Grammaticized discourse connectivity
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Introduction

The purpose of this study is to address what we consider to be an insufficiently structured picture of discourse connectivity. Here we define "discourse connectivity" as the way in which the illocutionary force of a sentence is established in terms of its relation to context. In general, linguists (e.g. Asher and Lascarides 2003, Webber et al. 2003) consider this to be accomplished by a process that I will describe as "reasoning-based." This type of discourse connection is achieved in two ways. The first way is for a speech act to be spelled out explicitly, in the form of an overt discourse connective. For example, the discourse adverbial "then" is used to establish that a discourse element has a Narrative function. The second way is for the speech act to be established by a process of defeasible inference. Thus, if one discourse element follows another, this would normally establish that it has a Narrative function, in accordance with a Gricean maxim of manner.

What these two types have in common is that they establish discourse connectivity exclusively by a process of reasoning, either monotonic or non-monotonic. Here, however, we propose a distinction between two types of discourse connectivity: reasoning-based and grammar-based. Grammar-based connectivity is based on processes of syntax: configurational/anaphoric factors. By making this distinction, we can predict the occurrence of speech acts that cannot be predicted by adverting exclusively to reasoning processes.

Examples of reasoning-based connectivity are:

Reasoning-based connectivity
First process: entailed, explicit relation
  (1) a. Joel rang the bell.
       b. Then Greg opened the door.
Discourse relation: Narration, mandated by discourse connective *then.*

(2)   a. Arnold tripped over a brick.
          b. Consequently he stubbed his toe.

Discourse relation: Result, mandated by adverbial connective *consequently*.

Second process: defeasible, inferred relation.

(3)   a. Joel rang the bell.
          b. Greg opened the door.

Discourse relation: Narration, this time inferred by pragmatic means, e.g., a Gricean maxim of Manner or Relevance. This inference could be cancelled by a continuation such as:

(3)   c. … but that was before Joel rang the bell.

(4)   a. Arnold tripped over a brick.
          b. He stubbed his toe.

Discourse relation: Result, pragmatically inferred. This relation is defeasible as in:

(4)   c. ... which was what led him to trip over the brick in the first place.

Reasoning-based speech acts, then are divided into two categories: either entailed-and-explicit or defeasible-and-inferred.

Grammar-based examples do not fall into either of these categories. This type of relation is entailed-and-implicit. Here we study two cases of grammar-based connectivity: adverb-fronting constructions and zero-anaphor constructions. Examples are

<u>Grammar-based connectivity</u>
Case 1: Discourse with adverb-fronting construction

(5)   **Discourse**
        a. What happened at 5:12?
        Continuations
        b. I turned slowly
        c. *Slowly I turned.
        d. I finally caught up with him at Niagara Falls. Slowly I turned.

The in situ form of (5b) is grammatical in isolation. But adverb fronting requires further contextual support. It produces the effect of a discourse connective with narrative force. It is grammatical only when preceded by another discourse element, as in (5d).

This narrative force is not given by either a monotonic or non-monotonic reasoning process:

—There is no overt adverbial discourse connective such as *then*.
—Also, the relation is not defeasible, as shown by the following:

(6)   a. I finally caught up with him at Niagara Falls.
       b. *Slowly I turned, although that was before I saw him.

Case 2: Discourse with zero-anaphor construction
(Note: henceforth we refer to "zero anaphora" as "Definite Understood Arguments", or DUA.)

(7)   **Discourse:** Paige fell on Rachel's property.

Continuations
(8)   a. Paige sued Rachel (but not for that reason).
       b. Paige sued Rachel (although that happened prior to her falling).

(9)   a. Paige sued **U**.   (**U** is the understood argument or zero anaphor.)
       b. *… but not for that reason.
       c. *… although that happened prior to her falling.

The overt-complement forms in (8) are unconstrained in interpretation. However, the omitted complement form (9a) is constrained to an illocutionary force that could be given as Result (illustrated by (9b)) or Narration (9c).

The latter interpretations are given grammatically, by an anaphoric relation. There is no overt adverbial phrase, and the relation is not defeasible.

Our conclusion is that the "grammatical" cases provide a closer discourse connection than other cases.

We define two speech acts, " event description" and "event narration", to describe this contrast. An event description is produced by reasoning-based processes, and an event narration is produced by grammar-based processes. Both speech acts are apparently narrative; but the closer connection given by a narration require the distinctions we have made.

1   Mechanisms of Connectivity

We now pursue the following question: can both reasoning-based and grammatically induced discourse connectivity to established by a single grammatical process?
A theory answering this requirement would have to relate two factors:

(i) The way in which the discourse-connective element, whatever its character, is related to its matrix. For example, in (5d), how is *slowly* associated to the

sentence of which it is a part?

(ii) The way in which the discourse-connective element is related to the context element. For example, how is the interpretation of the omitted complement in (9a) associated to the discourse context in (7)?

Two types of association are implicated in our examples: syntactic and contextual. A sentence adverb such as fronted *slowly* (or for that matter, *then*) is associated with the sentence syntax of its matrix. A definite understood argument has a discourse-anaphoric rather than a syntactic connection to its matrix; and its illocutionary force is established through this connection. How then do factors of discourse and syntax combine to produce the illocutionary force of Narration, or of Result?

In addressing these questions, the approach I will take is to determine whether the data under consideration can be accommodated in the framework of "Discourse-level Lexicalized Tree Adjoining Grammar", or DLTAG (Webber et al. 2003, Forbes 2003). The advantage of this system for our purpose is that it shows the interaction of syntactic and discourse/anaphoric factors in producing illocutionary force. Since the data under consideration involves such interactions, it seems possible that this approach can be extended to include these grammatically produced illocutionary forces.

The purpose of DLTAG is to "capture the mechanism by means of which discourse adverbials are involved in discourse syntax and discourse semantics" (Webber et al. 2003: 560). In this system, discourse connectives are considered to be predicates, both syntactically and semantically. This view establishes a correspondence between compositional processes of syntax and those of discourse. Therefore, "DLTAG can build both the syntax and the compositional semantics of these predicates using the same syntactic and semantic mechanisms that are used to build the syntax and compositional semantics of predicates at the clause level" (Forbes 2003:190).

I will briefly describe the DLTAG mechanism. Following this, I will show its application to the data under consideration. The following description is based on Webber et al. (2003) and Forbes (2003).

A lexicalized Tree Adjoining Grammar (TAG) involves the following components:
(i)   a lexical anchor
(ii) two types of elementary trees: initial trees that show basic functor-argument dependencies; and auxiliary trees that "introduce recursion and allow elementary trees to be modified and/or elaborated (Webber et al. 2003:574)
(iii) two composition operations: substitution, which applies to composition of initial trees; and adjunction, which applies to composition of auxiliary trees.
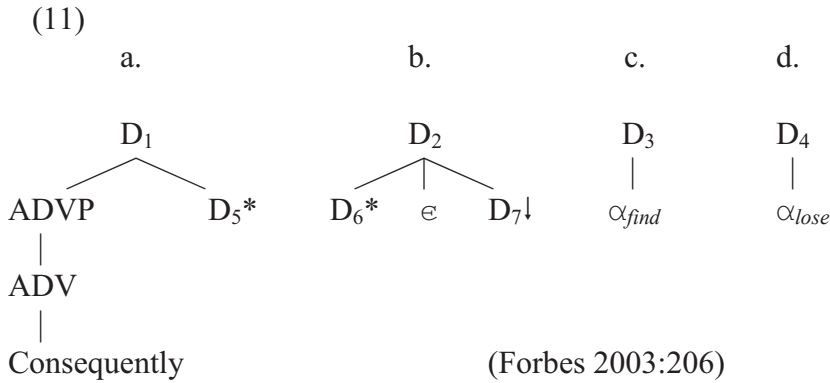
   The following is a sample DLTAG analysis of a discourse with an adverbial cue phrase (from Forbes 2003:205 ff.)

Discourse
   (10) a. Mike found no new clients.
         b. *Consequently*, he lost his job. (Forbes p.205).

Elementary trees of (8)
("D" = discourse unit; α-trees are initial trees, β-trees are auxiliary trees. Nodes marked by "↓" are replaced by the initial tree being substituted. Nodes marked by "*" are adjoined to trees of any type (initial, auxiliary, or derived by a substitution operation—see Forbes 2003:160).

   (11)
         a.   b.   c.   d.

            D_1 D_2 D_3 D_4

   ADVP D_5* D_6*   ɘ D_7↓ α_{find} α_{lose}

     |
   ADV
     |
   Consequently   (Forbes 2003:206)

—(11a) is an auxiliary tree anchored by the adverb *consequently*.   Since the adverb supplies optional modification, it is not a substitution tree.
—(11b) is an auxiliary tree anchored by the empty connective ɘ, represented by the period at the end of the first discourse element in (10a).
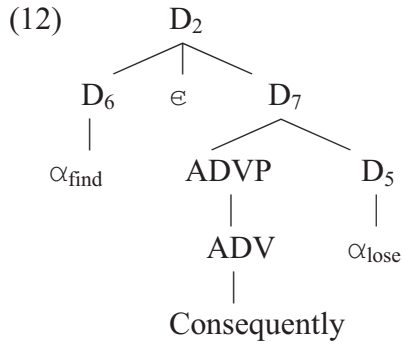—(11c) represents (10a)
—(11d) represents the matrix element in (10b) (*he lost his job*).

These elementary trees are composed as follows:

i.   The auxiliary tree $\beta_{consequently}$ is adjoined to the initial tree α_{lose} at D_5.
ii. The result is substituted into $\beta_{ɘ}$ at D_7.
III. α_{find} is adjoined to the result at D_6.

This process yields:

(12)

```
                    D₂
          ┌─────────┼─────────┐
        D₆        ∈         D₇
         │            ┌──────┴──────┐
       α_find       ADVP          D₅
                      │            │
                     ADV        α_lose
                      │
                Consequently
```

This model shows the discourse adverbial to be a predicate, the first of whose arguments is given anaphorically and the second structurally with its matrix.
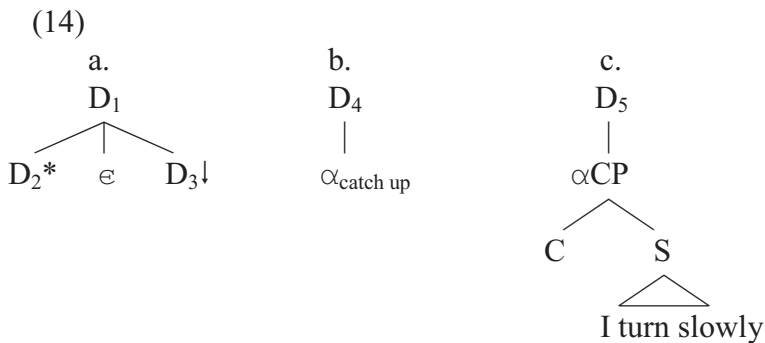
2   Analysis of Adverb-Fronting Data

We now provide an analysis of data using the DLTAG model. Consider this discourse involving an adverb-fronting construction.

(13) a. I finally caught with up him at Niagara Falls.
     b. Slowly$_i$ I turned t$_i$.

Note that in what follows, we present (13a) as an unanalyzed discourse element "D$_{catch\ up}$." However, we show some of the internal syntactic structure of (13b). This is because the fronted element *slowly* is not composed directly to *I turned* by a process of adjunction at the discourse level; rather it appears in its fronted position due to a process of syntactic movement.

   Also, we give the initial tree anchored by *turn* as a CP, not an S/TP. Here C will serve as the position occupied by the fronted element.

Elementary trees for (13):

(14)

```
        a.                    b.                  c.
        D₁                    D₄                  D₅
   ┌─────┼─────┐              │                   │
 D₂*    ∈    D₃↓          α_catch up            αCP
                                              ┌───┴───┐
                                              C       S
                                                   ┌──┴──┐
                                                 I turn slowly
```
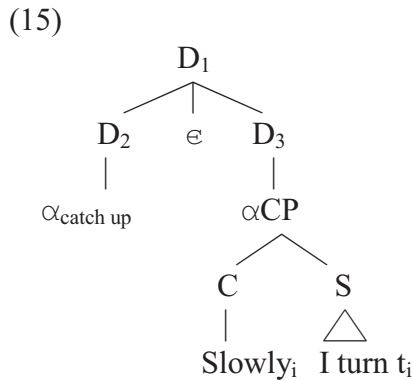
We now compose the discourse tree with the following steps.

i. Substitute D_5 into D_3.

ii. Adjoin D_4 to D_2.

iii. Move adverb to connective position

This yields:

(15)

```
                    D₁
            ┌───────┴───────┐
          D₂     ∈      D₃
          │                │
       αcatch up         αCP
                    ┌──────┴──────┐
                    C             S
                    │            △
                 Slowlyᵢ    I turn tᵢ
```

In this example, the adverb is adjoined in sentence syntax, not in discourse syntax. When fronted, it occupies the same position as an adverbial discourse connective like *consequently.* In C, the adverb provides Narrative force, connecting two discourse elements.

Thus we see the adverb as a predicate, in this case an abstract narrative predicate, where each argument is a proposition.

(16) a. $\text{NARR}_{\text{slowly}}$ [catch_up,   turn]

       b. NARR   [p_1 p_2]

This view leads to an extension of the DLTAG theory, in the sense that the fronted adverb is not an anaphor in any obvious way. But like a discourse anaphor, it is associated with a prior discourse element; and this association is not established by syntactic binding. Our conclusion is that the illocutionary force of adverb fronting—a grammatical process— is explainable in terms of a theory that accounts for reasoning-based illocutionary force.

3   Analysis of DUA Data

For the DUA data, we begin by establishing the following premises; we then apply them to the data.

Premises

i. As with adverb-fronting, illocutionary force is given by syntactic movement to a complementizer position.

ii. The understood element "**U**" in a DUA sentence has two components, an operator and a predication: $\mathbf{U} = ð\ \exists x[P(x)]$

iii. "ð" (the phonetic symbol eth) represents a particle or operator element that has the general meaning of "thus" or "therefore."

iv. The predication "$\exists x[P(x)]$ is the "zero anaphor" that corresponds to some element in the discourse context.

v. The ð-element is what undergoes movement in the discourse syntax. In its fronted position, it acts as a discourse predicate with two propositional arguments. As in the cue-phrase example from Forbes (2003), one argument is given anaphorically, the other structurally.

3.1   Structure of DUA Discourses

On the basis of the premises above, we give a picture of:
A. The structure of understood arguments
B. The structure of discourses involving these arguments

Consider,
   (17) a. Jones went up to the house.
       b. He stepped in **U**.

A. Structure of U

We will argue for the following structure for the understood argument "**U**":

  (18) a. Approximate meaning of **U**:   to _ his_destination
       b. Proposed representation of **U**:   ð $\exists x[$Jones's destination$(x)]$
       (The ð-operator corresponds to the understood particle *to*.)

B. Structure of discourse

The discourse of (17) is given as follows:

  (19) —Discourse structure is "ð $[p_1,p_2]$"
      —"ð" is a predicate with two propositional arguments.
      —p_1 = Jones_go_up
      —p_2 = He_step_in_**U**

On the basis of the premises in (19), we argue for the following derivation of the discourse structure of (17):

  (20) **"Deep structure" of discourse (syntactic representation):**
      a. Jones went up to the house.   (= 17a)
      b. $[_{CP}\ [_{S}$He stepped in $[ð\ \exists x[$Jones's_destination$(x)]]]]]$ (= 17b)

(21) **"Surface structure" of discourse (syntactic representation):**
    a. Jones went up to the house.
    b. $[_{CP} \, [_C \, \eth_i \, [_S \text{He stepped in} \, [t_i \, \exists x [\text{Jones's\_destination}(x)]]]]]$

    The fronting of the operator is motivated by the requirement of establishing the definiteness effect of the null argument. In the C-position it licenses the empty category **U**. This yields a discourse predication of the form "$\eth \, [p_1,p_2]$."

(22) **Semantic representation of (21)**
    $\eth[\text{Jones\_go\_up, He\_step\_in}]$

When it is fronted, the operator appears already associated with p_1, since it originally applies to the predication "$\exists x[P(x)]$"—which is itself anaphoric to p_1.

3.2   Motivating the ð-Element

We now examine various types of data that provide evidence for the ð-element.

3.2.1   Data: DUA Constructions Derived by Omission of PP-Complement

We make the initial observation that many if not most DUA elements are derived from PP-sources.

Examples:
    (23) **Discourse**: Ray went up to the house. He walked in **U**.
        U ≅ to_the_house_that Ray_went_up_to
    (24) **Discourse**: John is tall. Alice is taller **U**.
        U ≅ than_John_is_d_tall
    (25) **Discourse**; Lulu was guilty. Thomas found out **U**.
        U ≅ about_Lulu_being_guilty

In each case, there is a preposition/particle element in the interpretation of **U**, which contributes the meaning of aboutness. This element selects for a proposition (such as *Lulu_being_guilty*) that corresponds to the discourse context.

We conclude that an "aboutness" operator, applying to an element in the context, is present in the interpretation of **U**, when **U** stands in for a PP/PrtP element.

3.2.2 Data: DUA Verbs Selecting for More Than One Complement Type

Object of survey: epistemological verbs
Consider these contrasts:

(26) Verbs selecting for "**U**".	(27) Verbs not selecting for **U**.
a. I know **U**.	a. *I believe **U**.
b. I found out **U**.	b. *I figured out **U**.
c. I forgot **U**..	c. *I discovered **U**.

These verbs select for more than one type of complement (*that*-clause, direct object, PP-complement): which of these types does **U** stand in for in (25)?

All the verbs of (26-27) take *that*-clauses.
  (28) I {know, find out, forget, believe, figure out, discover} that Bruce is innocent..

All take direct objects.
  (29) a. I {know, forget, believe, discover} Mary.
        b. I {find, figure} Mary out.

But only DUA verbs take PP-complements.
  (30) a. I {know, find out, forgot} about that.
        b. *I {believe, figure out, discover} about that.

Conclusion: in the DUA form, it is the *about*-complement, rather than a *that*-clause or direct object that is being dropped. Therefore, in (26), a particle meaning *about* is in the interpretation of **U**.

3.2.3 Data: Constructions With Negation.

Consider:
  (31) **Discourse**
        a. What did Solon say?
        Responses
        b. *I don't know that Solon said.
        c. I don't know what Solon said.
        d. I don't know about that.
        e. I don't know **U**.

In negated forms, a *that*-clause does not make sense; appropriate responses include wh-operators or PP-complements.

Conclusion: An "aboutness" operator, applying to an element in the context, is present in the interpretation of **U**, when **U** stands in for a PP/PrtP element.

3.2.4 Data: DUA Forms Not Based on PP-Complements

Here we provide an extension to conclusion of (31), to the effect that the operator is present in all occurrences of **U,** even if the overt complement of the DUA-element is not a PP. This conclusion is supported by our original example:

(32) a. Paige fell on Rachel's property.
 b. Paige sued Rachel (*but not for that reason).
 c. Paige sued **U**. (**U** ≅ Rachel_[for_that_reason])

Sue does not select for a PP; yet a PP of some sort is apparently present in the interpretation of the understood element. (32c) has a particular illocutionary force that brings in the "PP" interpretation. In particular, the *for_that_reason* provides discourse deixis—supporting the postulation of an "aboutness" element in **U**, even when it does not stand in for a prepositional phrase.

3.3 The Predicational Component of U

We have given "∃x[P(x)]" as the complement of "ð". We argue for this as follows:

Consider,
 (33) **Discourse**:
   a. Al was in the building.
   Continuations:
   b. Brad followed Al.
   c. *Brad followed **U**.

 (34) **Discourse**:
   a. Al was walking around the building.
   Continuations:
   b. Brad followed him.
   c. Brad followed **U**.

 (35) **Discourse**:
   a. Paige didn't like Rachel
   Continuations:
   b. ... so Paige sued Rachel.
   c. *... so Paige sued **U**.

(36) **Discourse**:
    a. Paige fell on Rachel's property.
    Continuations:
    b. ... so Paige sued Rachel.
    c. ... so Paige sued **U**.

These contrasts show that two factors are necessary to license argument drop:

Factor A: mention in discourse of an argument that could serve as an overt complement to the verb.
Factor B: mention in discourse of an eventuality whose description includes semantic features of the verb

    (33) and (35) include only Factor A—mention of a potential complement to the verb (i.e. *Al* and *Rachel*). **U** is not licensed, although an overt direct object is possible, as in (33b) and (35b). However (34) and (36) include both factors, and **U** is licensed as in (34c) and (36c).

—In (34) Factor A is an element, *Al*, that could be the antecedent of *him*.
—In (36) Factor A is an element *Rachel*, that could serve as an overt complement to the verb.

—In (34) Factor B is constituted by the idea of *motion*, which is part of the semantic structure of *follow*.
—In (36) Factor B is constituted by the idea of a tort, which is part of the semantic structure of *sue.*

Our conclusion is that both the argument and eventuality-predicate (corresponding to Factors A and B respectively) must be in the interpretation of **U**. Therefore, **U** includes the formula "$\exists x[P(x)]$", where the *x* corresponds to the argument and *P* corresponds to the predicate.

    To sum up, the full structure of the understood element **U** is as follows.

 U consists of two elements:
1st element – aboutness operator "ð".
2nd element – predication anaphoric to discourse context: $\exists x[P(x)]$.

Examples:
  (37) a. Paige fell on Rachel's property. Paige sued **U**.
      b. **U** = ð [$\exists x$ [responsible_for_tort(x)]]

(38) a. **Statement:** Bruce is innocent.
     b. **Response:** I know **U**.
     c. **U** = ð [∃p [Bruce_being_innocent (p)]]
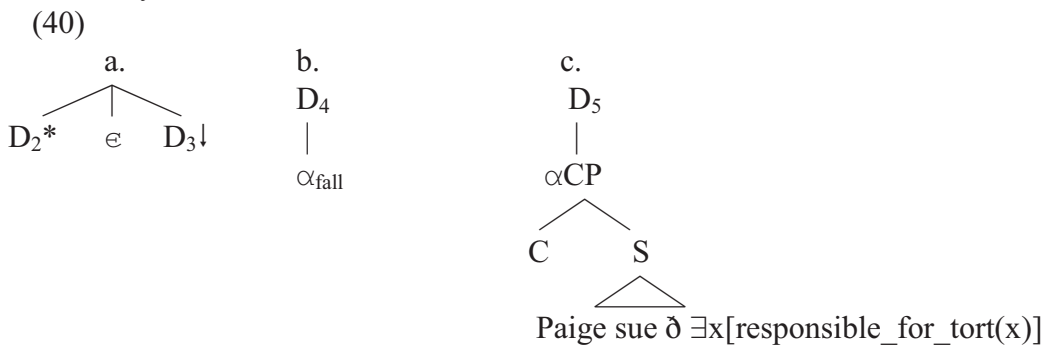
3.4   Discourse Syntax

Having provided a picture of the understood element "**U**" in a DUA construction, we are now in a position to examine the discourse syntax of our data.

DLTAG analysis
(39) a. **Discourse**:   Paige fell on Rachel's property.
     b. **Continuation**:   Paige sued **U**.
     U = ð [∃x [responsible_for_tort(x)]]
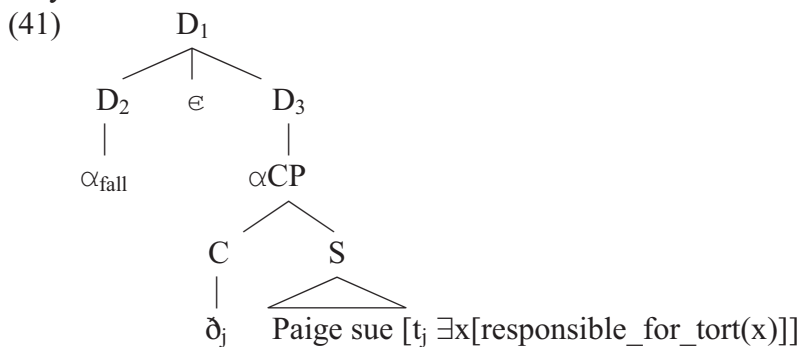
Elementary trees
(40)

These trees are composed as before.
1. Substitute α_{CP} at D_3.
2. Adjoin α_{fall} at D_2.
3. Front ð to C.

This yields:
(41)

This move places ð in a scoping position where it can act as a predicate with two propositions as arguments:

Semantic representation

(42) a. $ð_j[\alpha_{fall}, \quad \alpha_{sue}]$
      b. $ð[p_1, \quad p_2 \;]$

—The entire **U**-element is related anaphorically to the first discourse element "α_{fall}", because ð in its base position applies to the "$[\exists x \; [\text{responsible-for-tort}(x)]$" predication, which is itself anaphorically related to α_{fall}.
—Fronting of ð is motivated by the necessity to provide the definiteness effect of the DUA structure. In this fronted position, the operator:
—can license the empty category **U**.
—can serve as an anaphoric connective, associating the two discourse elements of (39).

4   Conclusion

In this presentation we have tried to account for structurally/configurationally achieved illocutionary force. Our hypothesis was that this could be established by the same grammatical process as reasoning-based illocutionary force. Since the former is given through a combination of structural and anaphoric factors, we have studied the question according to the DLTAG framework, which accounts for adverbial connectives that have two arguments, one structural and one anaphoric. A main advantage of the DLTAG system for our data is that it builds discourse structure on top of clausal structure, using the same principles of composition. This is an advantage because of our claim that the adverb/operator position is filled by a process of syntactic movement, but acts as an anaphoric connective providing illocutionary force.

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