a VP into a $VP/(VP\backslash VP)$ causes problems analogous to those caused here by raising an N into an $N/(N\backslash N)$, see Steedman 1996, chapter 3, page 65.