Explaining DPs vs. CPs without Syntax[*]

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1   Introduction

- Using the verb *explain* as a case study, I argue that *that*-clauses (1a), and DPs headed by content nouns[1] (content DPs) (1b) compose semantically with verbs in fundamentally different ways.

  (1)   a.   ...[$_{CP}$ that Jeff is late]
         b.   ...[$_{DP}$ the rumour that Jeff is late]

- Using evidence from propositional DPs, such as *something*, and *the same thing*, I argue that this cannot be because (1a) and (1b) have distinct syntactic categories. Rather, this is because (1a) and (1b) have distinct semantic types.

- Following Moulton (2009, 2015) and Kratzer (2013, 2014) in spirit, if not precise technical implementation, I argue that *that-clauses* are of type $\langle e, t \rangle$: they denote properties of entities with propositional content.

- I assume no basic type distinction between *events* and *individuals*. I furthermore adopt a neo-Davidsonian event semantics (Parsons 1990, Schein 1993), meaning that verbs denote properties of events/states, of type $\langle e, t \rangle$. I therefore argue that verb meanings and *that*-clauses compose semantically via *Predicate Modification (PM)* (i.e., set intersection).

- **Roadmap**

  - In §2, I Introduce Pietroski's (2000) observations concerning *explain*.

  - In §3, I provide evidence from *propositional DPs*, that the difference between embedded content DPs vs. *that*-clauses cannot be cashed out in terms of syntactic category.

[1]King (2002) calls these *proposition descriptions*.

– In §4, I provide an analysis of the distinction between propositional DPs and *that*-clauses which does not make reference to syntactic category.

– In §5, I tie up some loose ends left over from the analysis. I give a semantics for propositional DPs, reconcile the neo-Davidsonian position I take here with the standard Hintikkan semantics for attitude verbs, and explain the impossibility of stacking *that*-clauses.

– In §6, I conclude.

2   Pietroski (2000) on *explain*

• The following premises are representative of the prevailing view in contemporary philosophy of language/formal semantics.

  (2)   a.   *That*-clauses denote propositions.
        b.   *Facts* are true propositions.

• Pietroski points out that (2) gives rise to a *substitution problem* with the verb *to explain*.

  (3)   *Context: Cameron resigning was a huge surprise, and we have no idea why it happened. Jeremy is an expert on politics, and told us that Cameron was under a huge amount of political pressure.*
        Jeremy explained the fact that Cameron resigned.   *explanandum reading*

  (4)   *Context: There is a large commotion outside 10 Downing Street. We ask Jeremy what's going on.*
        Jeremy explained that Cameron resigned.   *explanans reading*

• Informally, (3) means that an explanation was given for the fact that Cameron resigned. Following Pietroski, I refer to this as the *explanandum* reading.

• (4) means that Jeremy's explanation (for something) was that Cameron resigned. Following Pietroski, I refer to this as the *explanans* reading.

• Pietroski claims that we can maintain (2) while accounting for the substitution problem in (3) & (4), by claiming that the verb *to explain* may assign two distinct thematic roles: a *theme* role, associated with nominal arguments, and a *content* role, associated with clausal arguments.

• This idea is cashed out in a neo-Davidsonian event semantics (Parsons 1990, Schein 1993) by positing the following Logical Forms for the examples in (3) & (4), repeated below.[2]

  (5)   Jeremy explained the fact that Cameron resigned.
        $\exists e[\text{explaining}(e) \wedge \text{AGENT}(e) = \text{Jeremy} \wedge$
        $\text{THEME}(e) = \text{the fact that Cameron resigned}]$

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[2]I depart from Pietroski here in treating thematic roles as functions instead of relations, following instead Carlson (1984), Parsons (1990), and Landman (1996, 2000) (the Unique Role Requirement).

(6)   Jeremy explained that Cameron resigned.
        $\exists e[\text{explaining}(e) \wedge \text{AGENT}(e) = \text{Jeremy} \wedge \underline{\text{CONT}(e) = \text{that Cameron resigned}}]$

- It is worth noting at this early juncture that Pietroski's substitution problem with *explain* is an instance of a much broader family of substitution problems involving *that*-clauses and CPs headed by *content* nouns[3], first noted (to my knowledge) in Prior (1971). See King (2002), Uegaki (2015) for further discussion.

(7)   **Content nouns**
        Fact, rumour, story, idea, hypothesis, proposition, myth, desire, belief, knowledge, thought, suspicion, fear, dream, hope, expectation etc.

(8)   a. Jeff fears [CP that he is balding].
        b. Jeff fears [DP the {rumour|hypothesis|story} that he is balding].

(9)   a. Jeff knows [CP that he is balding].
        b. Jeff knows [DP the {rumour|hypothesis|story} that he is balding].

(10)   a. Jeff imagined [CP that he was balding].
        b. Jeff imagined [DP the {rumour|hypothesis|story} that he was balding].

- Observe that in each of (8)-(10), the (a) examples fail to entail the (b) examples, and the (b) examples fail to entail the (a) examples.

- In these cases too, Pietroski's proposed solution seems appealing: content DPs are assigned the *theme* thematic role, whereas *that*-clauses are assigned the *content* thematic role.

(11)   ⟦Jeff fears that he is balding⟧
        $= \exists s[\text{fear}(s) \wedge \text{EXPERIENCER}(s) = \text{Jeff} \wedge \text{CONT}(s) = \lambda w'.\text{Jeff is balding}_{w'}]$

- Note that there are some verbs for which an entailment from the DP case to the CP case goes through, such as *believe*. (12b) entails (12a) (but (12a) does not entail (12b)).

(12)   a. Jeff believes [CP that he is balding].
        b. Jeff believes [DP the rumour that he is balding].

- **Aside:** Uegaki (2015a,b) formulates the following generalization – verbs which license the entailment from the (b)-type examples to the (a)-type examples are obligatorily declarative-embedding. Uegaki's account of substitution failures is tailored to derive this result.

- There are several exceptions to this putative generalization, e.g. *expect*, which is obligatorily declarative embedding (13), fails to license the entailment from (14b) to (14a).

(13)   *Jeff expects who will arrive late to the party.

(14)   a. Jeff expects [CP that he will bald].
        b. Jeff expects [DP the rumour that he will bald].

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[3]I define a *content* noun as a noun which may combine directly with *that*-clause.

- Instead, we can assume that substitution failures are the norm. The entailment from the (b)-type examples to the (a)-type examples sometimes goes through, due to arbitrary facts about what it means to be the theme of, e.g., *believe*.

- **Question**

  - Why do *that*-clauses and content DPs combine with verbs in fundamentally different ways, i.e., why is the *content* role only available to *that*-clauses, and the *theme*-role only available to content DPs?

3 Syntactic category vs. semantic type

- In this section, I argue that the following consequence of Pietroski's analysis is incorrect:

  (15)   DPs and CPs combine with verbs in fundamentally different ways.

- Pietroski is committed to this view, because he wants to maintain the view that *that*-clauses and content DPs may receive the same semantic value, while accounting for the substition problem in terms of different thematic roles.

- Under this kind of view, it must be the case that the distinct syntactic properties of the complements are responsible for the distinct thematic roles they receive, otherwise there would be nothing to stop a *that*-clause from receiving the *theme* role, and a content DP from receiving a *content* role.

3.1 Propositional DPs

- Verbs can be divided into those which readily combine with both a *that*-clause and a content DP (*believe*-type verbs), and those which only combine with *that*-clauses (*think*-type verbs).

  (16)   a.   Jeff believes [$_{CP}$ that Britta will be late].
          b.   Jeff believes [$_{DP}$ the {rumour|story|claim} that Britta will be late].

  (17)   a.   Jeff {thinks|said} [$_{CP}$ that Britta will be late].
          b.   *Jeff {thinks|said} [$_{DP}$ the {rumour|story|claim} that Britta will be late].

- It is tempting to capture the contrast between (16) and (17) via some syntactic mechanism, such as c-selection (Grimshaw 1979, 1981) or case-assignment (Pesetsky 1982, 1991).

- I reject this, on the basis of evidence from *propositional DPs* (as distinct from content DPs) (cf. Moltmann 2013 on "special quantifiers").

- There are a class of nominal expressions, which I claim may range over *that*-clause meanings.

  - DPs headed by *thing*: *the same thing*, *a different thing*, *most things*, *two things*, *something*, *everything*, etc.

- The simplex *wh*-phrase *what*.

- Anaphoric expressions, such as *it* and *that*.

- Null operators in comparatives (see Kennedy and Merchant 2000).

- Note that, although *think*-type verbs may not combine with content DPs, they may combine with propositional DPs.

  (18) a. Jeff thinks that Britta will be late, and Shirley thinks the same thing.
        b. Jeff thinks that Britta will be late, and Shirley thinks that too.
        c. What does Jeff think *t*?
        d. Jeff is thinking everything that Shirley is.

  (19) a. Jeff said that Britta will be late, and Shirley said the same thing.
        b. Jeff said that Britta will be late, and Shirley said that too.
        c. What did Jeff say *t*?
        d. Jeff said everything that Shirley said

- Other verbs which pattern with *think* and *say* in disallowing content DPs, but allowing propositional DPs: *hope, argue, find out*, etc.

- This suggests that verbs like *think* are not in principle incompatible with DP arguments. There are two possible explanations for the contrast between (17b) and (18a).

  1. There is a **syntactic distinction** between content DPs and propositional DPs.

  2. There is a **semantic distinction** between content DPs and propositional DPs.

- I argue that the first possible explanation is incorrect. Content DPs and propositional DPs are syntactically non-distinct.

- **Syntactic properties of propositional DPs**

- One possible response to the observation that verbs such as *think* allow propositional DPs but disallow content DPs, would be to claim that what I have called "propositional DPs" are syntactically more like *that*-clauses.[4] In this section I show that this is incorrect.

- Evidence from prepositional complements:

  (20) a. Jeff hopes for [DP a new bicycle].
        b. *Jeff hopes for [DP that Shirley will leave soon].
        c. Jeff hopes for **the same thing as Abed** – namely, that Shirley will leave soon.
        d. Q: **What** does Jeff hope for *t*? A: [CP that Shirley will leave soon].
        e. Abed hopes that Shirley will leave soon. Jeff hopes for **that** too.

- Evidence from passivization:

  (21) a. *It is believed [DP the rumour].

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[4]This is the position argued for by King (2002).

    b.   It is believed [$_{CP}$ that Jeff has a new bicycle].

    c.   *It is believed **the same thing as Abed** – namely, that Shirley will leave soon.

    d.   Q: ***What** is it believed t? A: [$_{CP}$ that Shirley will leave soon].

    e.   It is believed by Abed that Shirley will leave soon. It is believed **that** by Jeff too.

- In environments where nominals are licensed, but embedded declaratives are de-licensed, propositional DPs are licensed; in environments where embedded declaratives are licensed, but nominals are de-licensed, propositional DPs are de-licensed.[5]

- I conclude that there is no syntactic distinction between content DPs and propositional DPs. It follows therefore that there is no c-selectional/case-assignment differences between verbs like *believe* and verbs like *think*.

- **Propositional DPs and *explain***

- Having established that propositional DPs have (i) the syntax of nominals, and (ii) the semantics of a *that*-clause, we can use them as a diagnostic for *explain*.

- Recall, we are interested in whether the *content* vs. *theme* distinction concerns syntactic category or semantic type. Consider (22) and (23), which are variations on our original examples illustrating the distinction between explanandum and explanans readings (3) and (4).

(22)   *Context: Cameron resigning was a huge surprise, and we have no idea why it happened. Jeremy is an expert on politics, and told us that Cameron was under a huge amount of political pressure.*

    a.   Jeremy explained <u>something</u> – namely, the fact that Cameron resigned.

    b.   Q: <u>What</u> did Jeremy explain? A: The fact that Cameron resigned.

                  explanandum reading

(23)   *Context: There is a large commotion outside 10 Downing Street. We ask Jeremy what's going on.*

    a.   Jeremy explained <u>something</u> – namely, that Cameron resigned.

    b.   Q: <u>What</u> did Jeremy explain? A: That Cameron resigned.

                  explanans reading

- (22) and (23) shows that propositional DPs are compatible with both readings.

4   The analysis

- **Roadmap:**

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[5]By way of contrast, the pro-form *so* patterns syntactically with *that*-clauses – it is disallowed as the complement to a preposition (ia), and it may survive passivization (ib). Hence I do not include *so* in the class of propositional DPs.

(i)   a.   Jeff hopes (*for) so.

    b.   It is believed so.

- In §4.1, I outline the assumption that *that*-clauses come to denote properties of type $\langle e, t \rangle$, whereas content DPs denote/quantify over individuals.

- In §4.2, I outline the basic assumptions of neo-Davidsonian event semantics, which will be a crucial component of the analysis.

- In §4.3, I argue that there is no need to encode a basic type distinction in order to distinguish events and individuals.

- In §4.4 I show how all of these moving parts come together.

4.1 Semantics of *that*-clauses and content DPs

- Following Moulton (2009, 2015) and others, I adopt the *property analysis* of *that*-clauses. I implement this at LF by positing a covert functional head F_{PROP} in the left periphery of a *that*-clause, which takes a proposition of type $\langle s, t \rangle$, and gives back the (characteristic function of the) set of individuals with the CONTENT specified by the proposition (type $\langle e, t \rangle$).[6]

(24) $\llbracket F_{\text{PROP}} \rrbracket = \lambda p_{st}.\lambda x_e.\text{CONT}_w(x) = p$

- The (simplified) LF of an embedded declarative is therefore as follows:

(25) ...that Mary left.

$$\langle e, t \rangle$$
$$\lambda x.\text{CONT}_w(x) = \lambda w'.\text{Mary left}_{w'}$$

$F_{\text{PROP}}: \langle st, et \rangle$ $\qquad$ $\langle s, t \rangle$
$\lambda p.\lambda x.\text{CONT}_w(x) = p$ $\qquad$ $\lambda w'.\text{Mary left}_{w'}$

that Mary left

- Again, following Moulton, I assume that content nouns such as *rumour* have typical nominal meanings: they denote properties of type $\langle e, t \rangle$. Since *that*-clauses are also of type $\langle e, t \rangle$, they may combine with content nouns via *Predicate Modification (PM)* (Heim and Kratzer 1998).

(26) $\llbracket [\text{ n } \sqrt{rumour}] \rrbracket = \lambda x.\text{rumour}_w(x)$
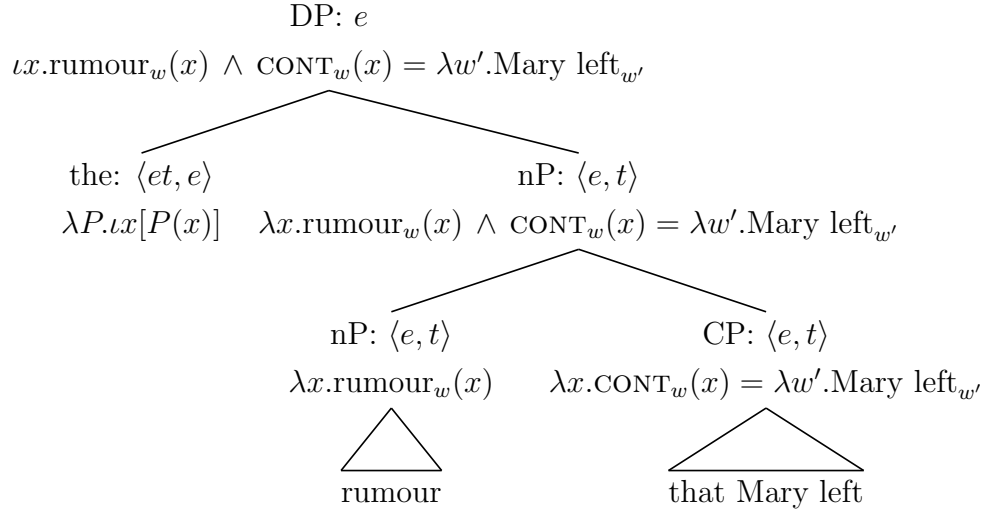
(27) $\text{PM}(\llbracket \text{rumour} \rrbracket)(\llbracket \text{that Mary left} \rrbracket) = \lambda x_e.\text{rumour}_w(x) \wedge \text{CONT}_w(x) = \lambda w'.\text{Mary left}_{w'}$

- The result of intersecting the content noun and the *that*-clause returns the set of *rumours* with the content specified by the proposition that Mary left. For concreteness, I assume that the definite article denotes the iota-operator (type $\langle \sigma t, \sigma \rangle$, defined for all types σ), which takes this set as its input and returns the unique member.

(28) $\llbracket \text{the} \rrbracket = \lambda P.\iota x[P(x)]$

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[6]I depart here from Kratzer (2013, 2014) and Moulton (2009, 2015), who assume that *that* is semantically contentful. I show in a later section that this makes undesirable predictions for conjoined *that*-clauses.

(29)   ...the rumour that Mary left.

DP: e
$\iota x.\text{rumour}_w(x) \wedge \text{CONT}_w(x) = \lambda w'.\text{Mary left}_{w'}$

the: $\langle et, e \rangle$
$\lambda P.\iota x[P(x)]$

nP: $\langle e, t \rangle$
$\lambda x.\text{rumour}_w(x) \wedge \text{CONT}_w(x) = \lambda w'.\text{Mary left}_{w'}$

nP: $\langle e, t \rangle$
$\lambda x.\text{rumour}_w(x)$

CP: $\langle e, t \rangle$
$\lambda x.\text{CONT}_w(x) = \lambda w'.\text{Mary left}_{w'}$

rumour

that Mary left

- The semantic value of a content DP is an indvidual of type e.

- The semantic value of a *that*-clause is a property of type $\langle e, t \rangle$.

4.2   Neo-Davidsonian event semantics

- I adopt a neo-Davidsonian event semantics in which all arguments are severed from the verb. I will assume, therefore, that verbs (specifically, verbalized roots) uniformly denote properties of events, e.g.,[7]

(30) $[\![_{\text{vP}} \text{ v } \sqrt{left} \,]\!] = \lambda e.\text{leaving}_w(e)$

- All arguments are introduced via *thematic functions*, which I define as follows.[8][9]

(31)   a. $[\![\text{AGENT}]\!] = \lambda f.\lambda x.\lambda e.\text{AGENT}_w(e) = x \wedge f(e)$
        b. $[\![\text{THEME}]\!] = \lambda f.\lambda x.\lambda e.\text{THEME}_w(e) = x \wedge f(e)$
             etc.

- For concreteness, I assume a broadly *Distributed Morphology* (DM) architecture.

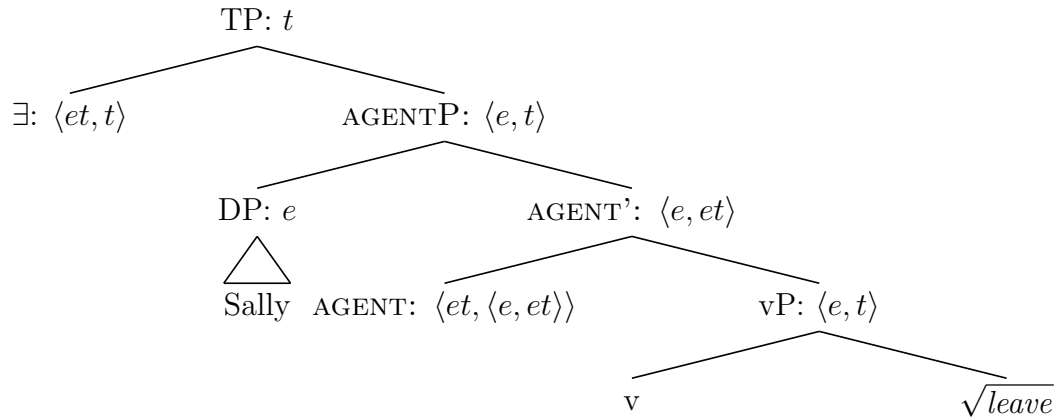- Here is what the LF of a simple intransitive sentence will look like:[10]

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[7] I use e, e', etc. as names for variables ranging over events. I do not, however, assume any basic type-distinction between individuals and events. I discuss this further in §4.3.

[8] Ultimately, it is probably not correct to posit thematic functions in the object language, since thematic distinctions never seem to be lexicalized cross-linguistically (see Lohndal 2014 for discussion). The functional heads I label AGENT, THEME etc. are placeholders for the functional heads responsible for introducing thematic arguments.

[9] Currying thematic functions this way allows them to introduce a thematic argument as a specifier. This gels nicely with a constructivist semantics for the extended verbal projection (see e.g., Lohndal 2014).

[10] See Ahn (2016) for a recent argument based on *out*-prefixation that internal arguments must be severed from the verb too.

(32)   Sally left.

$$\text{TP: } t$$

(Tree diagram)

- TP: t
  - $\exists$: $\langle et, t \rangle$
  - AGENTP: $\langle e, t \rangle$
    - DP: e
      - Sally
    - AGENT': $\langle e, et \rangle$
      - AGENT: $\langle et, \langle e, et \rangle \rangle$
      - vP: $\langle e, t \rangle$
        - v
        - $\sqrt{leave}$

4.3   Events and individuals

- I have implicitly assumed no basic type distinction between *individuals*, such as chairs, tables and people, and *events*, such as running, swimming and talking, rather I assume that both are subsets of domain of entities D_e.

- This is a departure from the mainstream event semantics literature, where typically authors assume a basic type-distinction between individuals and events.

- I posit that a basic type-distinction should only be made where there is a (linguistic) reason for doing so.

- From a philosophical perspective, there is nothing controversial about treating individuals and events as both being members of the domain of entities more generally. This is very much in line with Davidson's (1967) original conception of events.

- What goes wrong if we dispense with this type-distinction? It turns out, nothing much. Consider the following examples:

(33)   John's running was slow.

- Under standard event-semantic assumptions, *John's running* denotes an event, and *slow* denotes a property of events, allowing the two expressions to compose semantically. Note that (34) is unacceptable:

(34)   #John's running was blonde.

- The obvious explanation for this under standard assumptions is that *John's running* denotes an event, and *blonde* denotes a property of individuals. If events and individuals have different semantic types, then (34) is predicted to result in a type-mismatch.

- However, we need an independent explanation to account for contrast in (35), since under standard assumptions, people and furniture are both kinds of individuals.

(35)   a.   The assailant is fierce.

b. #The wardrobe is fierce.

- Uncontroversially, predicates place certain sortal restrictions on their arguments, not just type restrictions. Whether or not this is really linguistic is a moot point – the fact is that the predicate *fierce* requires its argument to be an *animate* individual. For concreteness, we can encode this in the denotation of the adjective via a presupposition.

(36) $[\![\text{fierce}]\!] = \lambda x_e : \text{animate}_w(x).\text{fierce}_w(x)$

- The explanation for the unacceptability of (35b) carries over straightforwardly to the unacceptability of (34). The predicate *blonde* places a sortal restriction on its argument (here: that it be animate), and since events aren't animate, the sentence is judged unacceptable.

4.4   Semantics of clausal embedding

- Having dispensed with the type-distinction between events and individuals, one consequence is that verbs and CPs have the same semantic type: they both denote properties of type $\langle e, t \rangle$. I argue that this allows us to give an elegant account of clausal embedding as involving simple intersection of a verb meaning and a CP-meaning via PM.

(37)   Jeff said that Shirley left.
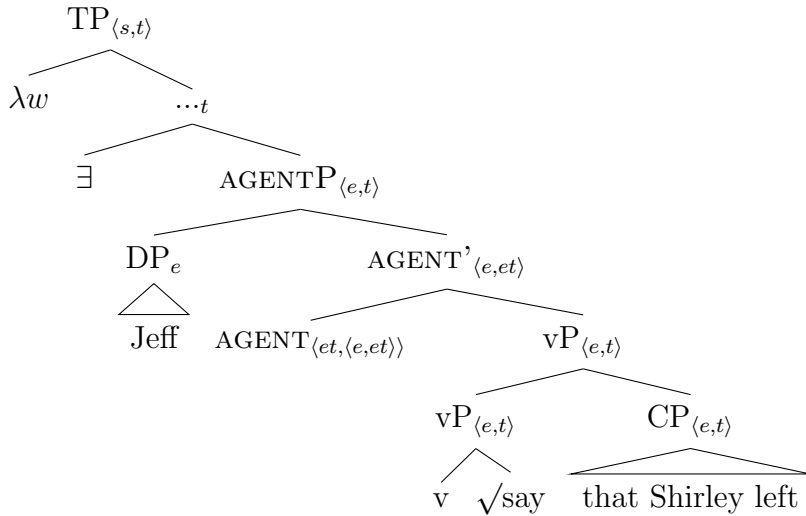
- The *that*-clause combines with the verb via PM and specifies its content.

(38) $[\![\text{vP}]\!] = \lambda e.\text{saying}_w(e) \wedge \text{CONT}_w(e) = \lambda w'.\text{Shirley left}_{w'}$

(39) $[\![\text{TP}]\!] = \lambda w.\exists e[\text{saying}_w(e) \wedge \text{AGENT}_w(e) = \text{Jeff} \wedge \text{CONT}_w(e) = \lambda w'.\text{Shirley left}_{w'}]$

- Informally, (37) denotes the proposition that there is a saying event e, the agent of e is Jeff, and the content of e is the proposition that Shirley left.

- Content DPs denote individuals, and therefore cannot combine directly with verbal meanings. Rather, I assume they must be integrated into the structure via a thematic function.

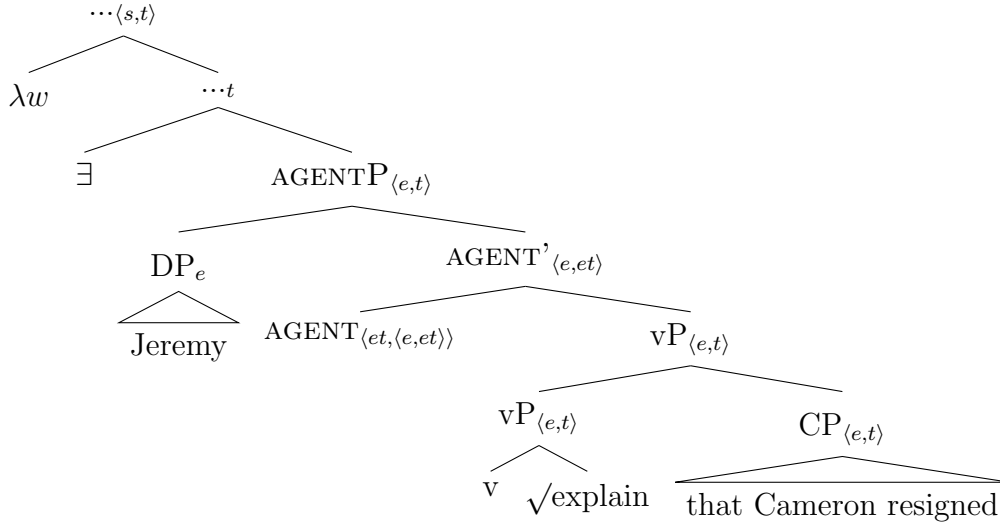(40)   Jeff believes the rumour that Shirley left.
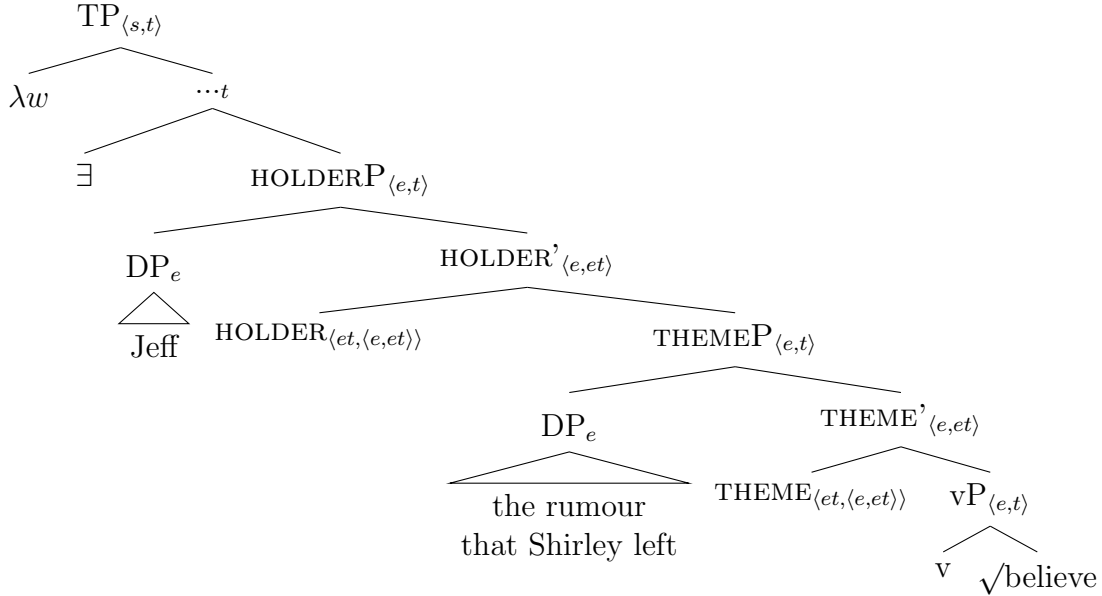
(41) $[\![\text{THEMEP}]\!] = \lambda e.\text{belief}_w(s) \wedge \text{THEME}_w(s) = \iota x[\text{rumour}_w(x) \wedge \text{CONT}_w(x) = \lambda w'.\text{Shirley left}_{w'}]$

(42) $[\![\text{TP}]\!] = \lambda w.\exists s[\text{belief}_w(s) \wedge \text{HOLDER}_w(s) = \text{Jeff} \wedge \text{THEME}_w(s) = \iota x[\text{rumour}_w(x) \wedge \text{CONT}_w(x) = \lambda w'.\text{Shirley left}_{w'}]]$

- Informally, (40) denotes the proposition that there exists a belief state s, Jeff is the holder of s, and there is a unique rumour x which has the content specified by the proposition that Shirley left, that is the theme of s.

- ***believe*-type verbs vs. *think*-type verbs**

- I cash out the distinction between *believe*-type verbs and *think*-type verbs, by assuming that *think*-type verbs do not introduce a THEME, and are therefore essentially intransitive.

- Since *that*-clauses are essentially modifiers, they may still combine with *think*-type verbs.

- We can perhaps make sense of the incompatibility between *think*-type verbs and a THEME in the morphology. Assuming that the spellout of the root is conditioned by the functional heads in the extended verbal projection, we could say that, e.g. $\sqrt{think}$ does not have well-defined spellout in the context of THEME (or, whichever functional head THEME stands in for).

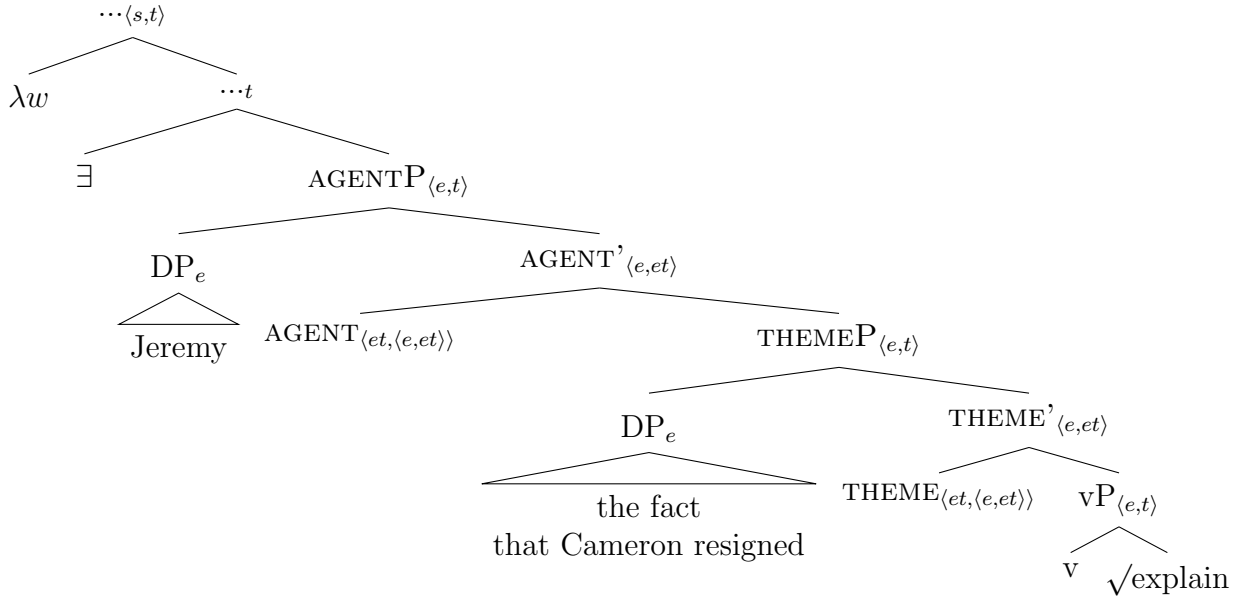- ***explain that P* vs. *explain the fact that P***

11

(43)   Jeremy explained that Cameron resigned.   explanans reading

```
                    ···⟨s,t⟩
                   /      \
                 λw       ···t
                         /    \
                        ∃     AGENTP⟨e,t⟩
                             /         \
                          DP_e        AGENT'⟨e,et⟩
                         /    \       /          \
                      Jeremy  AGENT⟨et,⟨e,et⟩⟩   vP⟨e,t⟩
                                              /        \
                                          vP⟨e,t⟩      CP⟨e,t⟩
                                         /    \       /       \
                                        v   √explain  that Cameron resigned
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(44)   Jeremy explained the fact that Cameron resigned.   *explanandum reading*

```
                    ···⟨s,t⟩
                   /      \
                 λw       ···t
                         /    \
                        ∃     AGENTP⟨e,t⟩
                             /         \
                          DP_e        AGENT'⟨e,et⟩
                         /    \       /          \
                      Jeremy  AGENT⟨et,⟨e,et⟩⟩   THEMEP⟨e,t⟩
                                              /          \
                                           DP_e         THEME'⟨e,et⟩
                                          /    \        /          \
                                       the fact  THEME⟨et,⟨e,et⟩⟩  vP⟨e,t⟩
                                    that Cameron resigned         /    \
                                                                 v   √explain
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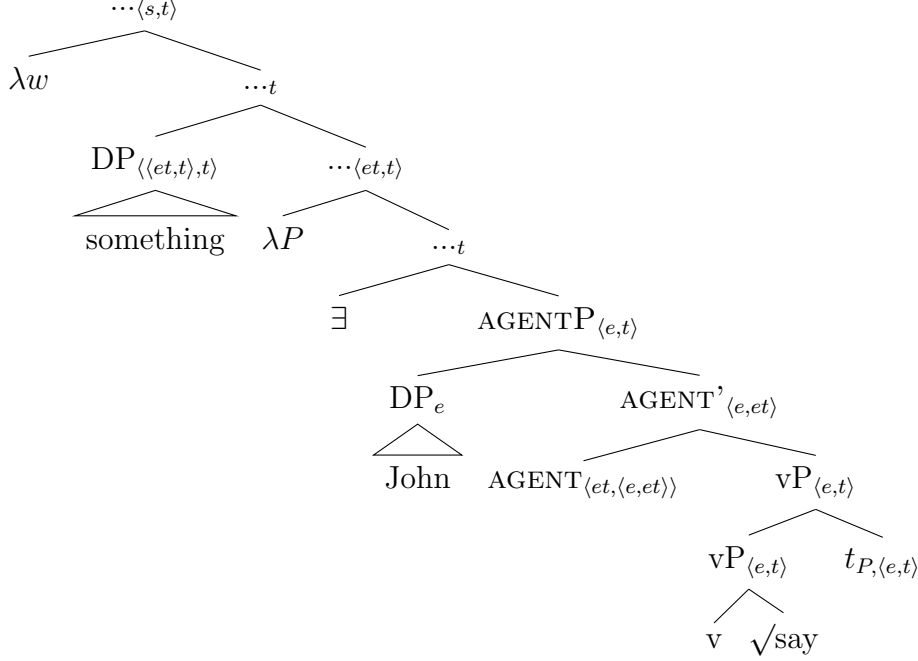
5   Loose ends

- **Semantics of propositional DPs**

- I argue that propositional DPs either refer to or quantify over CP meanings, i.e., properties.

(45) $[\![\textsc{thing}]\!] = \lambda P_{et}.\forall x, y[(P(x) \wedge P(y)) \rightarrow \textsc{cont}_w(x) = \textsc{cont}_w(y)]$

(46) $[\![\textsc{some}]\!] = \lambda P_{\sigma t}.\lambda Q_{\sigma t}.\exists x_{\sigma}[P(x) \wedge Q(x)]$

12

(47) $[\![\text{SOMETHING}]\!] = \lambda Q_{et,t}.\exists P_{et}[(\forall x, y[(P(x)\wedge P(y)) \rightarrow \text{CONT}_w(x) = \text{CONT}_w(y)])\wedge Q(P)]$

(48) John said something.

(49) $[\![\text{vP}]\!] = \lambda e.\text{saying}(e) \wedge P(e)$

(50) $= \lambda w.\exists P_{et}[(\forall x, y[(P(x) \wedge P(y)) \rightarrow \text{CONT}_w(x) = \text{CONT}_w(y)]) \wedge \exists e[\text{saying}_w(e) \wedge \text{AGENT}_w(e) = \text{John} \wedge P(e)]]$

- **Hintikkan semantics for attitude verbs**

- Standard Hintikkan semantics for, e.g., *believe*.

  (51) $[\![[_v \sqrt{believe}]]\!] = \lambda p_{st}.\lambda x_e.\forall w'[w' \in \text{Dox}_{x,w} \rightarrow p(w') = 1]$
  Where $\text{Dox}_{x,w} = \{w'|$ it is compatible with what x believes in w for w to be $w'\}$

- A neo-Davidsonian semantics for *believe*(!!!)

  (52) $[\![[_v \sqrt{believe}]]\!] = \lambda s.\text{belief}_w(s)$

- We can simply encode the Hintikkan semantics as a *meaning postulate* about what it means for s to be a *belief*-state of which x is the HOLDER.

  (53) **Hintikkan meaning postulate for *believe***
  In a world w, Given a state s, and an individual x, if $\text{belief}_w(s)$ and $\text{HOLDER}_w(s) = x$, then for every world w', if $w' \in \text{Dox}_{x,w}$, then $w' \in \text{CONTENT}_w(s)$.

- There is no reason in particular to assume that *believe* is a universal quantifier in the object language.

- Scha (1981) makes the point for distributive inferences licensed by plurals. *The girls sneezed* implies that each girl in the collection picked out by *the girls* sneezed, but it is not necessary to posit a universal quantifier in the object language to capture this.

- The only real evidence for so-called "phrasal distributivity" (i.e., a universal quantifier in the object language) comes from the interaction between plurals and other quantificational expressions. There is no parallel evidence that attitude verbs involve quantification in the object language.

- **Stacked CPs**

- Treating *that*-clauses as modifiers might seem to predict that stacking CPs should be acceptable, contrary to fact.

(54)   *John said [$_{CP}$ that Mary left] [$_{CP}$ that Jill is upset].
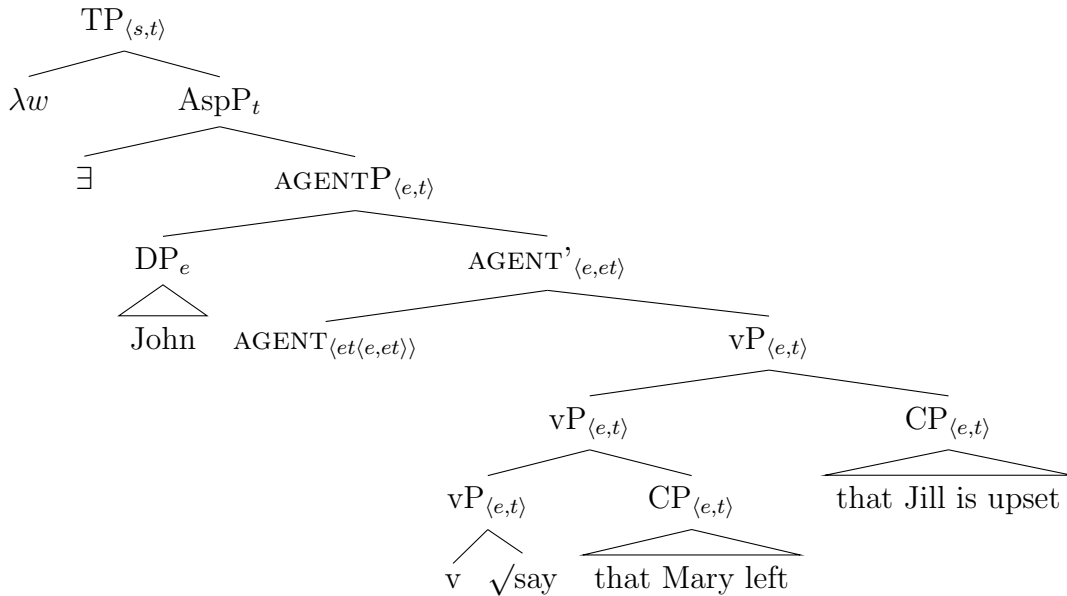
(55) $... = \lambda w.\exists e[\text{saying}_w(e) \wedge \text{AGENT}_w(e) = \text{John} \wedge \text{CONT}_w(e) = \lambda w'.\text{Mary left}_{w'} \wedge \text{CONT}_w(e) = \lambda w''.\text{Jill is upset}_{w''}]$

- CONTENT is a *function*. The functionhood of CONTENT rules out the Logical Form in (55) as a contradiction, since the content function applied to a given *saying* event supplies a uniquely specified proposition.

- **Conjoined CPs**

- Evidence from conjoined CPs supports our decision to locate the proposition-to-property shift in a high functional head, rather than in the complementizer *that* (as in, e.g., Moulton 2009).

(56)   John said [$_{CP_1}$ that Mary left] and [$_{CP_2}$ that Sally is upset].

- If we locate the proposition-to-property shift in *that*, we predict (56) to lead to a contradiction, just so long as conjunction takes scope over CONT.

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(57) a. $[\![\mathrm{CP}_1]\!] = \lambda x.\mathrm{CONT}(x) = \lambda w'.\mathrm{Mary\ left}_{w'}$
      b. $[\![\mathrm{CP}_2]\!] = \lambda x.\mathrm{CONT}(x) = \lambda w'.\mathrm{Sally\ is\ upset}_{w'}$

(58) $\mathrm{PM}([\![\mathrm{CP}_1]\!])([\![\mathrm{CP}_2]\!]) = \lambda x.(\mathrm{CONT}(x) = \lambda w'.\mathrm{Mary\ left}_{w'}) \wedge (\mathrm{CONT}(x) = \lambda w'.\mathrm{Sally\ is\ upset}_{w'})$

(59) $[\![(56)]\!] = \lambda w.\exists e[\mathrm{saying}_w(e) \wedge \mathrm{AGENT}_w(e) = \mathrm{John} \wedge \mathrm{CONT}_w(e) = \lambda w'.\mathrm{Mary\ left}_{w'} \wedge \mathrm{CONT}_w(e) = \lambda w'.\mathrm{Sally\ is\ upset}_{w'}]$

- We can resolve this issue by simply denying that the complementizer *that* is the locus of the shift from propositions to properties, but rather that there is a covert functional head higher than *that* which accomplishes this task.

(60) $[\![\mathrm{F_{PROP}}]\!] = \lambda p.\lambda x.\mathrm{CONT}(x) = p$

- We can take *that* to be semantically vacuous (i.e. to denote an identity function).

(61) $[\![\mathrm{that}]\!] = \lambda p_{st}.p$

- Although the grammar does not rule out coordinate at the topmost property-denoting node, this results in a contradiction, and therefore when conjoining *that*-clauses, coordination must take place at a proposition-denoting level.

- Assuming that *and* denotes boolean conjunction, the result of conjoining two propositions is a proposition.

(62) $\mathrm{and}([\![\mathrm{CP}_1]\!])([\![\mathrm{CP}_2]\!]) = \lambda w'.\mathrm{Mary\ left}_{w'} \wedge \mathrm{Sally\ is\ upset}_{w'}$

(63) $[\![\mathrm{F_{PROP}}]\!]((63)) = \lambda x.\mathrm{CONT}(x) = \lambda w'.\mathrm{Mary\ left}_{w'} \wedge \mathrm{Sally\ is\ upset}_{w'}$

- Combining the resulting denotation with the rest of the sentence results in the right truth-conditions.

(64) $= \lambda w.\exists e[\mathrm{saying}_w(e) \wedge \mathrm{AGENT}_w(e) = \mathrm{John} \wedge \mathrm{CONT}_w(e) = [\lambda w'.\mathrm{Mary\ left}_{w'} \wedge \mathrm{Sally\ is\ upset}_{w'}]]$

- **Open problem**

(65) *John fears [$_{\mathrm{DP}}$ the rumour that he is going bald] [$_{\mathrm{CP}}$ that he is getting old].

(66) $= \lambda w.\exists s[\mathrm{fear}_w(s) \wedge \mathrm{HOLDER}_w(s) = \mathrm{John} \wedge \mathrm{THEME}_w(s) = \iota x[\mathrm{rumour}(x) \wedge \mathrm{CONT}(x) = \lambda w'.\mathrm{John\ is\ going\ bald}_{w'}] \wedge \mathrm{CONT}_w(s) = \lambda w''.\mathrm{John\ is\ getting\ old}_{w''}]$

6   Conclusion

- Since Prior (1971), it has been observed that *that*-clauses and content DPs often give rise to substitution failures.

- This is a consequence of the generalization that content DPs and *that*-clauses combine with the verb in fundamentally different ways: *that*-clauses are *content*-providers, whereas content DPs give rise to more idiosyncratic interpretations.

- Using evidence from propositional DPs, I show that it is a mistake to analyze this phenomenon in terms of syntactic category.

- I develop a neo-Davidsonian analysis in which the difference between content DPs and *that*-clauses falls out as a matter of course: content DPs denote/quantify over individuals, and therefore must be integrated into the Logical Form as thematic arguments, whereas *that*-clauses are interpreted as *modifiers*.

- This has the advantage of providing a completely uniform account of (i) how *that*-clauses combine with nouns, and (ii) how *that*-clauses combine with verbs.

- To the extent that this account is successful, it can be considered an indirect argument for the position that ALL arguments, not just external arguments, are severed from the verb (see Lohndal 2014 for an overview).

- **Syntactic residue:** there is a small class of verbs which are incompatible with both content DPs and propositional DPs, but which surprisingly allow *that*-clauses.

  (67)   a.   Jeff complained that Britta messed up.
         b.   *Jeff complained the rumour that Britta messed up.
         c.   *Jeff complained the same thing as Abed – namely, that Britta messed up.
         d.   Q: *What did Jeff complain *t*? A: [$_{CP}$ that Britta messed up].
         e.   Abed complained that Britta messed up. *Jeff complained that too.

  (68)   Verbs which embed a *that*-clause, but not a propositional DP: *complain, pray, boast, brag, object, advise, warn, caution, counsel.*

- Perhaps this really should be explained in terms of abstract case, but it would be preferable to give an independent explanation, as part of the general project of eliminating abstract case from the grammar. I leave this as an open problem.

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A   Content type-shifting

- My analysis presupposes that content DPs are *always* interpreted as individuals of type e.

- King (2002) provides a brief argument that content DPs may denote propositions, and Uegaki (2015) implements this idea as a type-shifter CONT from individuals of type e to propositions of type $\langle s, t \rangle$. CONT is defined as below:[11]

(69) $[\![\text{CONT}]\!]^w = \lambda x_e.\mathcal{F}_{cont_w}(x)$

- King's observation is that both *that*-clauses and content DPs are compatible with predicates of truth and falsity.

(70)   a.   That Shirley is a fraud is false.
       b.   The rumour is false.

- King assumes that *that*-clauses always denote propositions, and that predicates of truth and falsity are predicates over propositions. It follows that in order to account for the acceptability of (70b) it must be at least possible for *the rumour* to denote a proposition.

(71)   King-type denotation for predicates of truth and falsity
       $[\![\text{false}]\!] = \lambda p_{st}.\lambda w.p(w) = 0$

- In my framework, it is in fact completely straightforward to account for the acceptability of (70b). I simply assume that predicates of truth and falsity are predicates over individuals with propositional content.

(72) $[\![\text{false}]\!] = \lambda x_e.\text{CONT}_w(x)(w) = 0$

- (72) is simply applied to the individual denoted by (70b).

(73)   The rumour is false.
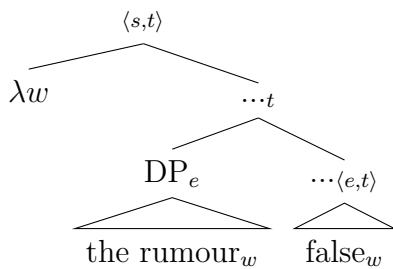
(74) $= \lambda w.\text{CONT}_w(\iota x[\text{rumour}(x)])(w) = 0$

- Evidence against the type-shifting/ambiguity theory of content nouns are examples such as the following (*propositions* cannot spread quickly):

(75)   The rumour is false and is spreading quickly.

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[11]Uegaki in fact provides a somewhat more complex denotation in the end, but the details will not be relevant here.