

Towards an integrated account of ellipsis: Dialogue-Grammar Correspondence in Dynamic Syntax

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Acknowledgments:
R.Cann, M.Purver

Preliminaries: Ellipsis as a window on Context?

Is ellipsis syntactic, semantic, pragmatic?

Dynamic Syntax

Modelling the incremental process of interpretation growth

Context as a Record of the Process

Ellipsis and Re-Use of Terms

Reuse of Structure

Reuse of Actions

Switching of speaker-hearer roles

Summary: Syntax as interpretation-building

Outline

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Ellipsis - current heterogeneity (1)

- ▶ Syntactic accounts postulate ambiguity and structure-specific stipulation

e.g.1a John has checked his results but I haven't yet. (strict vs sloppy)

1b I interviewed everyone that Bill did.

1c I insisted Sue visit Bill in hospital, but not Harry.

1d I insisted Sue visit her mother and Harry his father

- ▶ Pragmatic explanation used only for some remainder

e.g.2 A (to receptionist) Dr McWhirter's office please.

Receptionist (to A): Second on the left.

Ellipsis - current heterogeneity (2)

- ▶ Semantic accounts (as alternative to syntactic accounts) presume that the 'context' has to be massaged to provide appropriate input (higher-order unification)

e.g.3 The man who arrested Bill failed to read him his rights, and the man who arrested John did too.

- ▶ Parallelism effects are stipulated specifically for ellipsis, not more generally.

e.g.4 A consultant interviewed every patient; and a junior doctor.

- ▶ No basis for syntactic constraints eg. case constraints on fragment (German)

e.g.5

Hat	Kim	nicht	den Brief	geschrieben?	Nein	Ich/*Mich
Did	Kim	not	the letter	write?	No	I _{NOM}

Ellipsis in dialogue (1)

- ▶ Cross-speaker ellipsis - relying on context to interpret fragment

e.g.5 Hugh: We're leaving soon

Alex: for Edinburgh. To visit my cousin.

- ▶ Fragments, e.g. clarifications, can be incrementally raised/resolved:

e.g.6 A: I had a hospital appointment. The doctor

B: McWhirter?

A: Mhm. Diagnosed me as having TB.

Ellipsis in dialogue (2)

- ▶ speaker/hearer exchange of roles across ALL syntactic dependencies:

e.g.7 Ruth: What did Alex design for

Hugh: herself? A self-loading dish-washer.

- ▶ Children can do it from earliest stages of language acquisition

e.g.8 Ruth: Old McDonald had a farm... And on that farm he had a

Eliot: cow.

- ▶ Parallelism effects in structure, interpretation, within and across speakers:

e.g.9 A: What did Granny give everyone?

B: She gave each of us a hug. And then a present.

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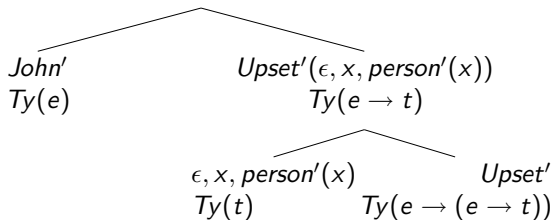
Summary: Syntax as interpretation-building

The Process of Building up interpretation

- ▶ Building representations of content as goal-driven monotonic tree growth from word-sequence

e.g. Parsing (and producing) 'John upset someone'
(Generation checks on richer "goal")

? $Ty(t)$, $\diamond \mapsto Upset'(\epsilon, x, person'(x))(John'), Ty(t), \diamond$



Arguments on left, Functor on right

NPs map onto terms of type e , propositions are of type t ,

All terms are concepts, induced from procedures given by words

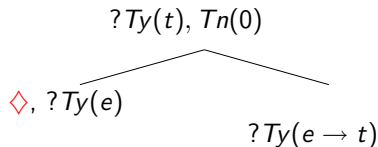
Unfolding then building up the tree

Processing *John upset Mary*

? $Ty(t)$, $Tn(0)$, \diamond

Unfolding then building up the tree

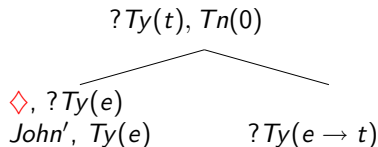
Processing *John upset Mary*



Unfolding then building up the tree

Processing *John upset Mary*

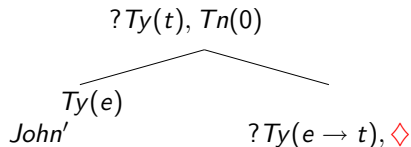
e.g. 'John



Unfolding then building up the tree

Processing *John upset Mary*

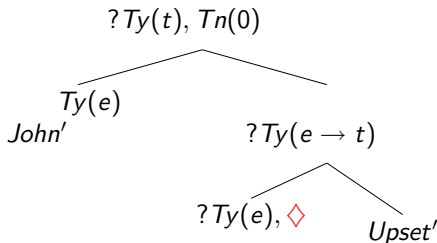
e.g. 'John



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Processing *John upset Mary*

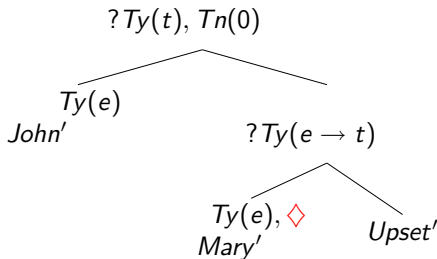
e.g. 'John upset



Unfolding then building up the tree

Processing *John upset Mary*

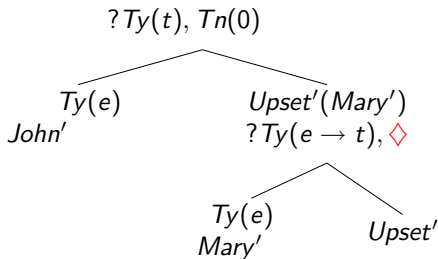
e.g. 'John upset Mary'



Unfolding then building up the tree

Processing *John upset Mary*

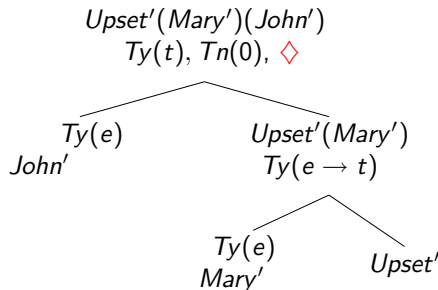
e.g. 'John upset Mary'



Unfolding then building up the tree

Processing *John upset Mary*

e.g. 'John upset Mary'

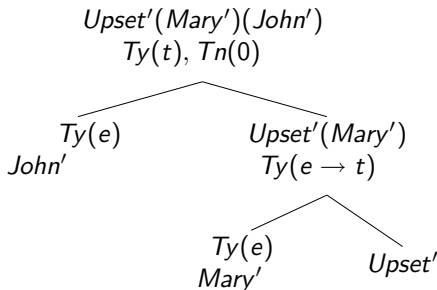


Speakers use exactly the same tree-growth actions except they have a rich goal tree.

Unfolding then building up the tree

Processing *John upset Mary*

e.g. 'John upset Mary'



Speakers use exactly the same tree-growth actions except they have a rich goal tree. Each word chosen must update partial tree towards the goal tree

Defining the growth in language processing

A language to talk about trees: LOFT

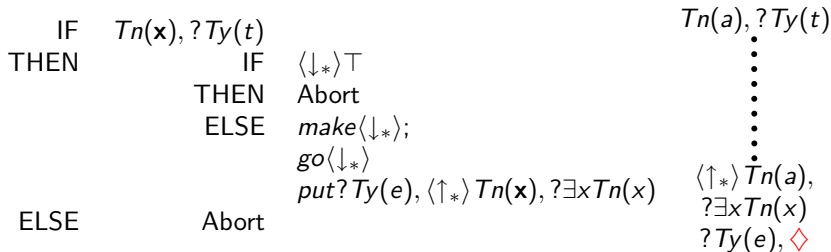
from the point of view of treenode n , $Tn(n)$:

- $\langle \downarrow_0 \rangle X$ X holds at argument daughter of $Tn(n)$.
- $\langle \downarrow_1 \rangle X$ X holds at functor daughter of $Tn(n)$.
- $\langle \uparrow \rangle X$ X holds at mother of $Tn(n)$.
- $\langle \downarrow_* \rangle X$ $Tn(n)$ dominates X .
- $\langle \uparrow_* \rangle X$ $Tn(n)$ is dominated by X .
- $\langle L \rangle X$ the LINK relation (between nodes in distinct trees)
- $\langle L^{-1} \rangle X$ the inverse LINK relation.

Requirements: $?X$ for any X including modal statements –
requirements on future developments

Underspecification & update as core syntax mechanism (1)

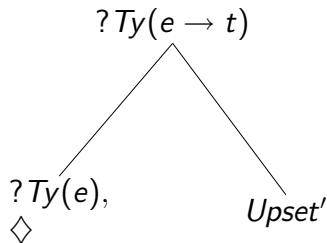
- ▶ Procedures from some partial tree as input onto partial tree as output
- ▶ Any node only characterised as $\langle \uparrow_* \rangle Tn(a)$ will be “unfixed” with a requirement $? \exists x Tn(x)$ for a fixed tree-node identifier
- *Adjunction - building weak tree relations (update within tree)



Lexical “Meaning” as actions for tree growth

- verbs induce (partial) propositional templates, eg *upset*

IF $\{?Ty(e \rightarrow t)\}$
THEN $\text{make}(\langle \downarrow_1 \rangle); \text{go}(\langle \downarrow \rangle);$
 $\text{put}(Fo(Upset'),$
 $Ty(e \rightarrow (e \rightarrow t)))$
 $\text{go}(\langle \uparrow_1 \rangle); \text{make}(\langle \downarrow_0 \rangle);$
 $\text{go}(\langle \downarrow_0 \rangle); \text{put}(?Ty(e))$
ELSE ABORT



Underspecification & update as core syntax mechanism (2)

- ▶ Processing noncontiguous dependency

e.g. Mary, John upset

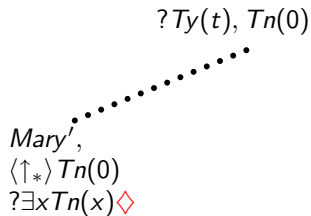
- ▶ Incrementally setting out structure and updating, then compiling interpretation bottom to top.

Moving down the tree: Processing 'Mary, John upset'

$?Ty(t), Tn(0), \diamond$

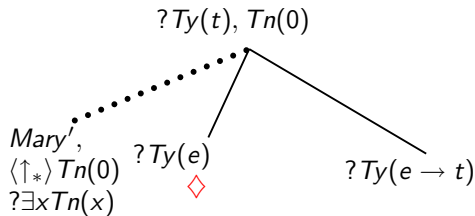
Moving down the tree: Processing 'Mary, John upset'

e.g. 'Mary



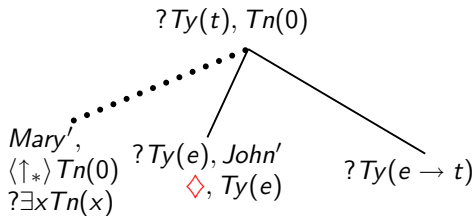
Moving down the tree: Processing 'Mary, John upset'

e.g. 'Mary



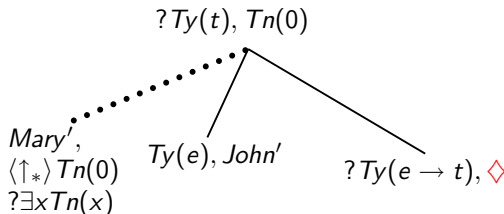
Moving down the tree: Processing 'Mary, John upset'

e.g. 'Mary, John



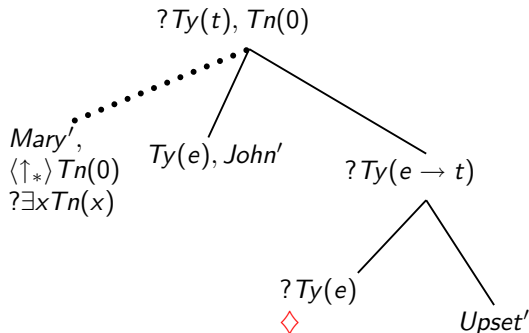
Moving down the tree: Processing 'Mary, John upset'

e.g. 'Mary, John



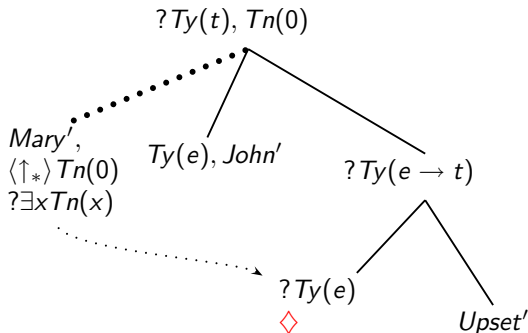
Moving down the tree: Processing 'Mary, John upset'

e.g. 'Mary, John upset'



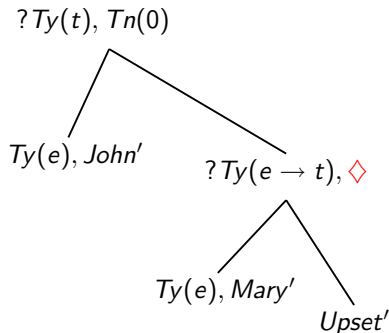
Moving down the tree: Processing 'Mary, John upset'

e.g. 'Mary, John upset'



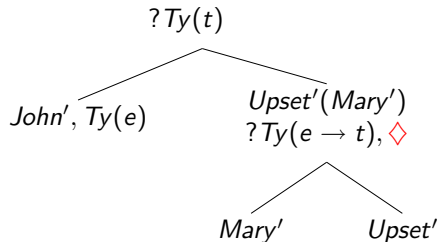
Moving down the tree: Processing 'Mary, John upset'

e.g. 'Mary, John upset'



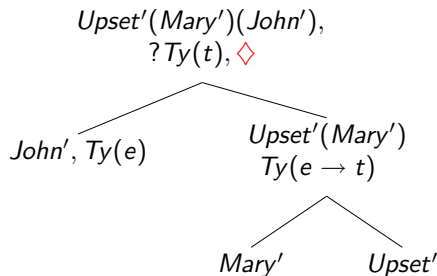
Moving back up the tree: Completing build-up of interpretation

e.g. 'Mary, John upset'



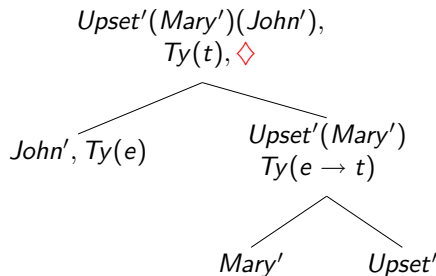
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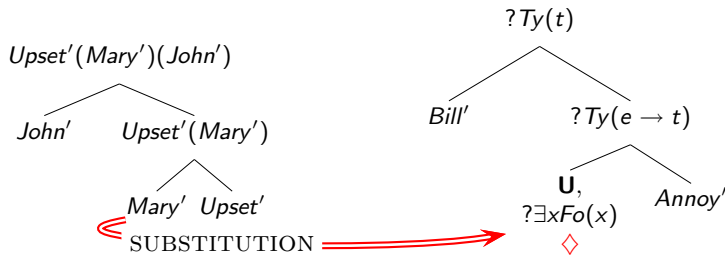
Context-dependence: Formula underspecification & update

► Pronouns project META-VARIABLES (**U**)

Substituted by item from context during construction

e.g. John upsets Mary Bill annoys her.

TREE AS CONTEXT: TREE UNDER CONSTRUCTION:

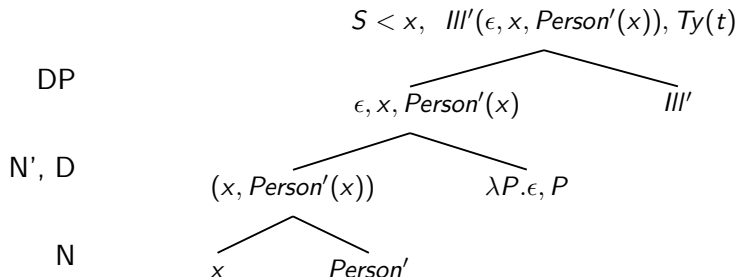


Speaker, like hearer, chooses value from context to license pronoun

Constructing “names” for quantifier phrases

Building up arbitrary-names via terms with scope constraints

Parsing *Someone is ill*



S an event term (from tense)

Rule for interpreting logical form yields equivalent of

$\exists x. \text{Person}'(x) \wedge \text{III}'(x):$

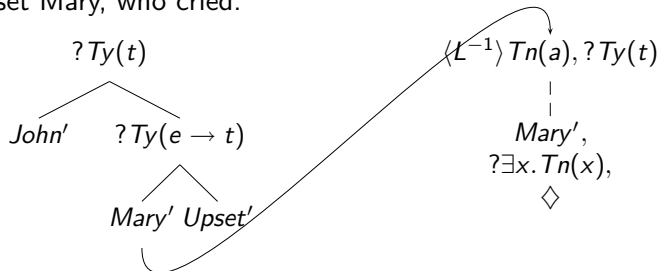
$S : \text{Person}'(\mathbf{a}) \wedge \text{III}'(\mathbf{a})$

$\mathbf{a} = (\epsilon, x, \text{Person}'(x) \wedge \text{III}'(x))$

Constructing context - relative clause construal

- ▶ One partial tree as context for another, with “linked” trees sharing a formula - relative pronouns: providing a copy of the head at an unfixed node

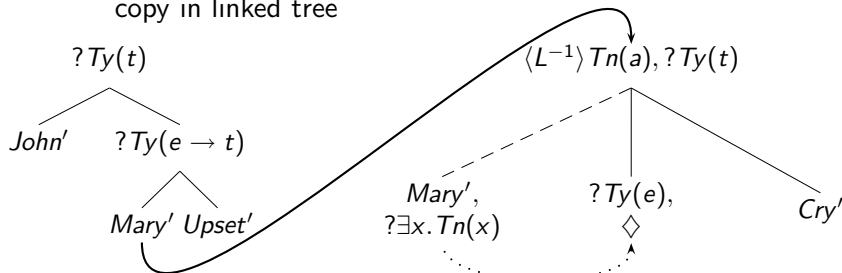
e.g. John upset Mary, who cried.



Building up “linked” trees for NONRESTRICTIVE construal

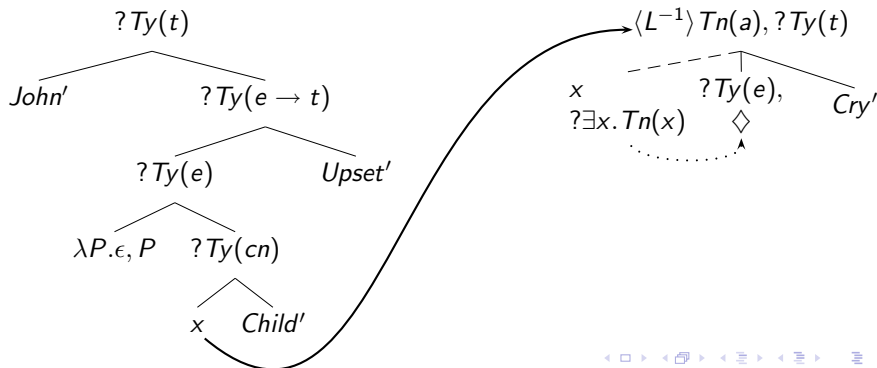
e.g. John upset Mary, who cried.

- ▶ Parsing *John upset Mary, who cried*
- ▶ Actions plus partial tree as context, relative pronoun induces copy in linked tree



Building up linked trees for RESTRICTIVE construal

- ▶ Parsing *John upset a child who cried* - relative pronoun induces variable in linked tree
- ▶ Context: structure PLUS actions for building interpretation



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Ellipsis - Filling out interpretation from Context

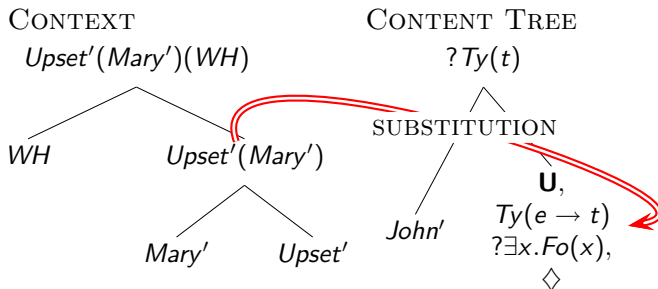
Can we recover the intuition that context directly provides a value?

Context as record of terms, structures and actions

Context-dependent processing: ellipsis (a)

- ▶ Ellipsis can select **terms** from (linguistic) context, bypassing lexicon search:

e.g.1 Q: Who upset Mary? Ans: John did. (strict readings)



e.g.2 Parent to teenage son with surf-board standing in shallows:
 I wouldn't if I were you. The flag's so flying, so it'll be dangerous

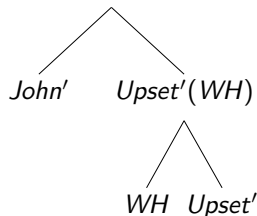
Context-dependent processing: ellipsis (b)

- Using **structure** from context - parser/generator starts from partial tree (narrowing search space):

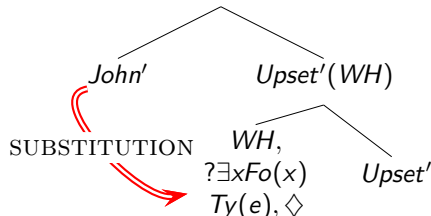
e.g.1 Q: Who did John upset? Ans: Himself.

PROCESSED TREE AS CONTEXT: **becomes** CONTENT TREE:

$Upset'(WH)(John')$



$Upset'(WH)(John')$



e.g.2 Q: Who did everyone ignore? Ans: Their husband.

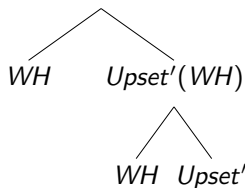
e.g.3 Q: McWhirter's office? Ans: Second on the left.

Context-dependence - ellipsis(c): re-use of actions from context

e.g. Who upset himself? John did.

CONTEXT TREE

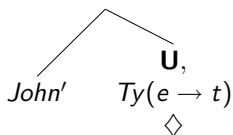
$Upset'(WH)(WH)$



CONTEXT ACTIONS
 TO RE-RUN

CONTENT TREE

$?Ty(t)$



actions of *upset*
 actions of reflexive
 completing/evaluating tree

Context-dependence - ellipsis(c): re-use of actions induces parallellism

Using **actions** from context – sloppy readings:

e.g.1 John upset his mother. Harry too.

e.g.2 Who upset his mother? John.

e.g.3 The man who arrested John failed to read him his rights.

The man who arrested Tom did too.

Also more general parallellism effects

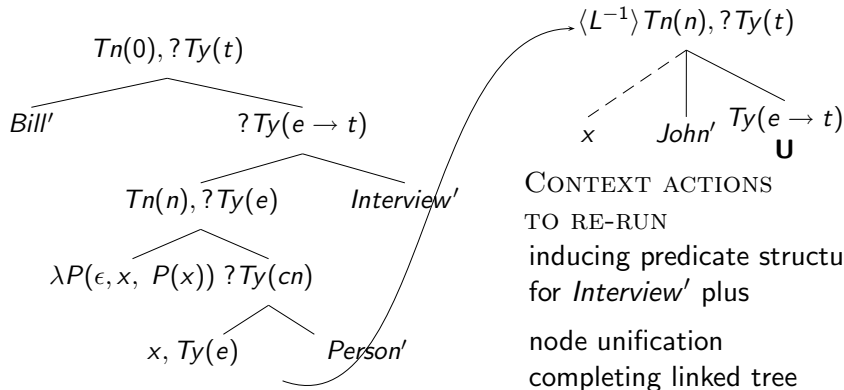
A consultant interviewed every patient. A junior doctor too.

John, I certainly wouldn't appoint. Bill I just might.

Using actions from context cont...

- ▶ antecedent contained ellipsis

e.g. Bill interviewed someone that John did



Shared Utterances

- ▶ Processes *necessarily* share same intermediate representations
 - parsing can begin from intermediate generator state
 - generator can begin from intermediate parser state
- ▶ Cross-speaker effects seem unproblematic:
 - actions resolving anaphoric dependence

e.g. A: *Has Eliot ...*

B: *... hurt himself?*

- underspecification from long-distance dependency

e.g. A: *What did Alex give ...*

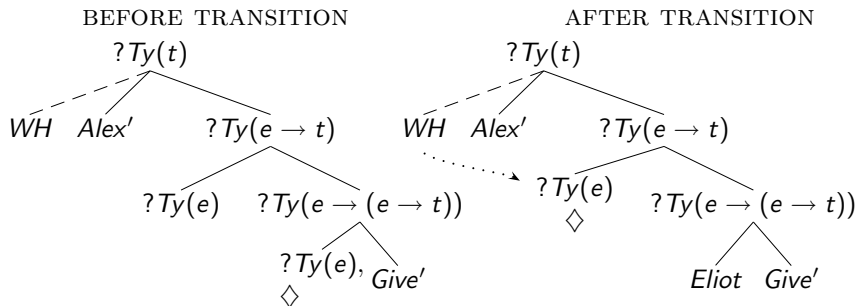
B: *... Eliot? A teddy-bear.*

Processing of Split Utterances

e.g. *Ruth*: What did Alex give ...

Hugh: ... Eliot? A music-box.

- At speaker/hearer transition:



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Dynamic Syntax and An Integrated Account of Ellipsis

- ▶ With Context as a dynamic record of structure PLUS actions
 - ▶ strict readings as identity of content
 - ▶ sloppy readings as identity of actions
 - ▶ fragments built up using structure in context
 - ▶ Antecedent-contained ellipsis predicted
 - ▶ Parallelism effects explained
 - ▶ Split utterances unproblematic

Consequences of analysis - for grammar

- ▶ The proposition expressed is constructed directly: no context-independent sentence-meaning
- ▶ Interweaving of grammar-internal and grammar-external processes
- ▶ Truth conditions definable only over the output.
- ▶ The concept of procedure is central.
- ▶ Syntax + lexicon: set of procedures for proposition construction

Language as a tool for communication/dialogue?