1 Introduction

- Externally headed (EHRC) vs. internally headed relative clauses (IHRCs), e.g. in Japanese:

1. (1) Taro-wa [Yoko-ga reezooko-ni irete-oita RC| hotondo-no kukkii-o| paatii-ni
   Taro-Top [Yoko-Nom refrigerator-Loc put-Aux RC| most cookie-Acc| party-to
   motte-itta.
   EHRC
   ‘Taro brought to the party most cookies that Yoko had put in the refrigerator .’

2. (2) Taro-wa [Yoko-ga reezooko-ni hotondo-no kukkii-o| irete-oita RC| -no |o
   Taro-Top [Yoko-Nom refrigerator-Loc most cookie-Acc put-Aux RC| -NM |-Acc
   paatii-ni motte-itta.
   IHRC
   party-to brought
   ‘Yoko put most cookies in the refrigerator and Taro brought them (= all the cookies Yoko had put
   in the refrigerator) to the party.’

3. Scenario: (Shimoyama, 1999)
   Yoko put 10 cookies in the refrigerator and Taro brought 7 of them to the party.
   → EHRC (1) is TRUE
   → IHRC (2) is FALSE

4. (4) Taro-wa [Yoko-ga reezooko-ni irete-oita RC| ooku-no kukkii-o| paatii-ni
   Taro-Top [Yoko-Nom refrigerator-Loc put-Aux RC| many-NM cookie-Acc| party-to
   motte-itta.
   EHRC
   brought
   ‘Taro brought to the party many cookies that Yoko had put in the refrigerator .’

5. (5) Taro-wa [Yoko-ga reezooko-ni ooku-no kukkii-o| irete-oita RC| -no |o paatii-ni
   Taro-Top [Yoko-Nom refrigerator-Loc many-NM cookie-Acc put-Aux RC| -NM |-Acc party-to
   motte-itta.
   IHRC
   brought
   ‘Yoko put many cookies in the refrigerator and Taro brought them (= all the cookies Yoko had put
   in the refrigerator) to the party.’

6. Scenario:
   Yoko put 10 cookies in the refrigerator and Taro brought 6 of them to the party.
   → EHRC (4) is TRUE
   → IHRC (5) is FALSE

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1 Crosslinguistically, IHRCs do not pattern alike in all languages. Grosu (2012) presents an overview distinguishing two
main types: restrictive IHRCs and maximalizing IHRCs. Japanese IHRCs belong to the latter type.
Current analysis of Japanese IHRCs (Shimoyama (1999) building on Hoshi (1995)):²

- The IHRC is adjoined to IP at LF, and it will interpreted as a separate sentence.
- The N position in the DP that the IHRC has been extracted from is occupied by a free (phonologically null) proform \( P_{<e,t>} \), to which \( \text{no} \) ‘NM’ (≈ definite article) applies: The DP as a whole functions as an E-type pronoun.

Determiner-like vs. adjective-live uses of \textit{many}, e.g. in English:

(10) \textbf{Many} students that attended the meeting has fun.

(11) The \textbf{many} students that attended the meeting had fun.

\( \approx \) ‘The students that attended the meeting, which were many students, had fun.’

²For an alternative analysis, see Grosu & Landman (2012).
Idea:3

Qu N functioning as internal heads of relative clauses in Japanese have parallel truth conditions to the Qu adj-use N in English.

(12) IHRC (5):
Translation: ‘Yoko put many cookies in the refrigerator and Taro brought them (= all the cookies Yoko had put in the refrigerator) to the party.’
Our paraphrase: ‘Taro brought to the party the many cookies that Yoko had put in the refrigerator, which were many cookies.’

(13) IHRC (2):
Translation: ‘Yoko put most cookies in the refrigerator and Taro brought them (= all the cookies Yoko had put in the refrigerator) to the party.’
Our paraphrase: ‘Taro brought to the party the cookies that Yoko had put in the refrigerator, which were most of the cookies.’

(14) IHRC (8):
Translation: ‘Taro wonders which cat Yoko brought along and that the cat that Yoko brought along ran away.’
Our paraphrase: ‘Taro wonders for which x: the cat that Yoko brought along, which was x, ran away.’

Parallel ambiguity exists between reconstructed N’ containing superlatives in (15) (Bhatt, 2002; Hulsey & Sauerland, 2006) and reconstructed N’ containing adjectival many/few in (16)-(17) (Romero, 2018):

(15) The longest book that John (ever) said Tolstoy had (ever) written is on the shelf.
   a. High reading: ‘the x that is the longest book about which John said that Tolstoy had written it’
   b. Low reading: ‘the x such that John said that the longest book that Tolstoy had written was x’

(16) The many women that Mary said John had dated were standing over there.
   a. High reading: ‘the x that is a numerous women sum and about which Mary said that John had dated it’
   b. Low reading: ‘the x such that Mary said [that John had dated the women sum x and that x is many]’

(17) The few women that Mary (ever) said John had (ever) dated were standing over there.

Goal:
To provide a unified analysis of English adjectival uses of many like (11) and Japanese IHRCs like (5) that is as close as possible to that of reconstructed superlatives.

Roadmap
§2 Background on determiner-like uses of many (Solt, 2009) and which (Rullmann & Beck, 1998)
§3 Background on reconstruction into relative clauses (Bhatt, 2002; Hulsey & Sauerland, 2006)
§4 Proposal on English adjective-like uses of many
§5 Proposal on Japanese IHRC
§6 Outlook

In fact, see (Solt, 2015, 257) for an analysis of adjectival-like uses of many in English that, building on an idea by Hackl (2000), involves reconstrcuting many N inside the relative clause and using Shimoyama’s (1999) E-type anaphora, as in (i):

(1) a. The many/few students who attended enjoyed the lecture. (Solt, 2015, 257)
   b. LF: [\[x.P \pro_{<,1>} \{CP that there were many students who attended \} \] enjoyed the lecture]
   c. [\[\pro_{<,1>}\] = \lam x. *student(x) \land attend(x)]

4 So far checked with one speaker!
2 Background

2.1 Background on determiner-like uses of many

• A family of degree operators: STEM + -er / -est / POS

\[\text{[-er]} = \lambda Q_{< dt, t>} . \lambda P_{< dt, t>} . Q \subseteq P\]

(18) a. (Greta is 1.26m). Lucía is taller (than that).
   b. \(\lambda d.\) tall(greta, \(d\)) \(\subseteq\) \(\lambda d.\) tall(lucia, \(d\))

(19) \[\text{[-est]} = \lambda Q_{< dt, t>} . \lambda P_{< dt, t>} . \forall Q \in Q [Q \neq P \rightarrow Q \subseteq P]\]

\[\text{J-est} K = \lambda Q_{< dt, t>} . \lambda P_{< dt, t>} . \forall Q \in Q \left[Q \neq P \rightarrow Q \subseteq P\right]\]

(20) a. Lucía is tallest (among the girls in her class).
   b. \(\forall Q \in \{\lambda d.\) tall(greta, \(d\)), \lambda d.\) tall(sarah, \(d\)), \lambda d.\) tall(lucia, \(d\), \lambda d.\) tall(liv, \(d\), ...) \[Q \neq \lambda d.\) tall(lucia, \(d\)) \rightarrow Q \subseteq \lambda d.\) tall(lucia, \(d\))\]

(21) \[\text{J-POS} K = \lambda Q_{< dt, t>} . \lambda P_{< dt, t>} . L_{< dt, t>, < dt, t>} (Q) \subseteq P\]

(22) a. Lucía is tall (for an 8-year old).
   b. \(L(\{\lambda d.\) tall(valentin, \(d\)), \lambda d.\) tall(jonah, \(d\)), \lambda d.\) tall(lucia, \(d\), ...) \subseteq \lambda d.\) tall(lucia, \(d\))

• Ordinary adjectives in superlative form:
   Ambiguity: absolute reading vs. relative relative reading with several association possibilities (Heim, 1999; Szabolcsi, 1986):

(25) John climbed the highest mountain.
   a. Absolute: ‘John climbed a mountain higher than any other mountain.’
   b. Relative: ‘John climbed a higher mountain than anybody else climbed.’

(26) a. John wrote the longest letter to Mary.
   b. John wrote the longest letter to Mary.

• Ordinary adjectives in positive form
   Ambiguity: absolute reading vs. relative reading with several “association” possibilities (Schwarz, 2010)

(27) Mia has an expensive hat.
   a. Absolute: ‘Mia has a hat that is expensive for a hat’
   b. Relative: ‘Mia has a hat that is expensive for somebody like Mia to have (e.g., for a 3-year old)’.

(28) a. Paul gave Mia an expensive hat.
   b. Paul gave Mia an expensive hat.

• Determiner-like uses of many in positive form
   o Ambiguity: absolute reading Penka (2016) vs. relative reading with several “association” possibilities (Romero, 2015; Solt, 2009):

(29) Ada ate many cookies.
   a. Absolute: ‘Of the cookies, Ada ate a cookie sum \(x\) that is large compared to the remaining cookie sums.’
   b. Relative: ‘Ada ate a sum of cookies that is large for somebody like Ada (e.g., a diabetic) to eat.’

(30) a. Many parents visited the Linguistics table this year.
   b. Many parents visited the Linguistics table [this year].
   \(\Rightarrow\) many visitors in comparison to those of the Ling table other years
Analysis of the relative reading, adapted from Solt (2009):

(31) \[ [POS] = \lambda Q_{dt,t} \cdot \lambda P_{dt,t} \cdot L_{dt,t,d} (Q) \subseteq P \]

(32) \[ [\text{MANY}_{\text{card}}] = \lambda d, \lambda x, |x| \geq d \]

(33) Many parents visited the Linguistics table this year.
   a. LF: [ [POS C] [1] [NP \land t_{\text{MANY}} parents visited the Linguistics table this year]] \sim C]
   b. \[ C \subseteq \{ \lambda d'. \exists x[^\text{parent}(x) \land |x| \geq d' \land \text{visit}(x, \text{the.ling.table, this.year})],
        \lambda d'. \exists x[^\text{parent}(x) \land |x| \geq d' \land \text{visit}(x, \text{the.psych.table, this.year})],
        \lambda d'. \exists x[^\text{parent}(x) \land |x| \geq d' \land \text{visit}(x, \text{the.bio.table, this.year})] \} \]
   c. \( L([C]) \subseteq \lambda d. \exists x[^\text{parent}(x) \land |x| \geq d \land \text{visit}(x, \text{the.ling.table, this.year})] \)

(34) Many parents visited the Linguistics table [this year].
   a. LF: [ [POS C] [1] [NP \land t_{\text{MANY}} parents visited the Linguistics table [this year]] \sim C]
   b. \[ C \subseteq \{ \lambda d'. \exists x[^\text{parent}(x) \land |x| \geq d' \land \text{visit}(x, \text{the.ling.table, this.year})],
        \lambda d'. \exists x[^\text{parent}(x) \land |x| \geq d' \land \text{visit}(x, \text{the.psych.table, 2018})],
        \lambda d'. \exists x[^\text{parent}(x) \land |x| \geq d' \land \text{visit}(x, \text{the.bio.table, 2017})], \ldots \} \]
   c. \( L([C]) \subseteq \lambda d. \exists x[^\text{parent}(x) \land |x| \geq d \land \text{visit}(x, \text{the.ling.table, this.year})] \)

2.2 Background on which phrases

- \textit{Which}-phrases and presupposition projection (Rullmann & Beck, 1998):

(35) A: Which unicorn did Bill want to catch?
    B: Bill wanted to catch the unicorn Isabella.
    B': Bill wanted to catch the blue unicorn.
    \( \rightarrow \) Speaker B/B' does not need to believe so.

- \textit{Which}-phrases as definite descriptions (Rullmann & Beck, 1998):
  As in (36), leading to answers like (35B), or as in (37), leading to answers like (35B) or (35B'):

(36) which\(_i\) unicorn \( \rightarrow \) the \( (\lambda y[\text{unicorn}\_w(y) \land y=x_i]) \)

(37) which\(_i\) unicorn \( \rightarrow \) the \( (\lambda y[P_i(y)(w) \land \text{unicorn}\_w(y)]) \)

3 Background on reconstruction into relative clauses

3.1 Low reading of \textsc{adj} + est

- Recall the low reading of example (15), repeated here as (38):

(38) The longest book that John said Tolstoy had written is on the shelf.
   a. Low reading: ‘the \( x \) such that John said that the longest book that Tolstoy had written was \( x \)’

- Syntactic structure (Bhatt, 2002; Hulsey & Sauerland, 2006):
  \( \circ \) Head raising structure of the Relative Clauses and Copy Theory of movement
  \( \circ \) Trace conversion (Fox, 2000)
  \( \circ \) Scoping out the degree phrase \textit{est C} and adding \( \sim C \)
(39) Trace Conversion Rule (Fox, 2000):
   a. Variable insertion: (Det) Pred, \( \Rightarrow (\text{Det}) [\text{Pred} \lambda y.y=\text{pro}] \)
   b. Determiner Replacement: (Det) [\text{Pred} \lambda y.y=g(i)] \Rightarrow [\text{Pred} \lambda y.y=\text{pro}] 

(40) a. Copies at LF:
   The longest book, \( \lambda 1 [\text{CP1} \text{Op longest book}] \) that John said \( [\text{CP2} \text{Op longest book}] \) that Tolstoy had written \( \text{book} \text{longest} \)
   b. Copy deletion:
   The longest book, \( \lambda 1 [\text{CP1} \text{Op longest book}] \) that John said \( [\text{CP2} \text{Op longest book}] \) that Tolstoy had written \( \text{Op longest book} \)
   c. Trace conversion:
   The longest book, \( \lambda 1 [\text{CP1} \text{Op longest book}] \) that John said \( [\text{CP2} \text{Op longest book}] \) that Tolstoy had written \( \text{the longest book} \lambda y.y=\text{pro} ]\)
   d. \(-\text{est}\) movement and marking of the focus associate:
   The longest book, \( \lambda 1 [\text{CP1} \text{Op longest book}] \) that John said \( [\text{CP2} \text{Op longest book}] \) that \( [-\text{est}\ C] \lambda 2 [\text{Tolstoy had written the t}_2\text{-long book} \lambda y.y=\text{pro}_{1,F} ]\)

[Semantic derivation:
   - Intensional version of \(-\text{est}\) (41)
   - The comparison class \( C \) is relativized to the relevant evaluation world \( w' \): (42)

(41) \(-\text{est}\) \( \equiv \lambda Q_{<d, st>}, \lambda P_{<d, st>}, \lambda w. \forall Q \in Q[Q \neq P \Rightarrow Q \cap P \subset P_w] \)
(42) \([\phi \sim C_{w'}] \) is defined only if \([C_{w'}] \subseteq [\phi]' \) and \( \forall D_{<d, st>} \in [C_{w'}] : \exists d[D(d)(w')] \)

(43) a. \([\text{The 1} [\text{CP1} \text{that John said} [\text{CP2} \text{Op longest book}] \text{that} \ w' [-\text{est} \ C_{w'}] 2] [\text{Tolstoy had written the t}_2\text{-long book} \lambda y.y=\text{pro}_{1,F}] \sim C_{w'} \] \) is on the shelf 
   b. \([\lambda 2 ['\text{Tolstoy had written the t}_2\text{-long book} \lambda y.y=\text{pro}_{1,F}] \sim C_{w'} ] = \lambda d. \lambda w'' \text{Tolstoy wrote}_{w''} ty[y = d-long} \text{book}_{w''} \wedge y = g(1)]\)
   c. \([C_{w'}] = \{ \lambda d. \lambda w''. \text{Tolstoy wrote}_{w''} ty[y = d-long} \text{book}_{w''} \wedge y = a], \lambda d. \lambda w''. \text{Tolstoy wrote}_{w''} ty[y = d-long} \text{book}_{w''} \wedge y = b], \lambda d. \lambda w''. \text{Tolstoy wrote}_{w''} ty[y = d-long} \text{book}_{w''} \wedge y = c], \ldots \} \)
   d. \([\text{CP2}] = \lambda w'. \forall Q \in [C_{w'}] \)
   e. \([\text{CC1}] = \lambda w'. \exists x \text{[John said}_{w'}: \lambda w'. \forall Q \in [C_{w'}] \)

3.2 Low reading of \text{ADJ+POS}

Consider scenario (44) and example (45), modified from Hulsey & Sauerland (2006):

(44) Scenario: Siouxsie said, pointing at a book on the table: “Lydia has written this book. For a 9-year old, this is a long book to write.”
(45) The long book that Siouxsie said that (for a 9-year old) Lydia had written was on the table.
   a. Low relative reading: ‘the \( x \) of which Siouxsie said that Lydia wrote the book \( x \) and that \( x \) was a long book for somebody like Lydia (\text{e.g., a 9 year old}) to write’
We parsimoniously extend the analysis in §3.1 to adjectives in the positive form:

- Intensional version of -POS: (46)
- The comparison class C is, again, relativized to the relevant evaluation world $w'$
- To derive the relative reading comparing each 9-yr old and her books with the other 9-yr olds and their books, we need two elements in the sentence to be ALT-marked: *Lydia* and *pro1*, as in (47a).

\[(46) \quad [\text{POS}] = \lambda Q \langle d, st, t \rangle \cdot \lambda P \langle d, st, t \rangle \cdot \lambda w. L_w(Q) \subseteq P_w\]

\[(47)\]
a. LF: [The 1 that [CP1 that S said [CP2 *Lydia* wrote [the $t_2$-long book $y = \text{pro1}_1$] *Lydia* wrote [the $t_2$-long book $y = \text{pro1}_1$]] was on the table]

\[(48) \quad \text{Rough paraphrase:} \]

"Consider the $x$ of which Siouxsie said that: *Lydia* wrote the book $x$ and $x$ is long compared to books that 9 yr-olds have written. That $x$ was on the table."

4 Proposal on English adjective-like uses of *many*

- We are ready to tackle the low reading of *many* in examples like (50) (= (16)) and, by extension, general adjective-like uses of *many* like (52) (parallel to (11)):

\[(49) \quad \text{Scenario: Mary said, pointing at a group of women nearby: "The women John has dated are standing over there. For an 18-year old, these are many women to have dated."} \]

\[(50) \quad \text{The many women that Mary said John had dated were standing over there.} \]

a. "the $x$ such that: Mary said [that John had dated the women sum $x$ and that $x$ is many for somebody like John (e.g., an 18-year old) to have dated]"

\[(51) \quad \text{Scenario: For an 18-year old, John had dated many women.} \]

\[(52) \quad \text{The many women that John had dated were standing over there.} \]

a. "the $x$ such that: John had dated the women sum $x$ and that $x$ is many for somebody like John (e.g., an 18-year old) to have dated"

- The analysis will be presented in several steps:
  - **First** attempt, which will fail. $\mapsto$ This section
  - **Second** attempt adding an Exhaustivity operator, INFORMALLY. $\mapsto$ This section
  - **Second** attempt adding an Exhaustivity operator, FORMALLY $\mapsto$ Romero (2018)

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5 The low reading that we are targeting is a de re reading about an individual $x_e$. For de re readings about an intensional object –e.g., an individual concept–, one could incorporate insights from Grosu & Krifka (2007) into the present analysis.
4.1 First attempt

Syntactic structure: We transpose the LF structure used for ADJ + POS to MANY + POS:

- [POS C] and the converted copy [the t2-MANY women λy.y = pro1] are embedded under the intentional verb say – hence the low reading.
- Both John and pro1 function as POS′ ALT-associates – hence the relative reading comparing John and his dates to other people like John and their dates

(53) The many women that Mary said John had dated were standing over there.

(54) LF: [The 1 |CP1 that M said |CP2 that [POS C] 2]IP JohnALT had dated [the t2-MANY women λy.y = pro1, ALT][|∼ C] were nearby]

Semantic derivation:
Assume for simplicity that, for any world w′ compatible with Mary’s utterance, the following holds: the set of 18-year olds in w′ contains only John, Bill and Herbert, the women John dated in w′ are a + b + c, the women Bill dated in w′ are d + e, and the women Herbert dated in w′ are f + g. This means that, for that world w′, the comparison class [Cw′] will be as in (56).

(55) \[2\text{John}\text{ALT had dated the t2-MANY women }\lambda y.y = \text{pro1, ALT}] = \lambda d.\lambda w'.\lambda w.\sigma y'[\text{woman}_w(y) \land |y| \geq d \land y = g(1)]

(56) \[C_{w′} = \{ \lambda d.\lambda w'.\lambda y.\lambda w.\sigma y'[\text{woman}_w(y) \land |y| \geq d \land y = a + b + c], \lambda d.\lambda w'.\lambda y.\lambda w.\sigma y'[\text{woman}_w(y) \land |y| \geq d \land y = a + b], \lambda d.\lambda w'.\lambda y.\lambda w.\sigma y'[\text{woman}_w(y) \land |y| \geq d \land y = b + c], \lambda d.\lambda w'.\lambda y.\lambda w.\sigma y'[\text{woman}_w(y) \land |y| \geq d \land y = a + c], \lambda d.\lambda w'.\lambda y.\lambda w.\sigma y'[\text{woman}_w(y) \land |y| \geq d \land y = a], \lambda d.\lambda w'.\lambda y.\lambda w.\sigma y'[\text{woman}_w(y) \land |y| \geq d \land y = b], \lambda d.\lambda w'.\lambda y.\lambda w.\sigma y'[\text{woman}_w(y) \land |y| \geq d \land y = c], \lambda d.\lambda w'.\lambda y.\lambda w.\sigma y'[\text{woman}_w(y) \land |y| \geq d \land y = d + e], \lambda d.\lambda w'.\lambda y.\lambda w.\sigma y'[\text{woman}_w(y) \land |y| \geq d \land y = d], \lambda d.\lambda w'.\lambda y.\lambda w.\sigma y'[\text{woman}_w(y) \land |y| \geq d \land y = e], \lambda d.\lambda w'.\lambda y.\lambda w.\sigma y'[\text{woman}_w(y) \land |y| \geq d \land y = f + g], \lambda d.\lambda w'.\lambda y.\lambda w.\sigma y'[\text{woman}_w(y) \land |y| \geq d \land y = f], \lambda d.\lambda w'.\lambda y.\lambda w.\sigma y'[\text{woman}_w(y) \land |y| \geq d \land y = g] \}

(57) [CP2] = \lambda w'. Lw([Cw′]) \subseteq \lambda d.\lambda w.\lambda w.\sigma y'[\text{woman}_w(y) \land |y| \geq d \land y = g(1)]

(58) [[54]] = \lambda w.\sigma x [\text{Mary said}_w: \lambda w'. Lw′([Cw′]) \subseteq \lambda d.\lambda w.\lambda w.\sigma y'[\text{woman}_w(y) \land |y| \geq d \land y = x] were\_w \text{ nearby.]

Problem!!!:
- Function L will combine with the set of degree properties (56) and, for each of these properties, it will extract its extension at w′. This leads to the multi-set of degree sets – depicted as intervals – in (59), where each 18-year old contributes not one but several degree intervals. If function L calculates the neutral segment based on this multi-set, we will end up with a wrong neutral segment skewed towards low numbers (as if many 18-year olds had dated exactly one woman).

If, additionally, there is an 18-year old – e.g. Al – who has not dated any woman in w′, we would need a degree property like (i), where $\top$ is a dummy individual whose cardinality is 0 and of which any combination of (other) non-contradictory properties is true at w′. We will ignore this complication in the remainder of this paper.

(1) $\lambda d.\lambda w'.\lambda y.\lambda w.\sigma y'[\text{woman}_w(y) \land |y| \geq d \land y = \top]$
4.2 Second attempt, informally

- Adding an exhaustivity operator \( \text{Exh} \):
  - We just saw that, for each alternative \( x \) to John, we want as the alternative to \( \text{proj} \) the maximal, exhaustive sum of women that \( x \) dated.
  - We propose to secure this maximality by adding the exhaustivity operator \( \text{Exh} \) in (61) to the LF (cf. Chierchia et al. (2012)) and associating it with \( \text{proj} \) via F-marking (cf. Nicolae (2013)): (62).
  - This means that we have nested \( \text{ALT} \)/F-marking on \( \text{proj} \) in (62).

(61) \[ [\text{Exh}] = \lambda C_{<s,t>,\ldots} \lambda p_{<s,t>,\ldots} \lambda w. \ p(w)=1 \land \forall q \in C \ [q(w)=1 \rightarrow p \subseteq q] \]

(62) LF: The 1 \( [\text{CP}_1 \text{ that M said} \ [\text{CP}_2 \text{ that}\ POS \ C_{j,m} 2]_1 \text{Exh D}_1 \ [\text{IP}_2 \text{ John}_{\text{ALT}}] \text{ dated the t2-MANY women} \ \lambda y. y = \{[\text{proj}][\text{ALT}][\text{F}], \sim \text{D}_1] \sim C_{j,m}] \] were nearby.

- Example of nested foci from the literature and informal derivation (Rooth, 1992; Wold, 1996):

(63) A: John once only drank Wine.
B: John also once only drank Water.

(64) LF: \( [\text{IP}_1 \ \text{Also C}_m] \) once \( [\text{only D}_1] \ \text{IP}_2 \) John drank \( [\text{water}_{\text{F}}][\text{F}] [\sim \text{D}_1] \sim C_{j,m}] \)

(65) a. \( [\text{D}_1] = \{ \lambda w'. \ \text{John drank}_{w'} \ \text{water}, \lambda w'. \ \text{John drank}_{w'} \ \text{wine}, \lambda w'. \ \text{John drank}_{w'} \ \text{beer}, \ldots \} \)
b. \( [\text{only D}_1] \ [\text{IP}_2] = \lambda w'. \ \text{John drank}_{w'} \ \text{water and nothing else} \)
c. \( [\text{C}_m] = \{ \lambda w'. \ \text{John once drank}_{w'} \ \text{water and nothing else}, \lambda w'. \ \text{John once drank}_{w'} \ \text{wine and nothing else}, \lambda w'. \ \text{John once drank}_{w'} \ \text{beer and nothing else}, \ldots \} \)
d. \( [\text{IP}_1] = \lambda w : \exists p \in C_{j,m}[p \neq \lambda w'. \ \text{John once drank}_{w'} \ \text{water and nothing else}] \) and \( p(w)=1 \). John once drank_{w'} water and nothing else

- Parallel informal derivation of our example:

(66) The many women that Mary said John had dated were standing over there.

(67) LF: The 1 \( [\text{CP}_1 \text{ that M said} \ [\text{CP}_2 \text{ that}\ POS \ C_{j,m} 2]_1 \text{Exh D}_1 \ [\text{IP}_2 \text{ John}_{\text{ALT}}] \text{ dated the t2-MANY women} \ \lambda y. y = \{[\text{proj}][\text{ALT}][\text{F}], \sim \text{D}_1] \sim C_{j,m}] = (62).\)
b. \([2[Exh \,D_i \,IP_2]]\)
\[= \lambda d.\lambda w''.\text{John dated}_w'' \, \sigma y''\text{*woman}_w''(y) \wedge |y| \geq d \wedge y=a+b+c\] and no other woman\(_w''\)
\[\forall p \in D_i \, [p(w'')] = 1 \rightarrow \]
\[|\lambda w''\text{.John dated}_w'' \, \sigma y''\text{*woman}_w''(y) \wedge |y| \geq d \wedge y=a+b+c| \subseteq p\]
\[= \lambda d.\lambda w''.\text{John dated}_w'' \, \sigma y''\text{*woman}_w''(y) \wedge |y| \geq d \wedge y=a+b+c\] and no other woman\(_w''\)
\[\forall p \in D_i \, [p(w'')] = 1 \rightarrow \]
\[|\lambda w''\text{.John dated}_w'' \, \sigma y''\text{*woman}_w''(y) \wedge |y| \geq d \wedge y=a+b+c| \subseteq p\]
\[\text{and no other woman}_w''\]

5 Proposal on Japanese IHRCs

- Back to Japanese IHRCs with \([many \,N]\) (and \([most \,N]\)):

(69) Taro-wa [[Yoko-ga reezooko-ni ooku-no (/ hotondo-no) kukkii-o irete-oita RC]
Taro-Top [[Yoko-Nom refrigerator-Loc many-NM (/ most) cookie-Acc put-Aux RC]
-ko o paatii-ni motte-itta.
-NM -]Acc party-to brought

‘Taro brought to the party the cookies that Yoko had put in the refrigerator, which were many(/most of the) cookies.’

- On (69) with internal head ooku-no/hotondo-no kukkii-o ‘many/most cookies’:
Analysis exactly as in §4, with:

i. adjectival version of ooku-no ‘many’ and hotondo-no ‘most’

ii. lowest copy / internal head \([\text{Op many/most cookies}]/\text{converted via Fox’s (2000) Trace Conversion}:
[the many cookies λy.y=pro_1]/

iii. \(Exh\) associates with \(pro_1\) within converted copy / internal head

- Back to Japanese IHRC with \([which \,N]\):

(70) Taro-wa [[Yoko-ga dono neko-o turete-kita RC] -no -ga nigateda ka]
Taro-Top [[Yoko-Nom which-NM cat-Acc brought-along RC] -NM -]Nom ran.away QI
siritagatte-iru.

‘Taro wonders which cat Yoko brought along and that the cat which Yoko brought along ran away.’

≈ ‘Taro wonders for which \(x\): the cat the Yoko brought along, which was \(x\), ran away.’

- On (70) with internal head dono neko-o ‘which cat’:
Analysis as close as possible to that in §4, with:

i. adjectival version of dono ‘which’:
which unicorn \(\mapsto\rightarrow\) \(\lambda y[P_2(y)(w) \land \text{unicorn}_w(y)]\) \(\approx(37)\)

ii. lowest copy / internal head \(\text{Op which}_2 \text{ cat}_1\) converted via Fox’s (2000) Trace Conversion:

\[
\begin{align*}
\text{the which}_2 \text{ cat } & \lambda y.y=\text{pro}_1 \text{ cat } \lambda y.y=\text{pro}_1 \\
\text{the which}_2 \text{ cat } & \lambda y.y=\text{pro}_2 \land \text{unicorn}_w(y) \\
\end{align*}
\]

iii. Need of Exh? If so, associating with what?

- The analysis of (70) will be presented in two steps:
  - First attempt, which will fail.
  - Second attempt adding an Exhaustivity operator.

5.1 First attempt

- The embedded interrogative at stake:

\[
\begin{align*}
\ldots&\ldots[\text{Yoko-ga} \ \text{dono} \ \text{neko-o} \ \text{turate-kita} \ \text{RC}] -\text{no} \ [-\text{ga} \ \text{nigedasita} \ \text{ka}] \ \ldots \\
\ldots&\ldots[\text{Yoko-Nom} \ \text{which-NM} \ \text{cat-Acc} \ \text{brought-along} \ \text{rc}] -\text{NM} \ [-\text{Nom} \ \text{ran-away} \ \text{Q}] \ \ldots \\
\text{‘For which } x: \text{ the cat the Yoko brought along, which was } x, \text{ ran away.’} \\
\mapsto\mapsto \text{It implies that Yoko brought exactly one cat and that all the cats that Yoko brought (which are just one) ran away.} \\
\mapsto\mapsto \text{It asks what cat } x \text{ that is.} \\
\end{align*}
\]

- Syntactic structure and semantic interpretation:

\[
\begin{align*}
\text{LF: [ Q}_2 \ [\text{The 1 IP Yoko brought [the which}_2 \text{ cat } \lambda y.y=\text{pro}_1]] \ \text{ran away}] \\
\{ \lambda w.\ u[\text{Yoko brought } w \ \text{ι } x[ x=z \land \text{cat}_w(x) \land x=\text{u} ] \ \text{ran-away}_w \mid z \in \text{D}_e \} \\
\end{align*}
\]

- Problem!!:
  No guarantee that Yoko brought exactly one cat, but just guarantee that Yoko brought exactly one cat that equals \(z\) –which is (far more) trivial.

5.2 Second attempt

- Adding the exhaustivity operator \(\text{Exh}\) to the LF and associating it with...
  - F-marking on \(\text{pro}_2\) and
  - F-marking in \(\text{which}_2\)

\[
\begin{align*}
\text{LF: [ Q}_2 \ [\text{The 1 IP Yoko brought [the which}_2 \text{ cat } \lambda y.y=\text{pro}_1 \text{ F}]] \ \text{ran away}] \\
\{ \lambda w.\ u[\text{Yoko brought } w \ \text{ι } x[ x=z \land \text{cat}_w(x) \land x=\text{u} \land p] \ \text{ran-away}_w \mid z \in \text{D}_e \} \\
\end{align*}
\]

- Semantic interpretation:

\[
\begin{align*}
\text{[C]} = \{ \lambda w. \ \text{Yoko brought}_w \ \text{ι } x[z \land \text{cat}_w(x) \land x=\text{u}] \mid z,u \in \text{D}_e \} \\
= \{ \lambda w. \ \text{Yoko brought}_w \ \text{ι } x[ a \land \text{cat}_w(x) \land x=a], \\
\lambda w. \ \text{Yoko brought}_w \ \text{ι } x[ b \land \text{cat}_w(x) \land x=b], \\
\lambda w. \ \text{Yoko brought}_w \ \text{ι } x[ e \land \text{cat}_w(x) \land x=e], \\
\ldots \} \\
\end{align*}
\]

\[
\begin{align*}
\{ \lambda w.\ u[\text{Yoko brought}_w \ \text{ι } x[z \land \text{cat}_w(x) \land x=\text{u}] \land \\
\forall p \in \text{C} \ p(w)=1 \ \mapsto \\
\lambda w'. \ \text{Yoko brought}_w' \ \text{ι } x[z \land \text{cat}_w'(x) \land x=\text{u}] \subseteq p] \ \text{ran-away}_w \mid z \in \text{D}_e \} \\
\end{align*}
\]

To sum up section §5:

The correct reading of Japanese IHRCs containing \textit{many/most} and \textit{which} has been derived using:

i. LF structures motivated for reconstruction of N’ heads of relative clauses in general and
ii. an additional exhaustive operator \(\text{Exh}\) maximizing the value of \(\text{pro}_1\) and \(\text{which}_1\).
6 Outlook

- A unified analysis of reconstructed Relative Clause heads (in English) and internal Relative Clause heads (in Japanese) has been proposed that derives the correct truth conditions using:
  - independently motivated LF structures (for reconstruction of superlatives, as in Bhatt (2002); Hulsey & Sauerland (2006)) and,
  - crucially, an exhaustivity operator Exh associating with part(s) of the reconstructed/internal head.

- Some open issues:
  - What principle of the grammar enforces the insertion of this Exh?
  - Why can we have reconstructed adjectival uses of many in English but not of most and which?

References


