

# Hypothetical Reasoning and Association with Focus

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# A gesture towards the gist

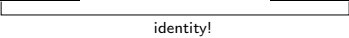
- Adopting a particular perspective on ellipsis pushes us toward
- Transformational analyses of linguistic phenomena, but in addition to ‘movement’, we need
- Hypothetical reasoning, which is, derivationally speaking, the ‘mirror image’ of movement.
- Can hypothetical reasoning be linked up with some linguistic phenomenon, or is it just a technical tool?
- Here we explore the possibility that

Hypothetical reasoning. . .

. . . is association with focus

- The **discharge** operation gives us a *one pass* way to form *Topic-Comment* structures.
- These we can use to provide an account of focus-sensitive operators, basically reconstructing the LF-movement account (of the structured meaning approach to focus), but
- By imposing island constraints, we are able to achieve a homogeneous theory of focus (i.e. of both association with focus and alternative-set computation), that allows us to account for some 'Island-like' effects[Drubig, 1994]

- 1 Motivation : Ellipsis
- 2 Hypothetical Reasoning
- 3 Association with Focus

- Deletion is a natural way of describing ellipsis.
  - John can eat spicy food, but Mary can't ~~eat spicy food~~.  


identity!
- It is often straightforward to add an operation of deletion to linguistic grammar formalisms.

$$\text{SPELLOUT}(\text{delete}(t)) = \epsilon$$

- We see that we must constrain the application of deletion, so as to rule out 2.
  - 1 John loves Mary and Bill does ~~love Mary~~ too.
  - 2 \*John loves Mary and Bill does ~~enjoy drinking Kölsch~~ too.
- This has its traditional formulation as “deletion up to recoverability.” More precise explications of this intuition recast ‘recoverability’ in terms of the existence of an appropriate antecedent:

## Deletion up to recoverability

A structure  $t$  in a derivation  $D$  may be deleted only if there is a  $t'$  in  $D$  such that

- 1  $t'$  is not deleted
  - 2  $t$  and  $t'$  are identical
- There are at least three natural notions of identity
    - A] Derivational identity:  $t = t'$
    - B] Derived tree identity:  $eval(t) = eval(t')$
    - C] Semantic identity:  $\llbracket eval(t) \rrbracket = \llbracket eval(t') \rrbracket$  or  $\llbracket t \rrbracket = \llbracket t' \rrbracket$

Interpretation at LF

Direct Interpretation

- This is arguably the most natural...
  - ① the derivation is the structure computed by the parser, and by the generator
  - ② items in a chart are derivational constituents...
  - ③ to compute the meaning/surface structure of an expression, we need first its derivation

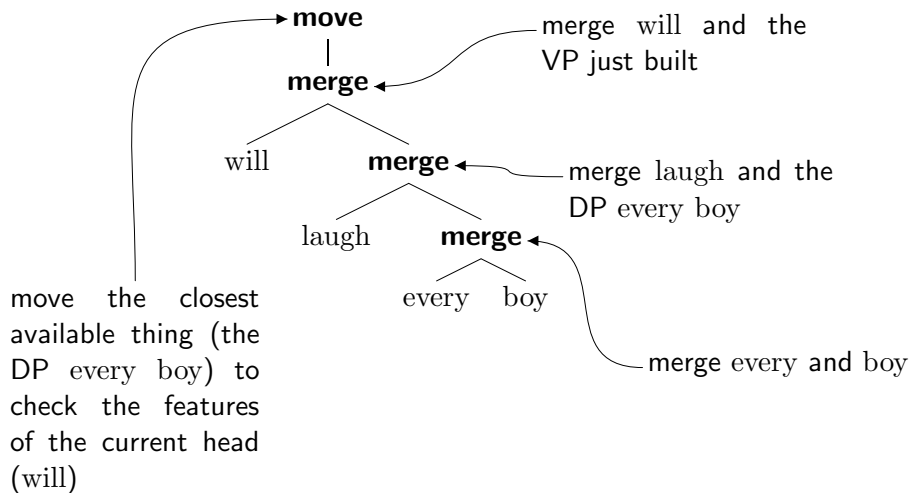
# Representing derivations

- A derivation can be thought of as licensing a sound-meaning pair by showing how it is built up from the primitives of the grammar. Given the obvious lexical items (as ‘axioms’), we ‘prove’ the existence of the sentence *every boy will laugh* as follows:
  - ① [<sub>DP</sub> every [<sub>NP</sub> boy ]] (merge of *every* and *boy*)
  - ② [<sub>VP</sub> laugh [<sub>DP</sub> every boy ]] (merge of *laugh* and *every boy*)
  - ③ [<sub>IP</sub> will [<sub>VP</sub> laugh [<sub>DP</sub> every boy ]]] (merge of *will* and the VP in 2)
  - ④ [<sub>IP</sub>[<sub>DP</sub> every boy ]][<sub>I'</sub> will [<sub>VP</sub> laugh *t*]] (move of *every boy*)
- It can be difficult to reason about ‘processes’. However, once we realize that derivations like the above can be viewed as *trees*, we can switch between the static ‘tree’ perspective and the dynamic ‘process’ perspective as it becomes convenient:

**move(merge(will, merge(laugh, merge(every, boy))))**



# Representing derivations



# Representing derivations

- The set of *possible derivations* will be called  $T_\Sigma$ , which we define as follows:

- 1 each lexical item is a possible derivation (of itself)
- 2 given derivations  $t$  and  $t'$ , their merger is a possible derivation:  
**merge**( $t, t'$ ), or, as a tree

**merge**



- 3 given a derivation  $t$ , applying the operation **move** to  $t$  is a possible derivation: **move**( $t$ ), or, as a tree

**move**



## Theorem:

The set of convergent derivations  $Conv \subseteq T_\Sigma$  in a minimalist grammar is definable in  $FOL(DTC^1)$ .

# Implementing Deletion Under Identity

- We can ask what happens once we enrich our stock of operations to include deletion, by adding the following case to our definition of possible derivations:
  - given a derivation  $t$ , applying the operation `delete` to  $t$  is a possible derivation: **delete**( $t$ ), or, as a tree

**delete**  
|  
 $t$

- If, in a derivation  $d \in T_{\Sigma}$ , there is a subpart **delete**( $t$ ), then
  - 1 there must be another occurrence of  $t$  in  $d$ ,
  - 2 which is not deleted (there is no node labelled 'delete' on the path from the root of  $t$  to the root of  $d$ )

## Theorem:

The set of convergent derivations  $Conv \subseteq T_{\Sigma}$  in a minimalist grammar *with deletion under identity* is definable in  $FOL(DTC^2)$ .

# Derivational Identity versus Ellipsis

Some well-known ‘identity mis-matches’ in ellipsis [Hardt, 1993]:

## Agentive nominals and Vs

“Harry used to be a great **speaker**, but he can’t ~~spea~~k anymore, because he’s lost his voice.”

## Gerunds and VPs

“The candidate was dogged by charges of **avoiding the draft**, or at least trying to ~~avoid the draft~~”

## Passives and actives

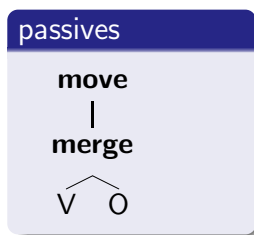
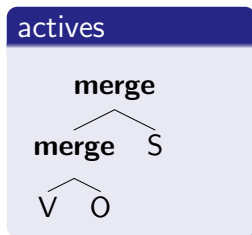
“**This information** could have been **released** by Gorbachev, but he chose not to ~~release this information~~.”

# Derivational Identity versus Ellipsis

- Assuming that identity is derivational (the *Derivational Identity Hypothesis*, or DIH for short), we interpret 'mis-matches' as *constraints* on possible theories of grammar.
- For example,
  - ① Given that agentive nominals can antecede verbs, the DIH rules out any theory of syntax which doesn't allow us to derive agentive nominals from verbs
  - ② Given that gerunds can antecede VPs, the DIH rules out any theory of syntax in which gerunds are not built from Verb-Object complexes
  - ③ Given that passives can antecede active VPs, the DIH rules out any theory of syntax in which passive is lexical
- What we have to do is find a theory of grammar that satisfies all of the constraints imposed by the DIH interpretation of the ellipsis facts!

# The structure of VP – Conflicting requirements

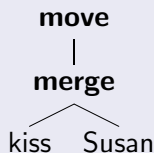
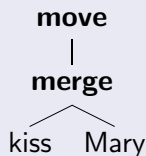
- Because passives may antecede actives, these structures must be derived along something like the following lines:



# The structure of VP – Conflicting requirements

- But what about passive – passive ellipsis?

Mary was kissed, and Susan was too




- This *is* VP ellipsis:
  - 1 Mary was kissed passionately, and Susan was too
  - 2 Mary seems to have been kissed, and Susan does too

- 1 Motivation : Ellipsis
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# Hypothetical Reasoning

- We saw that the object *can* count for identity, but doesn't have to.
- Under the DIH, this means that in a passive sentence, the object can be merged either in its 'base' position, or in its 'surface' position.
- This means that we need to have another way of satisfying syntactic dependencies, one which allows dependencies to be temporarily satisfied, even if there is nothing there to satisfy them.
- The basic idea will be to incorporate both transformations, as well as hypothetical reasoning into a single formalism.
- Then we can establish dependencies either by using transformations:
  - 1 [VP seems Mary to smile ]
  - 2 [S Mary [VP seems Mary to smile ] ]
- Or by means of hypothesis introduction and discharge:
  - 1 [VP/NP seems  $\tau_{NP}$  to smile ]
  - 2 [S Mary [VP seems to smile ] ]

# Hypothetical reasoning

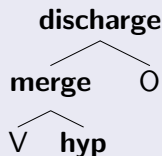
## Syntax as Economics (a mercantile metaphor)

- **merge** is putting money in the bank
  - **move** is withdrawing money to pay for something
  - **hyp** is getting a loan: you get something for free, but you have to pay it back later
  - **discharge** is how to pay back loans
- Now, as desired, we have two possible derivations for passives

one where the object  
counts for identity



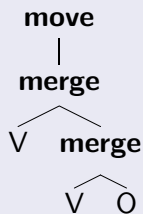
and one where it  
doesn't



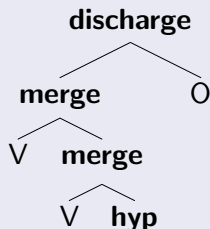
# Hypothetical reasoning

- In raising contexts, it looks like this:

one where the object  
counts for identity



and one where it  
doesn't



- I introduced the Derivational Identity Hypothesis (DIH) as a principled way of thinking about identity in ellipsis.
- We saw that identity mismatches are actually a powerful tool, acting as constraints on syntactic theories.
- We saw that the ellipsis data put seemingly contradictory requirements on a syntactic theory (sometimes the object counts, sometimes it doesn't), and I outlined a (non-contradictory) theory that satisfied these requirements by allowing two ways of satisfying dependencies,
- Which led us to introduce the 'dual' of movement, [hypothetical reasoning](#)

- 1 Motivation : Ellipsis
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- The idea common to theories of focus-sensitive operators is that

In a sentence  $\Phi[Foc]$ ...

we are making some sort of statement about the set of meanings of sentences of the form  $\Phi[\psi]$ , where  $\psi$  ranges over *alternatives* to *Foc*.

- *only*( $\Phi[Foc]$ ) will be true just in case for any alternative  $\psi$  to *Foc*,  $\Phi[\psi]$  is true only if  $\psi = Foc$ .
- *also*( $\Phi[Foc]$ ) will be true just in case for some distinct alternative  $\psi$  to *Foc*, both  $\Phi[\psi]$  and  $\Phi[Foc]$  are true.

- One standard way of assigning lexical meanings to focus-sensitive operators like *only* is to assume that they are given as arguments both the focused element *Foc*, as well as its context,  $\Phi[\_]$  [von Stechow, 1990]

$$\llbracket \textit{only} \rrbracket := \lambda x, y. \forall z. (z \in \text{ALT}(x) \wedge y(z) \rightarrow z = x)$$

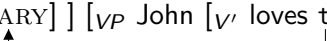
- Alternatives are presumably influenced by contextual factors, but for simplicity, we can take them to be anything of the same type as the focus:  $\text{ALT}(x) := D_{\text{type}(x)}$
- So in a sentence “*John only loves MARY*”, the semantic form is:

$$\llbracket \textit{only} \rrbracket(\mathbf{m})(\lambda x. \mathbf{love}(x)(\mathbf{j}))$$

- The tried and true strategy for arriving at such a bipartite representation for a sentence with a focus-sensitive operator is to (covertly) *move* the focused expression to be adjacent to the operator it associates with.

① [S only [VP John [V' loves [MARY] ] ] ]

② [S [ only [MARY] ] [VP John [V' loves t ] ] ]

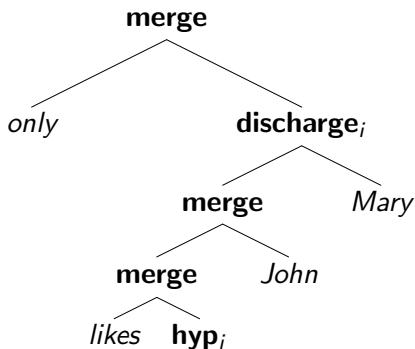
A diagram illustrating the movement of the focused expression 'MARY' to be adjacent to the focus-sensitive operator 'only'. A horizontal line is drawn under the phrase '[VP John [V' loves t ] ]' in the second structure. An arrow points from the end of this line up to the word 'MARY' in the first structure, indicating that 'MARY' is the first argument of the operator 'only'.

- Here, the first argument to *only* is MARY,
- And the second is [VP John [V' loves t ] ]

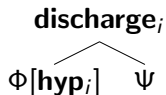


# Structured Meanings

- Note that the operations of **hyp** and **discharge** already
  - 1 mark the location of the missing element (**hyp**)
  - 2 pair the missing element up with its context (**discharge**)
- So, for “*John only likes MARY*”, we might have a derivation like



- When **discharge** occurs in a well-formed derivation, its first argument can be viewed as the context of its second.



- A natural interpretation of such a structure is as a pair:

$$\llbracket \mathbf{discharge}_i(\Phi[\mathbf{hyp}_i], \Psi) \rrbracket := \langle \lambda x_i. \llbracket \Phi[t_i] \rrbracket, \llbracket \Psi \rrbracket \rangle$$

- The argument that ‘movement’ of some sort is involved in creating these structures comes from contrasts like the following:
  - 1 Mary didn’t invite JOHN to the party, but ROBERT
  - 2 \*Mary didn’t invite [the girls [that JOHN likes]] to the party, but ROBERT
  - 3 Mary didn’t invite [the girls [that JOHN likes]] to the party, but [the girls [that ROBERT likes]]
- The idea is that when the focus occurs embedded in an island, the entire island behaves syntactically as though it were the focused expression.

- Krifka [2004] suggests that we move the island containing the focused item as per what we've been doing,
- but then we still need some way to compute the alternatives!

Note the difference:

- 1 Mary only invited [the girls [that JOHN introduced to Robert]]
  - 2 Mary only invited [the girls [that John introduced to ROBERT]]
- He uses alternative semantics for this [Rooth, 1996].

- Currently, **discharge** has no restrictions on which **hyps** it can, well, discharge.
- If we make it sensitive to syntactic islands, then we can compute alternatives as follows:

$$\text{ALT}(p) = D_{\text{type}(\llbracket p \rrbracket)}$$
$$\text{ALT}(\text{discharge}_i(q, p)) = \{\lambda x_i. \llbracket q \rrbracket(\phi) : \phi \in \text{ALT}(p)\}$$

- In other words, in a structure like:

**discharge**( $q_1$ , **discharge**( $q_2$ , ... **discharge**( $q_n$ ,  $p$ ) ...))

- The alternatives will be gotten by replacing only the most deeply embedded discharged argument,  $p$  (the one that was originally focused, but which was trapped in the island)

- To compute the alternatives of *the girls with RED hats*:
- ①  $\text{ALT}(\text{discharge}_k(\mathbf{r}(\text{the}, \mathbf{r}(\text{girls}, \mathbf{r}(\text{with}, \mathbf{r}(\text{hats}, \text{hyp}_k))))), \text{red}))$   
(using case:  $\text{ALT}(\text{discharge}_i(q, p)) = \{\lambda x_i. \llbracket q \rrbracket(\phi) : \phi \in \text{ALT}(p)\}$ )
- ②  $\{\lambda x_k. \llbracket \mathbf{r}(\text{the}, \mathbf{r}(\text{girls}, \mathbf{r}(\text{with}, \mathbf{r}(\text{hats}, \tau_k)))) \rrbracket(\phi) : \phi \in \text{ALT}(\text{red})\}$   
(using case:  $\text{ALT}(p) = D_{\text{type}(\llbracket p \rrbracket)}$ )
- ③  $\{\lambda x_k. \llbracket \mathbf{r}(\text{the}, \mathbf{r}(\text{girls}, \mathbf{r}(\text{with}, \mathbf{r}(\text{hats}, \tau_k)))) \rrbracket(\phi) : \phi \in D_{\text{type}(\llbracket \text{red} \rrbracket)}\}$

# Hypothetical Reasoning and Association with Focus

- Using hypothetical reasoning, we are able to derive phrases in a way that allows us to 'separate' various constituents from their derivational context
- This in turn allows us to have a straightforward treatment of focus-sensitive operators
- And a simple characterization of 'alternatives'
- Adding island sensitivity to hypothesis discharge makes for simple treatment of 'pied-piping' of islands during focus-movement

# Conclusions: Association with Focus, and Ellipsis

- Our treatment of ellipsis forces us to use hypothetical reasoning in certain cases. How well do these line up with focalization?
- ① **Passive–Passive ellipsis:** *Mary was kissed, and Susan was too.*  
To a first approximation, both surface subjects are contrasted (focused).
- ② **Antecedent contained deletion:** *Mary read every book that I did.*  
Less immediately promising; it seems that the object ‘every book’ is *not* focused, although ellipsis forces upon us the idea that the objects is introduced hypothetically.  
**However:** the subjects must be hypothesized as well, and they seem naturally contrasted.
- **Prognosis:** the simplest association between hypothetical reasoning and focus (hypothesis iff focused) won’t be easy to maintain.
- Still, the relation between hypotheses and focalization doesn’t seem to be completely random. Perhaps elegance will emerge!



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