Concealed Questions with Quantifiers

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Frequently Asked Concealed Questions, Workshop
June 5-7, 2009
Georg-August Universität Göttingen

1. Introduction.

■ Simple concealed questions: an individual concept analysis (Heim 1979, Romero 2005).

(1) Mary knows / guessed / revealed / forgot the capital of Italy.

(2) $[\![$*the capital of Italy*$]\!]$ = $\lambda w.\ \iota x_e$ [capital-of-Italy(x,w)]

(3) $[\![know_{CQ}]\!](x_{<s,e>})(z)(w) = 1$ iff $\forall w'' \in Dox_z(w)\ [\ x(w'') = x(w)\ ]$

(4) $Know_{CQ}$ + INTENSION of the NP:
$[\![$*Mary knows the capital of Italy*$]\!]$ =
$\lambda w.\ \forall w' \in Dox_m(w)\ [\ \iota x_e[\text{capital-of-Italy}(x,w')] = \iota x_e[\text{capital-of-Italy}(x,w)]\ ]$

■ Complex concealed questions (CQs):

- Heim's (1979) ambiguity:

(5) John knows the price that Fred knows.
a. Reading A: "John and Fred know the same price, e.g. the price of milk"
b. Reading B: "John knows this about Fred: what price Fred knows"

- Romero's (2005) proposal (see also Lasersohn 2005 and Aloni 2007):

(6) a. Reading A: $[\![$*know*$]\!]$ + EXTENSION of *[$_{NP}$ the price that Fred knows]*.
b. Reading B: $[\![$*know*$]\!]$ + INTENSION of *[$_{NP}$ the price that Fred knows]*.

(7) $[\![$*the price that Fred knows*$]\!]$ =
$\lambda w^*.\ \iota x_{<s,e>}\ [\ \text{price}(x,w^*)\ \&\ \forall w'' \in Dox_f(w^*)\ [x(w'') = x(w^*)]\ ]$

(8) a. $[\![know_1]\!](x_{<s,e>})(z)(w) = 1$ iff $\forall w'' \in Dox_z(w)\ [\ x(w'') = x(w)\ ]$ (=(3))
b. $[\![know_2]\!](x_{<s,<s,e>>})(z)(w) = 1$ iff $\forall w'' \in Dox_z(w)\ [\ x(w'') = x(w)\ ]$

(9) **Reading A**: $Know_1$ + <s,e>-extension of the NP:
$\lambda w.\ \forall w' \in Dox_j(w)\ [\ \iota x_{<s,e>}\ [\text{price}(x,w)\ \&\ \forall w'' \in Dox_f(w)\ [x(w'') = x(w)]]\ (w') =$
$\iota x_{<s,e>}\ [\text{price}(x,w)\ \&\ \forall w'' \in Dox_f(w)\ [x(w'') = x(w)]]\ (w)\ ]$

(10) **Reading B**: $Know_2$ + <s,<s,e>>-intension of the NP:
$\lambda w.\ \forall w' \in Dox_j(w)\ [\ \iota x_{<s,e>}\ [\text{price}(x,w')\ \&\ \forall w'' \in Dox_f(w')\ [x(w'') = x(w')]] =$
$\iota x_{<s,e>}\ [\text{price}(x,w)\ \&\ \forall w'' \in Dox_f(w)\ [x(w'') = x(w)]]\ ]$

■ Complex CQs with quantifiers:

(11) a. John knows **a** price that Fred knows.
b. John knows **most** prices that Fred knows.

- Reading A: the NP_{CQ} QRs, leaving a trace of the type corresponding to the extension:

(12) ⟦*most prices that Fred knows*⟧ =
$\lambda Q_{<<s,e>,<s,t>>}.\ \lambda w^*.\ \text{MOST}\ x_{<s,e>}$ [price(x,w*) & ∀w''∈Dox_f(w*) [x(w'') = x(w*)]]
[Q(x)(w*)]

(13) LF of (11b):
Most prices that Fred knows 1 [John knows $t_{1,<s,e>}$]

(14) $\lambda w.\ \text{MOST}\ x_{<s,e>}$ [price(x,w) & ∀w''∈Dox_f(w) [x(w'') = x(w)]]
[∀w'∈Dox_j(w): x(w') = x(w)]

⇨ Reading A is predicted to be available. CORRECT!

- Reading B: If *know* takes individual (concept) concepts, we cannot plug in the intension of the NP --namely (12)-- into the λ-slot.

⇨ Unless we do something else, Reading B is predicted to be unavailable. WRONG!

■ Simple(r) CQs with quantifiers:
(15) can be done like reading A above: (16)-(18). But (19) presents the same problem as reading B: the intension (20) of the NP_{CQ} does not match the type of the λ-slot.

(15) Mary knows **some** / **most** European capitals.

(16) ⟦*most European capitals*⟧ =
$\lambda Q_{<<s,e>,<s,t>>}.\ \lambda w^*.\ \text{MOST}\ x_{<s,e>}$ [Eu-capitals(x,w*)] [Q(x)(w*)]

(17) LF of (15b):
Most European capitals 1 [Mary knows $t_{1,<s,e>}$]

(18) $\lambda w.\ \text{MOST}\ x_{<s,e>}$ [Eu-capitals(x,w)] [∀w'∈Dox_m(w): x(w') = x(w)]

(19) The waiter remembered **some** / **most** dishes you ordered.

(20) ⟦*most dishes that you ordered*⟧ =
$\lambda Q_{<e,<s,t>>}.\ \lambda w^*.\ \text{MOST}\ x_e$ [dish(x,w*) & order(you,x,w*)] [Q(x)(w*)]

(21) "Extensional" CQs: a definite NP provides its extension; a quantificational NP provides a QR-trace of the type corresponding to the extension.
"Intensional" CQs: a definite NP provides its intension; a quantificational NP fails to combine properly. PROBLEM!

■ GOAL of this talk: to sketch a solution to this problem within the individual concept line. Idea: in the same way that adverbials like *to some extent* and *for the most part* quantify over subquestions of a question, *some* and *most* can quantify over sub-individual concepts (sub-ICs) of a CQ individual concept.

(22) John knows [$_{CQ}$ **some / most** prices that Fred knows]. (Reading B)

≈

John **to some extent / for the most part** knows [$_{InterrCP}$ what prices Fred knows].

(23) The waiter remembered [$_{CQ}$ **some / most** dishes you ordered].

≈

The waiter **to some extent / for the most part** remembered [$_{InterrCP}$ what dishes you ordered].

■ Plot of the rest of this talk

§2. Background on QVE with interrogative clauses.
§3. Some empirical observations about "intensional" CQs with quantifiers.
§4. Towards a proposal.
§4.1. Beck and Sharvit's (2002) analysis of Adv + Interrogative
§4.2. Analysis of *for the most part / to some extent* + CQ.
§4.3. Analysis of *most / some* + CQ.
§5. Brief critical review of previous approaches to "intensional" CQs with quantifiers.
§6. Conclusions and further issues.

3. Background on Q(uantification) V(ariability) E(ffect) with interrogative clauses.

(24) John knows for the most part who cheated on the final exam.

■ Berman (1991): quantification over individuals; embedding verb takes proposition.

(25) Most x [x cheated on the final exam]
[John knows that x cheated on the final exam]

■ Lahiri (1991, 2000, 2002): quantification over propositions (true answers to the question); embedding verb takes proposition.

(26) Most p [p is an answer to 'which students cheated on the final exam' and p is true]
[John knows p]

■ Beck and Sharvit (2002):
Their observation: Some verbs that only embed questions (e.g. *depend* and generic uses of *decide* and *determine*) allow for QVE: (27)-(30).
Their proposal: quantification over subquestions; embedding verb takes subquestion.

(27) Who will be admitted depends for the most part (exclusively) on this committee.
(28) * That John will be admitted depends on this committee.

(29) The committee mostly decides which candidates will be admitted.
(30) ? The committee decides that Fritz will be admitted.

(31) A la Berman:
Most x [x will be admitted]
[that x will be admitted depends on the committee]

(32) A la Lahiri:
Most p [p is an answer to 'who will be admitted' and p is true]
[p depends on this committee]

(33) Beck and Sharvit:
Most Q' [Q' is a relevant subquestion of 'who will be admitted']
[Q' depends on this committee]

(34) Q' is a subquestion of Q
iff it is possible that the answer to Q' provides a partial answer to Q. That is,
iff $\exists w' \exists p$ [Ans-strg(Q')(w') $\rightarrow$ p $\wedge$ p is a partial answer to Q]

3. Some empirical observations about "intensional" CQs with quantifiers.

■ OBSERVATION 1: The quantification introduced by the quantifier of a CQ is not part of the intensional object fed into the λ-slot of *know*, but it is external to it. That is, as it was suggested above, the (roughly) correct paraphrase is not (35a), but (35b).
This is shown in (36)-(40).

(35) John knows most prices that Fred knows.
a. ≠ "John knows what plural object has the property of being <u>a majority of</u> prices known to Fred."
b. = John <u>for the most part</u> knows what prices Fred knows."

(36) Scenario: Fred knows which are the capitals of Spain, France, Germany, Portugal and Italy. John knows that Fred knows which are the capitals of Spain, France and Germany, but John does not know how many more capitals Fred knows.

(37) John doesn't know most capitals that Fred knows.
↳ FALSE in scenario (36).
That is, (37) cannot be understood as the negation of (35a).

(38) Scenario: Unbeknownst to the public/spies, the secret code is 60 digits long. Spy A got 15 digits, spy B 20 digits and spy C 57 digits. None of them knows what proportion of the code their finding amounts to.

(39) No spy knows most of the code.
↳ FALSE in scenario (27).
That is, the sentence cannot be understood as "No spy knows what series of digits have the property of being most of the code".

(40) Look at this. This is what spy C knows of the code. If she knew that she is so close to having the complete code, she'd be unstoppable. # Luckily, <u>she doesn't know most of the code</u>, so she may get discouraged and give up.

■ OBSERVATION 2:

- At least in some languages (e.g. Spanish and Catalan), intensional CQ occur quite productively with *know*-type embedding verbs (*know, remember, reveal, tell*, etc.), with *depend*- type embedding verbs, and with *ask*-type embedding verbs.

(41) Juan sabe los estudiantes que copiaron en el examen.
J knows the students that copied on the exam
'Juan knows the students that copied on the exam.'

(42) Lo que haga Marga esta semana depende de ti.
The that does-Subjunct M this week depends on you
'The things Marga goes this week depend on you.'

(43) Juan me preguntó lo que (pro) había comido.
J to-me asked the that (pro) had eaten
'Juan asked me what I/he/she had eaten.'

(44) - Señor Conde Lucanor -dijo Patronio-, para que sepáis lo que más os conviene hacer en este negocio, me gustaría contaros lo que sucedió a un rey moro con tres pícaros granujas que llegaron a palacio.
Y el conde le preguntó lo que había pasado.

'- Count Lucanor -said Patronio-, in order for you yo know what (*lit.* the that) is most advantageous for you in this business, I would like to tell you what (*lit.* the that) happened to an Arab king with three naughty urchins that arrived in the palace.
And the count **asked** him what (*lit.* the that) had happened.'

http://www.ciudadseva.com/textos/cuentos/esp/juanma/lucanor/32.htm

(45) Hay cartas que llegan a un destino equivocado. «Yo he tenido que devolver varias que estaban en mi buzón, pero me pregunto las que no me habrán llegado a mí», se quejaba una vecina.

'There are letters that arrive at the wrong destination. «I had to return several (letters) that were in my mailbox, but I **wonder** which letters (*lit.* the.pl.fem that) didn't reached me», complained a neighbour.'

http://www.lavozdegalicia.es/vigo/2007/09/11/0003_6130372.htm

- Interestingly, in these languages, intensional CQs admit quantificational determiners and adverbs of quantification with *know*-type embedding verbs and with *depend*-type embedding verbs, but they are very awkward with *ask*-type embedding verbs. This parallels the facts about QVE with interrogatives: (46)-(48).

(46) a. Juan sabe en su mayor parte qué estudiantes copiaron en el examen. ADV + INTERR
'Juan knows for the most part which students cheated on teh exam.'
b. Juan sabe en su mayor parte los estudiantes que copiaron en el examen. ADV + CQ
'Juan knows for the most part the students who cheated on the exam.'
c. Juan sabe la mayoría de los estudiantes que copiaron en el examen. DET + CQ
'Juan knows most students who cheated on the exam.'

(47) a. En su mayor parte, qué haga Marga esta semana depende (exclusivamente) de ti.
'For the most part, what$_{\text{INTERR}}$ Marga does this week depends (exclusively) on you.'
ADV + INTERR
b. En su mayor parte, lo que haga Marga esta semana depende (exclusivamente) de ti.
'For the most part, the things (*lit*. the that) Marga does this week depend (exclusively) on you.' ADV + CQ
c. La mayor parte de lo que haga Marga esta semana depende de ti.
'Most of what Marga will do this week depends on you.' DET + CQ

(48) a. # En su mayor parte, me preguntó qué había comido.
'For the most part, s/he asked me what$_{\text{INTERR}}$ I/she/he had eaten.' ADV + INTERR
b. # En su mayor parte, me preguntó lo que había comido. ADV + CQ
'For the most part, s/he asked me the things (*lit*. the that) I/she/he had eaten.'
c. * Me preguntó la mayor parte de lo que había comido. DET + CQ
'S/he asked me most of what I had eaten.'

■ OBSERVATION 3: CQs with quantificational determiners and with adverbs of quantification differ in the kinds of sub-individual concepts they can quantify over.

- Quantifying over *whether*-subquestions (or "whether" sub-individual concepts):

(49) For the most part, John knows which students cheated.

(50) Most Q' [Q' is a relevant subquestion of 'which students cheated']
[John knows Q']

(51) Set of *whether*-subquestions:
{Did student 1 cheat?, Did student 2 cheat?, Did student 3 cheat? ...}

(52) For the most part, John knows the students who cheated on the exam.
↳ Adv + CQ: ✓ set (51).

(53) Johb knows most students who cheated on the exam.
↳ Det + CQ: ✓ set (51).

- Quantifying over subquestions induced by a cumulative plural NP:

(54) Luise knows for the most part which books these professors recommended.

(55) {Which books did professor 1 recommend?, Which books did professor 2 recommend?, Which books did professor 3 recommend?, ...}

(56) For the most part, Luise knows the books that these professors recommended.
↳ Adv + CQ: ✓ set (55).

(57) Luisa knows most books that these professors recommended.
↳ Det + CQ: * set (55).

- Quantifying over subquestions induced by a distributive plural NP:

(58) For the most part, how well these children do depends (exclusively) on their families.

(59) {How well does child 1 do?, How well does child 2 do?, How well does child 3 do?, ...}

(60) En su mayor parte, el rendimiento diario de estos niños depende
In its/his/her/their greatest part, the performance daily of these children depends
exclusivamente del ambiente familar.
exclusively on+the athmosphere familiar
'For the most part, the daily performance of these children depends on the family athmosphere.'
⇘ Adv + CQ: ✓ set (59).

(61) # La mayor parte del rendimiento diario de estos niños depende
The greatest part of+the performance daily of these children depends
exclusivamente del ambiente familiar.
exclusively on+the athmosphere familiar
'Most of the daily performance of these children depends on the family athmosphere.'
⇘ Det + CQ: * set (59).

- Quantifying over subquestions induced by a pair-list answers:

(62) Luise mostly knows what everyone did.

(63) {What did person 1 do? What did person 2 do?, What did person 3 do?, ...}

(64) For the most part, Luisa knows the activities that everyone did.
⇘ Adv + CQ: ✓ set (63).

(65) Luisa knows most activities that everyone did.
⇘ Det + CQ: * set (63).

4. Towards a prososal.

4.1. Beck and Sharvit's (2002) analysis of Adv + Interrogative

■ Definitions:

(66) Q' is a subquestion of Q (=(40))
iff it is possible that the answer to Q' provides a partial answer to Q. That is,
iff $\exists w'\exists p$ [Ans-strg(Q')(w') → p ∧ p is a partial answer to Q]

(67) A set Part(Q)(w) of questions Q' is a division of Q into subquestions in w iff
i. For each Q' ∈ Part(Q)(w), Q' is a subquestion of Q; and
ii. Either a. $\cap${Ans-wk(Q')(w): Q' ∈ Part(Q)(w)} = Ans-wk(Q)(w)
or b. $\cap${Ans-wk(Q')(w): Q' ∈ Part(Q)(w)} = Ans-strg(Q)(w)

■ Example of adv + interrogative quantifying over *whether*-subquestions:

(68) For the most part, John knows which students cheated.

(69) λw. Most Q' [Q' ∈ Part(⟦*which students cheated*⟧)(w)]
[John knows Q' in w]

(70) {Did student 1 cheat?, Did student 2 cheat?, Did student 3 cheat?}

■ Example of adv + interrogative quantifying over subquestions induced by a distributive plural NP:

(71) For the most part, how well these children do depends (exclusively) on their families.

(72) λw. Most Q' [Q' ∈ Part(⟦*how well these children do*⟧)(w)]
[Q' depends on their families in w]

(73) {How well does child 1 do?, How well does child 2 do?, How well does child 3 do?}

4.2. Analysis of *for the most part / to some extent* + CQ

■ Proposed definition

(74) A set Part($x_{<s,e>}$) of individual concepts $y_{<s,e>}$ is a division of $x_{<s,e>}$ into sub-individual concepts iff:
For all w ∈ Dom(x): $\cup$\{y(w): y ∈ Part(x)\} = x(w).

■ Example of adv + CQ quantifying over "whether" sub-individual concepts (sub-ICs):

(75) For the most part, Juan knows the students that cheated on the final exam.

(76) ⟦*the students that cheated on the final exam*⟧ =
λw'. σz_e [*student(z,w') ∧ cheated(z,w')]
E.g.
$$\begin{bmatrix} w_{100} \text{ --> } 1+2+3 \\ w_{101} \text{ --> } 2 \\ w_{102} \text{ --> } \# \end{bmatrix}$$

(77) $\lambda w.\ \text{Most}\ y_{<s,e>}\ [C(y_{<s,e>}) \wedge y_{<s,e>} \in \text{Part}([\![\textit{the students that cheated}]\!])(w)]$
$[\text{John knows}\ y_{<s,e>}\ \text{in}\ w]$ [1]

(78)
$$\{\ \lambda w.\ \iota z_e[\text{student}(z,w) \wedge z=\text{stud1} \wedge \text{cheated}(z,w)],$$
$$\lambda w.\ \iota z_e[\text{student}(z,w) \wedge z=\text{stud2} \wedge \text{cheated}(z,w)],$$
$$\lambda w.\ \iota z_e[\text{student}(z,w) \wedge z=\text{stud3} \wedge \text{cheated}(z,w)]\ \}$$

E.g. $\left\{ \left[\begin{array}{ll} w_{100} & \text{-->}\ 1 \\ w_{101} & \text{-->}\ \# \\ w_{102} & \text{-->}\ \# \end{array}\right] \left[\begin{array}{ll} w_{100} & \text{-->}\ 2 \\ w_{101} & \text{-->}\ 2 \\ w_{102} & \text{-->}\ \# \end{array}\right] \left[\begin{array}{ll} w_{100} & \text{-->}\ 3 \\ w_{101} & \text{-->}\ \# \\ w_{102} & \text{-->}\ \# \end{array}\right] \right\}$

■ Example of adv + CQ quantifying over sub-ICs induced by a cumulative plural NP:

(79) For the most part, Luisa knows the books that these professors recommended.

(80) $[\![\textit{the books that these professors recommended}]\!] =$
$\lambda w'.\ \sigma z_e\ [\ {*}\text{book}(z,w') \wedge {**}\text{recommend}(\text{these.professors},z,w')]$

E.g. $\left[\begin{array}{ll} w_{100} & \text{-->}\ a+b+c+d+e \\ w_{101} & \text{-->}\ e+f+g \\ w_{102} & \text{-->}\ \# \end{array}\right]$

(81) $\lambda w.\ \text{Most}\ y_{<s,e>}\ [C(y_{<s,e>}) \wedge y_{<s,e>} \in \text{Part}([\![\textit{the books these profs recommened}]\!])(w)]$
$[\text{Luisa knows}\ y_{<s,e>}\ \text{in}\ w]$

(82)
$$\{\ \lambda w.\ \sigma z_e[{*}\text{book}(z,w) \wedge \text{recommend}(\text{prof1},z,w)],$$
$$\lambda w.\ \sigma z_e[{*}\text{book}(z,w) \wedge \text{recommend}(\text{prof2},z,w)],$$
$$\lambda w.\ \sigma z_e[{*}\text{book}(z,w) \wedge \text{recommend}(\text{prof3},z,w)]\ \}$$

E.g. $\left\{ \left[\begin{array}{ll} w_{100} & \text{-->}\ a+b+c \\ w_{101} & \text{-->}\ e \\ w_{102} & \text{-->}\ \# \end{array}\right] \left[\begin{array}{ll} w_{100} & \text{-->}\ b \\ w_{101} & \text{-->}\ f \\ w_{102} & \text{-->}\ \# \end{array}\right] \left[\begin{array}{ll} w_{100} & \text{-->}\ d+e \\ w_{101} & \text{-->}\ g \\ w_{102} & \text{-->}\ \# \end{array}\right] \right\}$

4.3. Analysis of *most* / *some* + CQ.

■ Proposed definitions:

(83) A set $\text{Part}(x_{<s,e>})$ of individual concepts $y_{<s,e>}$ is a division of $x_{<s,e>}$ into sub-individual concepts iff: (=(74))

For all $w \in \text{Dom}(x)$: $\cup\{y(w): y \in \text{Part}(x)\} = x(w)$.

(84) $[\![\textit{most}_{\text{CQ}}]\!] =$
$$\lambda P_{<e,st>}.\lambda Q_{<se,st>}.\lambda w.\ \text{MOST}\ y_{<s,e>}\ [C(y_{<s,e>}) \wedge y_{<s,e>} \in \text{Part}(\lambda w'.\sigma z_e[P(z)(w')]) \wedge y_{<s,e>}\ \text{is a constant function}]\ [Q(y_{<s,e>})(w)]$$

■ Example of quantificational Det + CQ quantifying over "whether" sub-ICs:

(85) John knows most students who cheated on the final exam.

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[1] C in (77) restricts the quantification to natural concepts, in order to avoid e.g. splitting of $[<w_{100},2>, <w_{101},2>]$ in (78) into two separate unnatural concepts $[<w_{100},2>]$ and $[<w_{101},2>]$.

(86) $[\![$*students who cheated on the final exam*$]\!] =$
$\lambda z_e.\lambda w'.\ {*}student(z,w') \wedge cheated(z,w')$

(87) $\lambda w.\ MOST\ y_{<s,e>}\ [C(y_{<s,e>}) \wedge$
$y_{<s,e>} \in Part(\lambda w'.\sigma z_e[[\![$*students who cheated on the final exam*$]\!](z)(w')]) \wedge$
$y_{<s,e>}$ is a constant function]
[John knows $y_{<s,e>}$ in w]

(88) $\lambda w'.\ \sigma z_e\ [\ [\![$*students who cheated on the final exam*$]\!]\ (z)(w')\ ] =$
$\lambda w'.\ \sigma z_e\ [\ {*}student(z,w') \wedge cheated(z,w')]$ (=(76))
E.g. $\begin{bmatrix} w_{100} & \text{-->} & 1+2+3 \\ w_{101} & \text{-->} & 2 \\ w_{102} & \text{-->} & \# \end{bmatrix}$

(89) $\{\ \lambda w.\ \iota z_e[student(z,w) \wedge z{=}stud1 \wedge cheated(z,w)],$ (=(78))
$\lambda w.\ \iota z_e[student(z,w) \wedge z{=}stud2 \wedge cheated(z,w)],$
$\lambda w.\ \iota z_e[student(z,w) \wedge z{=}stud3 \wedge cheated(z,w)]\ \}$
E.g. $\{ \begin{bmatrix} w_{100} & \text{-->} & 1 \\ w_{101} & \text{-->} & \# \\ w_{102} & \text{-->} & \# \end{bmatrix} \begin{bmatrix} w_{100} & \text{-->} & 2 \\ w_{101} & \text{-->} & 2 \\ w_{102} & \text{-->} & \# \end{bmatrix} \begin{bmatrix} w_{100} & \text{-->} & 3 \\ w_{101} & \text{-->} & \# \\ w_{102} & \text{-->} & \# \end{bmatrix} \}$

■ Example of quantificational Det + CQ failing to quantify over sub-ICs induced by a cumulative plural NP:

(90) For the most part, Luisa knows the books that these professors recommended.

(91) $[\![$*books that these professors recommended*$]\!] =$
$\lambda z_e.\lambda w'.\ {*}prof(z,w') \wedge {**}recommend(z,w')$

(92) $\lambda w.\ MOST\ y_{<s,e>}\ [C(y_{<s,e>}) \wedge$
$y_{<s,e>} \in Part(\lambda w'.\sigma z_e[[\![$*books that these profs recommended*$]\!](z)(w')]) \wedge$
$y_{<s,e>}$ is a constant function]
[Luisa knows $y_{<s,e>}$ in w]

(93) $\lambda w'.\ \sigma z_e\ [\ [\![$*books that these professors recommended*$]\!]\ (z)(w')\ ] =$
$\lambda w'.\ \sigma z_e\ [\ {*}book(z,w') \wedge {**}recommend(these.professors,z,w')]$ (=(80))
E.g. $\begin{bmatrix} w_{100} & \text{-->} & a+b+c+d+e \\ w_{101} & \text{-->} & e+f+g \\ w_{102} & \text{-->} & \# \end{bmatrix}$

(94) $\{\ \lambda w.\ \sigma z_e[{*}book(z,w) \wedge recommend(prof1,z,w)],$ (=(82))
$\lambda w.\ \sigma z_e[{*}book(z,w) \wedge recommend(prof2,z,w)],$
$\lambda w.\ \sigma z_e[{*}book(z,w) \wedge recommend(prof3,z,w)]\ \}$
E.g. $\{ \begin{bmatrix} w_{100} & \text{-->} & a+b+c \\ w_{101} & \text{-->} & e \\ w_{102} & \text{-->} & \# \end{bmatrix} \begin{bmatrix} w_{100} & \text{-->} & b \\ w_{101} & \text{-->} & f \\ w_{102} & \text{-->} & \# \end{bmatrix} \begin{bmatrix} w_{100} & \text{-->} & d+e \\ w_{101} & \text{-->} & g \\ w_{102} & \text{-->} & \# \end{bmatrix} \}$

➯ Quantification over these $y_{<s,e>}$ is ruled out, since *most*, as defined in (84), quantifies over constant functions.

5. Brief critical review of previous approaches to "intensional" CQs with quantifiers.

■ Potential problems for Frana (2006): She assumes factivity: the subject has a de re belief about an object that in the actual world has the CQ-property (factivity) and ascribes to that object the CQ-property.

(95) John knows the governor of California.

$\lambda w_0.\ \exists x_e [\ x = \iota y_e[\text{gov-of-CA}(y)(w_0)] \wedge \forall w\ [\ w \in Dox_j(w_0) \rightarrow x = \iota y_e[\text{gov-of-CA}(y)(w)]\ ]\ ]$

- But CQs are possible with *agree*, which is not factive, and with *depend*, which doesn't produce a belief ascription.

(96) John and Peter agree on the price of milk / a price / most prices (... but they are wrong about it / about all of them).

(97) The price of the milk depends on the Swiss market.

- Frana's approach accounts for definite and indefinite CQs very elegantly: they are (shifted to) properties, which then combine with the belief ascription verb. But, if we applied the same shifting procedure to *most*+CQ, we would get the "mostness" part as part of the belief ascription, contra observation 1.

■ Potential problems for Schwager (2008): factivity and the spurious reading B'.

(98) John knows the capital Fred knows.

(99) $\lambda w.\ \exists^K z_{se}[\ z(w) = \iota x_{se}[\text{capital}_{<se,t>}(x) \wedge \exists^F y_{se}[\ y(w)=x(w) \wedge \forall w' \in Dox_{fred}(w)[\ y(w')=x(w')]]](w) \wedge$
$\forall w'' \in Dox_{john}(w)[\ z(w'') =$
$\iota x_{se}[\text{capital}_{<se,t>}(x) \wedge \exists^F y_{se}[\ y(w)=x(w) \wedge \forall w' \in Dox_{fred}(w)[\ y(w')=x(w')]]](w'')\ ]\ ]$

(100) Idea behind (99):
F identifies "the capital of France" as "the capital named Paris" (=y)
J identifies "the capital of France" as "the capital hat Fred knows". (=z)
⇩ ⇩
From sem: $\iota x_{se}[...]$ — Selected members of pragmatically relevant Conceptual Covers: $y_{<s,e>}$ out of F for Fred and $z_{<s,e>}$ out of K for John.

(101) Lucía just learnt her first capital at the Kindergarten: she learnt that the capital of France is Paris. When her mom picked her up and heard the news from the care-takers, she decided to play a guessing game on her husband in the evening: Martin, the husband, would have to find out which capital Lucía learnt today / the capital that Lucía knows. But guess what! It turns out that Martin called the Kindergarten earlier today and heard the news as well. Martin can't tell what capitals mommy knows, but now he can tell what capital Lucía knows. This means that Lucía's mom won't be able to play her guessing game, because...
a. ... Martin (already) knows the capital that Lucía knows.
b. ... # Lucía knows the capital that Martin (already) knows.

The three individual concepts <s,e> needed are made salient by the underlined phrases, which directly or indirectly evoke the <s,e> (cf. indirect evoking by NP_{CQ}, Schwager §4.2). So, we would expect (101b) to be interpretable as (102). But (101b) cannot meant that (spurious reading B' discussed in Romero 2005).

(102) Martin identifies "the capital of France" as "the capital Lucía knows" (=y)
Lucia identifies "the capital of France" as "the capital named Paris" (=z).
⇩ ⇩
From sem: $\iota x_{se}[...]$ Values of $y_{<s,e>}$ and $z_{<s,e>}$ switched

■ Potential problems for Roelofsen and Aloni (2008): factivity and spurious reading B'.

(103) John knows every capital that Fred knows.

(104) $\forall x_m$ [(CAPITAL(x_m) ∧ K_f (?x_h.P_1(x_m))) → K_j (?x_n.P_2(x_m)]

(105) Idea behind (104):
F ascribes to "the capital of Italy" the property "being the capital named Rome"(P_1+h)
J ascribes to "the capital of Italy" the property "the capital hat Fred knows". (P_2+n)
⇩ ⇩
From sem Selected members of pragmatically relevant Conceptual Covers h and n combined with the salient properties P_1 and P_2 respectively

(106) Values for reading B pair-list reading:
m, n → {the capital of Italy, the capital of France, ...}
h → {Rome, Berlin, Paris, ...}
P_1 → $\lambda y.y=x_h$
P_2 → λx_m. CAPITAL(x_m) ∧ K_f (?x_h.P_1(x_m))

Note that one can select an <s,e> out of a derived cover (e.g. out of {the capital of Itatly, the capital of France...} (p.15). Also, the property P can be the identity property, the N'-property of the CQ, or something else (pp. 15-16). This means that, for (101b), we could in principle have the values in (107):

(107) Martin ascribes to "the capital of France" the property "being the capital Lucía knows" (=P_1+h)
Lucia ascribes to "the capital of France" the property "being the capital named Paris" (=P_2+n).
⇩ ⇩
From sem Values switched

■ Romero 2005 on Reading B:

F assigns to "the capital of Italy" the correct value in all his belief-w'
J assigns to "the capital hat Fred knows" the correct value in all his belief-w'
⇩
From semantics

6. Conclusions and further issues.

- Three empirical observations about "intensional" CQs with quantifiers (e.g. *most*, *some*):

  - Observation 1: the quantifier is not part of the content of the IC, but external to it.

  - Observation 2: in languages where CQs are productive enough to run the test, the three types of quantification in (108) follow the same pattern:

(108)

	know	*depend*	*ask*
ADV + INTERROGATIVE	✓	✓	*
ADV + CQ	✓	✓	*
DET + CQ	✓	✓	*

  - Observation 3: Det + CQ is more restriced wrt what kinds of sub-ICs we quantify over:

(109)

	"whether" sub-qu/IC	Sub-qu/IC based on distributive plural NP	Sub-qu/IC based on cumulative plural NP	Sub-qu/IC based on pair-list answers
ADV + INTERROGATIVE	✓	✓	✓	✓
ADV + CQ	✓	✓	✓	✓
DET + CQ	✓	*	*	*

- Proposed analysis:

  In the ADV + CQ construction: ADV quantifies over sub-individual concepts of the original (plural-like) individual concept.

  In the DET + CQ construction: DET builds the sum individual concept and then it quantifies over the sub-individual concepts of it that are constant functions.

- Some open questions:

  - About observation 2: Beck and Sharvit (2002) note that, in some special contexts, QVE with *ask* is possible. I do not like the corresponding Spanish translations very much, so I am leaving those examples aside. Once better examples of ADV + interrogatives are found, one could test how the ADV + CQ counterpart and the DET + CQ counterpart fair.

  - About observation 3 and proposed analysis: Why should there be a difference between the domain of quantification of ADV + CQ and of DET + CQ, to begin with? Not entirely clear, but the intuition is that a Determiner directly quantifies over individuals (or over the closest thing that comes to that, e.g. individual concepts), whereas an advervial achieves quantification over individuals only indirectly (e.g. through situations or events). Cf. Nakanishi and Romero (2004):

(110) Most of the boys lifted the piano. ✓collective, ✓distributive
(111) For the most part, the boys lifted the piano. * collective, ✓distributive

(112) a. For the most part, John read the books that these professors recommended.
b. For the most part, John can achieve the performance that those brilliant students achieved on the test.
c. For the most part, John liked what each child did.

(113) a. John read most (of the) books that these professors recommended.
b. # John can achieve most of the performance that those brilliant students achieved on the test.
c. John liked most of what each child did.

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