On Concealed Questions and Specificational Subjects

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Overview of the three lectures

1. Introduction to conceptual covers, questions & attitudes
   - Aloni 2005. A Formal Treatment of the Pragmatics of Questions and Attitudes. *Linguistics and Philosophy*, 28(5), 505–539
   - Aloni 2005. Individual Concepts in Modal Predicate Logic. *Journal of Philosophical Logic*, 34(1), 1–64 (optional)
2. **Concealed questions and specificational subjects**
   - Aloni and Roelofsen 2011. Interpreting Concealed Questions. *Linguistics and Philosophy* 34(5), 443–478
3. Epistemic indefinites and methods of identification
   - Aloni and Port 2010. Epistemic indefinites crosslinguistically. NELS. (http://maloni.humanities.uva.nl/aloniport.pdf)
   - Aloni and Port, to appear. Epistemic indefinites and methods of identifications. In Luis Alonso-Ovalle and Paula Menendez-Benito (eds) *Epistemic Indefinites*. Oxford University Press. (http://maloni.humanities.uva.nl/resources/aloni-port-EI-webversion.pdf)

Concealed Questions

- Paradigmatic example of knowledge attributions:

(1) S knows that p.

- But sentences used to express knowledge often take a different form:

(2) Philip knows who denounced Catiline. [**embedded question**]

(3) Meno knows the way to Larissa. [**concealed question**]

- Intuitively (2) and (3) are true iff Philip and Meno know the true answer to the **direct questions** (4) and (5) respectively:

(4) Who denounced Catiline?

(5) What is the way to Larissa?

- GOAL 1: present a uniform analysis of the meaning of direct questions, embedded questions and concealed questions

- **Proposal**:
(i) concealed questions are semantically questions;
(ii) questions are context sensitive expressions (Aloni 2001);
(iii) questions denote propositions (Groenendijk & Stokhof 84)

Specificational Subjects

- GOAL 2: Extend the analysis to subjects in specificational sentences
- Taxonomy of copular sentences (Higgins, 1979):

(6) The director of *Kill Bill* is fat (isn't he?) **[predicational]**
Who I met was fat.

(7) The director of *Kill Bill* is Tarantino$_F$ (isn't it?) **[specificational]**
Who I met was Tarantino$_F$.

(8) (Philip believes that) Cicero is Tully. **[equative]**

- 'Metaphysically loaded' statements like (9) arguably examples of specificational sentences:

(9) The number of Jupiter's moons is four. (Frege, 1884)
The number of planets is eight.

- Moltmann's (2011) argument: [see also Fenka 2014]

(10) Die Zahl der Planeten ist acht. Früher dachte man, es/*sie wären neun.
'The number of planets (*fem*) is eight. Before it was thought that it (*neut*) was nine.'

(11) Maria ist nicht Susanne, ?sie/*es ist Anna.
'Mary is not Sue, she /*it is Ann.'

Frege, 1884

Now our concern here is to arrive at a concept of number usable for the purposes of science; we should not, therefore, be deterred by the fact that in the language of everyday life number appears also in attributive constructions. That can always be got round. For example, the proposition "Jupiter has four moons" can be converted into "the number of Jupiter's moons is four". Here the word "is" should not be taken as mere copula, as in the proposition "the sky is blue". This is shown by the fact that we can say: "the number of Jupiter's moons is the number four, or 4". Here "is" has the sense of "is identical with" or "is the same as". So that what we have is an identity, stating that the expression "the number of Jupiter's moon" signifies the same object as the word "four".

[*Frege, The Foundation of Arithmetics, 1884, par. 57*]

Number words and ontological commitment

- Different ontological commitments of (12) and (13):

(12) Jupiter has four moons.

(13) The number of Jupiter's moons is four.

- Frege: (12) can be converted into (13), which should be analysed as an equative, which commits us to the existence of numbers:

(14) a. The number of Jupiter's moons is four.
b. The number of Jupiter's moons = four

- Anti-Fregeans: (13) should be converted into (12), in which no reference to numbers is made. E.g. Moltmann (2011):

(15) a. The number of Jupiter's moons is four.
b. How many moons has Jupiter? Jupiter has four moons.

- **My proposal**: Specificational subjects are semantically questions (concealed questions), but Fregean denotations will be assumed:

(16) a. The number of Jupiter's moons is four$_F$.
b. What is the number of Jupiter's moons? Four$_F$.

Outline

- Background
  - Concealed questions: basic data
  - Existing linguistic analyses of concealed questions
  - Groenendijk & Stokhof (1984) on questions and knowledge
  - Quantification under conceptual covers (Aloni 2001)
- Proposals
  - Concealed questions under cover (Aloni 08, Aloni & Roelofsen 11)
  - Specificational subjects as concealed questions
- Two puzzles
  - An open problem: derived covers and uniqueness
  - A puzzle of knowing who
- Appendix:
  - Constraints on Conceptual Cover Selection (Aloni & Roelofsen 2011)

References

Maria Aloni. Concealed questions under cover. In Franck Lihoreau (ed.), *Knowledge and Questions. Grazer Philosophische Studien*, 77, 2008, pp. 191–216.

Maria Aloni and Floris Roelofsen. Interpreting concealed questions. *Linguistics and Philosophy*, 2011, vol. 34, nr. 5, pp 443-478.

Concealed Questions (CQs)

Concealed questions are nominals naturally read as identity questions

Some examples

(17)
a. Meno knows the way to Larissa. (Plato, *Meno*)
b. John knows the price of milk. (Heim 1979)
c. (I know that) Peter knows the password. (cf. McCarthy 1979)
d. They revealed the winner of the contest.
e. Mary discovered the murderer of Smith.
f. Ann told me the time of the meeting.

Paraphrases

(18)
a. Meno knows what the way to Larissa is.
b. John knows what the price of milk is.
c. (I know that) Peter knows what the password is.
d. They revealed who the winner of the contest was.
e. Mary discovered who the murderer of Smith is.
f. Ann told me what the time of the meeting is.

Acquaintance (ACQ) *vs* concealed question (CQ) readings

(19) Mary knows the capital of Italy.

a. ACQ: She is acquainted with Rome.
b. CQ: She knows what the capital of Italy is.

(20) Mary knows the price of milk.

a. ?ACQ: She is acquainted with 1,60 euro.
b. CQ: She knows what the price of milk is.

In many languages epistemic 'know' and acquaintance 'know' are lexically distinct

(21)
a. German: *wissen*$_{\text{EPI}}$+ NP (only CQ) vs. *kennen*$_{\text{ACQ}}$ (Heim 1979)
b. Italian: *sapere*$_{\text{EPI}}$ + NP (only CQ) vs. *conoscere*$_{\text{ACQ}}$ (Frana 2007)
c. Dutch: *weten*$_{\text{EPI}}$ + NP (only CQ) vs. *kennen*$_{\text{ACQ}}$

(22) Maria sa la capitale dell'Italia.
Mary knows$_{\text{EPI}}$ the capital of-the-Italy
'Mary knows what the capital of Italy is' [CQ/#ACQ]

Basic Data (Heim 1979)

Definite CQs

(23) John knows the price of milk.

Quantified CQs

(24) John knows every European capital.

CQ-containing CQs (CCQs) (aka Heim's Ambiguity)

(25) John knows the capital that Fred knows.

Reading A: Fred and John know the same capital
There is exactly one country x such that Fred can name x's capital; and John can name x's capital as well

Reading B: John knows which capital Fred knows
John knows which country x is such that Fred can name x's capital (although John may be unable to name x's capital himself)

Recent Approaches

	[–perspective]	[+perspective]
Questions / Propositions	Nathan, 2006 Romero, 2007 Barker, 2015	**Aloni, 2008** **Aloni & Roelofsen, 2011**
Properties	Brogaard, 2008	Schwager, 2007
Individual concepts	Romero, 2005 Frana, 2010	Schwager, 2007

Main features of our proposals

- TYPE dimension: CQs denote question extensions, i.e. propositions;
- Their interpretation depends on the particular PERSPECTIVE that is taken on the individuals in the domain.

Illustration: Romero 2005

- CQs denote individual concepts.

(26) a. John knows$_{\text{CQ1}}$ the capital of Italy.
b. $\lambda w.\forall w' \in Dox_j(w) : \iota x_e[\text{C-of-I}(x, w')] = \iota x_e[\text{C-of-I}(x, w)]$

- Heim's ambiguity captured by allowing 'know' to take the extension and the intension of the CQ.

(27) John knows the capital Fred knows.

a. Reading A: know$_{\text{CQ1}}$ + extension CQ: $\lambda w.\forall w' \in Dox_j(w) :$
$\iota \mathbf{x}_{(s,e)}[C(\mathbf{x}, w) \wedge \forall w'' \in Dox_f(w) : \mathbf{x}(w) = \mathbf{x}(w'')](w') =$
$\iota \mathbf{x}_{(s,e)}[C(\mathbf{x}, w) \wedge \forall w'' \in Dox_f(w) : \mathbf{x}(w) = \mathbf{x}(w'')](w)$

b. Reading B: know$_{\text{CQ2}}$ + intension CQ: $\lambda w.\forall w' \in Dox_j(w) :$
$\lambda w^*.\iota \mathbf{x}_{(s,e)}[C(\mathbf{x}, w^*) \wedge \forall w'' \in Dox_f(w^*) : \mathbf{x}(w^*) = \mathbf{x}(w'')](w') =$
$\lambda w^*.\iota \mathbf{x}_{(s,e)}[C(\mathbf{x}, w^*) \wedge \forall w'' \in Dox_f(w^*) : \mathbf{x}(w^*) = \mathbf{x}(w'')](w)$

- Special purpose lexical items know$_{\text{CQ1}}$, know$_{\text{CQ2}}$ introduced:

(28) a. know$_{\text{CQ1}}$ $\mapsto \lambda \mathbf{y}_{(s,e)}.\lambda x_e.\lambda w.\forall w' \in Dox_x(w) : \mathbf{y}(w') = \mathbf{y}(w)$
b. know$_{\text{CQ2}}$ $\mapsto \lambda \mathbf{y}_{(s,(s,e))}.\lambda x_e.\lambda w.\forall w' \in Dox_x(w) : \mathbf{y}(w') = \mathbf{y}(w)$

- Problem: no B reading predicted for second conjunct in (29):

(29) John knows the capital of Italy and the price that Fred knows.

Arguments along the TYPE dimension

Coordination

(30) They knew <u>the winner of the contest</u> and that the President of the association would hand out the prize in person.

(31) I only knew <u>the price of milk</u> and who won the World Series in 1981.

Parsimony

- We'd rather not assume special purpose lexical items know$_{\mathrm{CQ1}}$, know$_{\mathrm{CQ2}}$ besides know$_{\mathrm{ACQ}}$ and know$_{\mathrm{EPI}}$.

  (32) John knows$_{\mathrm{ACQ}}$ Barack Obama.

  (33) John knows$_{\mathrm{EPI}}$ what is the capital of Italy and that it is a very old town.

  (34) John knows$_{?}$ the price that Fred knows.

  a. Individual concept approach: know$_{\mathrm{CQ1}}$, know$_{\mathrm{CQ2}}$ (Romero 05)

  b. Proposition/question approaches: know$_{\mathrm{EPI}}$

Groenendijk & Stokhof on questions and knowledge

Questions

Questions denote their true exhaustive answers (propositions):

(35) a. What is the capital of Italy?
$?y.\ y = \iota x.\text{CAPITAL-OF-ITALY}(x)$
b. $\lambda w.[\![\iota x.\text{CAPITAL-OF-ITALY}(x)]\!]_w = [\![\iota x.\text{CAPITAL-OF-ITALY}(x)]\!]_{w_0}$
λw. Rome is the capital of Italy in w (if Rome is the capital of Italy in w_0)

Knowledge

John knows$_{\text{EPI}}$ α ($K_j\alpha$) iff John's information state $\subseteq$ the denotation of α

Applications

(36) John knows what is the capital of Italy and that it is a very old town.

(37) Mary knows that John knows that it is raining
$\Rightarrow$ Mary knows that it is raining

(38) Mary knows that John knows whether it is raining
$\not\Rightarrow$ Mary knows that it is raining

(39) Rome is the capital of Italy & John knows what the capital of Italy is
$\Rightarrow$ John knows that Rome is the capital of Italy

Recent Approaches

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Main features of our proposals

- TYPE dimension: CQs denote question extensions, i.e. propositions;
- Their interpretation depends on the particular PERSPECTIVE that is taken on the individuals in the domain.

Arguments along the PERSPECTIVE dimension

Perspective-related ambiguities (cf. Schwager 07 & Harris 07)

Two face-down cards, the ace of hearts and the ace of spades.
You know that the winning card is the ace of hearts, but you don't know whether it's the card on the left or the one on the right.

(40) a. You know the winning card.
b. You know which card is the winning card.

True or false?

Intuitive analysis

Two salient ways to identify the cards:

1. By their position: the card on the left, the card on the right
2. By their suit: the ace of hearts, the ace of spades

Whether (40-a,b) are judged true or false depends on which of these perspectives is adopted.

Conceptual Covers (Aloni 2001)

- Identification methods can be formalized as *conceptual covers*:

(41) A conceptual cover CC is a set of concepts such that in each world, each individual instantiates exactly one concept in CC

In each world each individual is identified by at least one concept (existence); in no world is an individual identified twice (uniqueness)

- In the cards scenario, 3 salient covers/ways of identifying the cards:

(42)
a. {on-the-left, on-the-right} [ostension]
b. {ace-of-spades, ace-of-hearts} [naming]
c. {the-winning-card, the-losing-card} [description]
d. #{on-the-left, ace-of-spades}

- Evaluation of (43) depends on which of these covers is adopted:

(43)
a. Anna knows which$_n$ card is the winning card.
b. $K_a(?y_n.\ y_n = \iota x.\textsc{winning-card}(x))$

(44)
a. False, if $n \mapsto$ {on-the-left, on-the-right}
b. True, if $n \mapsto$ {ace-of-spades, ace-of-hearts}
c. Trivial, if $n \mapsto$ {the-winning-card, the-losing-card}

$\mapsto$ CC-indices n added to logical form, their value is contextually supplied

Further illustration: cards

- Two face-down cards, the ace of hearts and the ace of spades. You know that the winning card is the ace of hearts, but you don't know whether it's the card on the left or the one on the right.
- Modeling the scenario (the dot indicates the winning card):

$$\begin{array}{lccc} w_1 & \mapsto & \heartsuit & \spadesuit^{\bullet} \\ w_2 & \mapsto & \spadesuit & \heartsuit^{\bullet} \\ w_3 & \mapsto & \heartsuit^{\bullet} & \spadesuit \\ w_4 & \mapsto & \spadesuit^{\bullet} & \heartsuit \end{array}$$

- (45) partitions the set of worlds in two different ways depending on the assumed cover resolution:

(45) Which$_n$ card is the winning card?

under $\wp_1$: $\begin{array}{|c|} \hline w_1 \\ w_2 \\ \hline w_3 \\ w_4 \\ \hline \end{array}$ under $\wp_2$: $\begin{array}{|c|} \hline w_1 \\ w_4 \\ \hline w_2 \\ w_3 \\ \hline \end{array}$

(46) a. $\wp_1(n) = \{$the card on the left, the card on the right$\}$
b. $\wp_2(n) = \{$the Ace of Spades, the Ace of Hearts$\}$

Q1 What about $\wp_3(n) = \{$the winning card, the losing card$\}$?

Q2 Is *You know which$_n$ card is the winning card* true or false in the scenario?

Concealed questions under cover (Aloni 2008)

Main idea: CQs as embedded identity questions

(47) a. John knows the capital of Italy.
b. John knows what the capital of Italy is.

Type Shift

(48) $\uparrow_n \alpha \ =_{\text{def}} \ ?x_n.\ x_n = \alpha$

$\uparrow_n$ transforms an entity-denoting expression α into the identity question 'who$_n$/what$_n$ is α?', where n is a pragmatically determined conceptual cover

Illustration

(49) a. John knows the capital of Italy.
b. $K_j(\uparrow_n \iota x.\text{CAPITAL-OF-ITALY}(x))$
c. $K_j(?x_n.\ x_n = \iota x.\text{CAPITAL-OF-ITALY}(x))$

where x_n ranges over {Berlin, Rome, Paris, ...}

fct1 Rome is the capital of Italy & John knows the capital of Italy $\models$ John knows that Rome is the capital of Italy

fct1′ Mary knows that John knows the capital of Italy $\not\models$ Mary knows the capital of Italy

More illustrations

Cards

(50) a. Anna knows the winning card.

b. $K_a(\uparrow_n \iota x.\text{WINNING-CARD}(x))$

c. $K_a(?x_n.\ x_n = \iota x.\text{WINNING-CARD}(x))$

with x_n ranging either over {left, right} or over {spades, hearts}.

Quantified CQs

(51) a. John knows every European capital.

b. $\forall x_n(\text{EUROPEAN-CAPITAL}(x_n) \to K_j(\uparrow_m x_n))$

where:

- x_n ranges over {the capital of Germany, the capital of Italy, ...}
- x_m ranges over {Berlin, Rome, ...}

—— —— —— —— ——

fct2 Berlin is the capital of Germany & Germany is in Europe & John knows every European capital $\models$ John knows that Berlin is the capital of Germany

More illustrations

Heim's Ambiguity (definite CCQ)

(52) John knows the capital that Fred knows.

a. Reading A: John and Fred know the same capital

$$\exists x_n(x_n = \iota x_n[C(x_n) \wedge K_f(\uparrow_m x_n)] \wedge K_j(\uparrow_m x_n)) \qquad (\textit{de re})$$

b. Reading B: John knows which capital Fred knows

$$K_j(\uparrow_n \iota x_n[C(x_n) \wedge K_f(\uparrow_m x_n)]) \qquad (\textit{de dicto})$$

where:

- x_n ranges over {the capital of Germany, the capital of Italy, ...}
- x_m ranges over {Berlin, Rome, ...}

—— —— —— —— ——

fct3 Fred knows that the capital of Italy is Rome & John knows the capital that Fred knows [Reading A] $\models$ John knows that the capital of Italy is Rome

fct4 Fred knows that the capital of Italy is Rome & John knows the capital that Fred knows [Reading B] $\not\models$ John knows that the capital of Italy is Rome

Problem 1: quantified CQs are ambiguous (Heim 1979)

- Quantified CQs are ambiguous between pair-list (or specificational) and set (or predicational) readings:

(53) John knows every phone number.

a. Pair-list reading: John knows that Paul's number is 5403, that Katrin's number is 5431, etc.

b. Set reading: John knows which numbers are someone's phone number, and which are not.

- Set readings are particularly salient when the CQ noun is non-relational:

(54) John knows every prime number.

a. Pair-list reading: ?

b. Set reading: John knows which numbers are prime numbers, and which are not.

- Aloni (2008) only captures pair-list readings.

Problem 2: quantified CCQs

- Aloni (2008) derives the ambiguity of (55) as a de re/de dicto ambiguity:

(55) John knows the capital that Fred knows.

a. Reading A: $\exists x_n(x_n = \alpha \wedge K_j(\uparrow_m x_n))$

b. Reading B: $K_j(\uparrow_n \alpha)$

- But the account of quantified CQs assumes a de re representation:

(56) John knows every capital.

$\forall x_n(C(x_n) \rightarrow K_j(\uparrow_m x_n))$

- Therefore, reading B of a quantified CCQ like (57) is not captured:

(57) John knows every capital that Fred knows.
'for every country such that Fred knows its capital, John knows that it is a country such that Fred knows its capital'

Aloni (2008) observes that a de re representation of B readings is possible but it would involve the adoption of a pragmatically implausible conceptual cover.

Solution to Problem 1 and 2: Aloni & Roelofsen 08, 11

New type shift

(58) $\uparrow_{(n,P)} \alpha \ =_{\text{def}} \ ?x_n.P(\alpha)$ [cf. old: $\uparrow_n \alpha \ =_{\text{def}} \ ?x_n.x_n = \alpha$]

Two pragmatic parameters in $\uparrow_{(n,P)}$

- n is some contextually determined conceptual cover;
- P is a contextually determined property:
  - Either the property of being identical to x_n:

    (59) Specificational: $\uparrow_{n,P} \alpha \ =_{\text{def}} \ ?x_n.\ x_n = \alpha$

  - Or another salient property (generally the one expressed by CQ noun phrase):

    (60) Predicational: $\uparrow_{n,P} \alpha \ =_{\text{def}} \ ?P(\alpha)$

Solution Problem 1: Quantified CQs

(61) a. John knows every telephone number.

b. $\forall x_n(\textsc{phone-number}(x_n) \rightarrow K_j(\uparrow_{m,P} x_n))$

c. $\forall x_n(\textsc{phone-number}(x_n) \rightarrow K_j(?y_m.P(x_n))$

Pair-list reading via specificational shift $\quad P \rightarrow \lambda z.y_m = z$ (Id)

(62) $\forall x_n(\textsc{phone-number}(x_n) \rightarrow K_j(?y_m.y_m = x_n))$

- $n \rightarrow$ {Ann's phone number, Bill's phone number, ...}
- $m \rightarrow \{5403, 5431, \ldots\}$

Set reading via predicational shift $\quad P \rightarrow \textsc{phone-number}$

(63) $\forall x_n(\textsc{phone-number}(x_n) \rightarrow K_j(?\textsc{phone-number}(x_n)))$

- $n, m \rightarrow \{5403, 5431, \ldots\}$

Solution Problem 2

Quantified CCQs

(64) a. John knows every capital that Fred knows.

b. $\forall x_m((\textsc{capital}(x_m) \wedge K_f(\uparrow_{h,P_1} x_m)) \rightarrow K_j(\uparrow_{n,P_2} x_m))$

Reading A: $[P_1 = P_2]$

- Pair-list: for every country such that Fred knows its capital, John also knows its capital $[P_1, P_2 \rightarrow \mathbf{Id},\ h = n]$
- Set: for every capital of which Fred knows that it is a capital, John also knows that it is a capital $[P_1, P_2 \rightarrow \textsc{capital}]$

Reading B: $[P_2 = \textsc{capital that Fred knows}]$

- Pair-list: for every country such that Fred knows its capital, John knows that it is a country such that Fred knows its capital $[P_1 \rightarrow \mathbf{Id}]$
- Set: for every capital of which Fred knows that it is a capital, John knows that Fred knows it is a capital $[P_1 \rightarrow \textsc{capital}]$

Solution Problem 2: Quantified CCQs

Readings A $\qquad P_1 = P_2$

(65) a. John knows every capital that Fred knows.
b. $\forall x_m((\textsc{capital}(x_m) \wedge K_f(\uparrow_{h,P_1} x_m)) \rightarrow K_j(\uparrow_{n,P_2} x_m))$

Pair-list via specificational shift: $\qquad [P_1, P_2 \rightarrow \mathsf{Id},\ n = h]$

(66) $\forall x_m((\textsc{capital}(x_m) \wedge K_f(?y_n.y_n = x_m)) \rightarrow K_j(?y_h.y_h = x_m))$

- x_m ranges over {the capital of Italy, the capital of France, . . . }
- y_n and y_h range over {Rome, Berlin, Paris, . . . }

Set-reading via predicational shift: $\qquad [P_1, P_2 \rightarrow \textsc{capital}]$

(67) $\forall x_m((\textsc{capital}(x_m) \wedge K_f(?\textsc{capital}(x_m))) \rightarrow K_j(?\textsc{capital}(x_m)))$

- x_m ranges over {Rome, Berlin, Paris, . . . }

Solution Problem 2: Quantified CCQs

Readings B $\quad P_2 = \lambda x.[\textsc{cap}(x) \wedge K_f(\uparrow_{h,P_1} x)]$

(68) a. John knows every capital that Fred knows.

b. $\forall x_m((\textsc{cap}(x_m) \wedge K_f(\uparrow_{h,P_1} x_m)) \rightarrow K_j(\uparrow_{n,P_2} x_m))$

Pair-list via specificational shift: $\quad [P_1 \rightarrow \text{Id}]$

(69) $\forall x_m((\textsc{cap}(x_m) \wedge K_f(?y_n.y_n = x_m)) \rightarrow K_j(?(\textsc{cap}(x_m) \wedge K_f(?y_n.y_n = x_m)))$

- x_m range over {the capital of Italy, the capital of France, ...}
- y_n ranges over {Rome, Berlin, Paris, ...}

Set-reading via predicational shift: $\quad [P_1 \rightarrow \textsc{capital}]$

(70) $\forall x_m((\textsc{cap}(x_m) \wedge K_f(?\textsc{cap}(x_m))) \rightarrow K_j(?(\textsc{cap}(x_m) \wedge K_f(?\textsc{cap}(x_m)))$

- x_m {Rome, Berlin, Paris, ...}

Interim Conclusions on Concealed Questions

- Conceptual covers: useful tool for perspicuous representations of CQ meanings (perspective-related ambiguities, quantified CQs, Heim's ambiguity);
- Conceptual and empirical advantages wrt previous accounts, e.g. Romero (2005):
  - No multiple entries know$_{\mathrm{CQ1}}$, know$_{\mathrm{CQ2}}$, ... needed;
  - Coordination facts easily accounted for;
  - Analysis easily extendable to represent (71) (Aloni & Roelofsen 11)

(71) a. John knows the price known to Fred that Bill knows.
b. John knows every price that Fred knows.

Next: extend analysis to Specificational Subjetcs

- Specificational subjects as concealed questions under cover:
  1. Pronominalisation and focus effects explained
  2. Analysis compatible to 'Question plus deletion' accounts to connectivity effects
  3. Pragmatic account of Romero's A and B Reading examples:

(72) The price Fred thought was 2 euros was in fact 1 euro.

(73) The price Fred thought was 2 euros was the price of milk.

Specificational subjects under cover

Main idea: specificational subjects as CQs

(74) a. The number of planets is eight$_F$.
b. What is the number of planets? Eight$_F$.

Pronominalisation and focus effects (mysterious if (74-a) treated as an equative) are now easily explained

Implementation

(75) a. α is β
b. $\uparrow_n \alpha = {}^\wedge\phi(\beta)$ (adopting $\uparrow_n$ from Aloni 2008)

Main ingredients (cf. Schlenker 2003):

1. $\uparrow_n \alpha$ is a concealed question, i.e. a proposition denoting expression
2. ${}^\wedge\phi(\beta)$ stands for a propositional answer to the question
3. 'is' is identity: $\lambda x_a.\lambda y_a.x = y$, for any type a

Illustration

(76) a. The number of planets is eight.
b. $\uparrow_n \iota x.\textsc{number-of-planets}(x) = {}^\wedge\phi(8)$
c. $(?x_n.\ x_n = \iota x.\textsc{number-of-planets}(x)) = {}^\wedge\phi(8)$

where x_n ranges over {one, two, ...}

Post-copular elements as full sentences

- Question: How to go from β to $^\wedge\phi(\beta)$?

(77) a. α is β
b. $\uparrow_n \alpha = {}^\wedge\phi(\beta)$

- One possible answer: syntactic reconstruction
  - The post-copular element is a full sentence containing elided material
    1. Pre-copular element α is syntactically a nominal but semantically a question/proposition
    2. Post-copular element is semantically and syntactically a sentence
- Two arguments for syntactic reconstruction:
  - Mismatch between category pre- and post-copular element is what triggers the application of $\uparrow_n$
  - Connectivity effects in specificational sentences

Connectivity effects in specificational sentences

- Principle A of Binding Theory: reflexive pronouns should be c-commanded locally by their antecedents.

(78) a. John$_i$ likes himself$_i$.
b. #John$_i$'s mother likes himself$_i$.

- Apparent violation in specificational clauses:

(79) What John$_i$ likes is himself$_i$.

Questions plus deletion account (Ross 1972, Schlenker 2003)

- Main ingredients:
  (i) the pre-copular element in a specificational clause is a question;
  (ii) the post-copular element is a full IP which contains an elided subject which licenses the reflexive locally:

  (80) What does John$_i$ like is [$_{IP}$ ~~he$_i$ likes~~ himself$_i$].

- Evidence for (ii):

(81) What I did then was [I called the grocer]. (Ross 1972)

Back to Frege example

- Frege: committed to existence of numbers

(82) a. The number of Jupiter's moons is four.
b. The number of Jupiter's moons = four

- Anti-Fregean: not committed to existence of numbers

(83) a. The number of Jupiter's moons is four.
b. How many moons has Jupiter? Jupiter has four moons.

- My proposal: two possible analyses (depending on how ϕ is reconstructed)

(84) The number of Jupiter's moons is four.
$\uparrow_n \iota x.\textsc{number-of-J-moons}(x) = {}^\wedge\phi(4)$
a. What is the number of Jupiter's moons? The number of Jupiter's moon is four.
b. What is the number of Jupiter's moons? Jupiter has four moons.

Both analyses committed to existence of numbers given current analysis of CQ

Reading A and B of specificational subjects (SS)

- Romero (2005) examples:

(85) The price Fred thought was 2E was in fact 1E. (Reading A)

(86) The price Fred thought was 2E was the price of milk. (Readng B)

- Romero's analysis:
  - Specificational subjects denote individual concepts.
  - Reading A and Reading B sentences captured by allowing 'be' to take the extension and the intension of the NP, respectively.

(87) a. $\text{be}_{1,spec} \mapsto \lambda x_e \lambda \mathbf{y}_{(s,e)} \lambda w_s . \mathbf{y}(w) = x$

b. $\text{be}_{2,spec} \mapsto \lambda \mathbf{x}_{(s,e)} \lambda \mathbf{y}_{(s,(s,e))} . \lambda w_s . \mathbf{y}(w) = \mathbf{x}$

- Our analysis: No multiple entries for 'be' needed, question expressed by the SS interpreted under different covers in the two examples:

(88) What is the price Fred thought was 2 euros?

a. Possible answers under A: 1 euro, 2 euros, ...

b. Possible answers under B: the price of milk, ...

(89) a. Cover A: $\{$1 euro, 2 euro, ...$\}$

b. Cover B: $\{$the price of milk, the price of butter, ...$\}$

Analysis A and B examples

(90) The price Fred thought was 2 euros was in fact 1 euro.

a. What$_A$ is the price Fred thought was 2 euros? 1 euro.

b. $\uparrow_A \iota x_B[P(x) \wedge \Box_f x = 2] = {}^\wedge(\iota x_B[P(x) \wedge \Box_f x = 2] = 1)$

(91) The price Fred thought was 2 euros was the price of milk.

a. What$_B$ is the price Fred thought was 2 euros? The price of milk.

b. $\uparrow_B \iota x_B[P(x) \wedge \Box_f x = 2] = {}^\wedge(\iota x_B[P(x) \wedge \Box_f x = 2] = m)$

(92)

	milk	butter	Dox$_f$	the price Fred thought was 2
w_0	1	2	$\{w_1\}$	1
w_1	2	1	$\{w_0\}$	1

(93) a. What is the price that Fred thought was 2 euros?

b. $?y_{A/B}.y = \iota x_B[P(x) \wedge \Box_f x = 2]$

under A : $\boxed{\begin{array}{c} w_0 \\ w_1 \end{array}}$ under B : $\begin{array}{|c|}\hline w_0 \\ \hline w_1 \\ \hline \end{array}$

(94) a. Cover A: {1 euro, 2 euro, ...}

b. Cover B: {the price of milk, the price of butter, ...}

Conclusions

Summary

- Conceptual covers: useful tool for perspicuous representations of concealed questions
- Analysis easily extendable to capture Reading A and Reading B specificational sentences.
- In appendix:
  - General pragmatic constraints on cover selection and P-resolution.

Future concealed questions

- Which syntactic reconstruction of elided material in post-copular position?
- Distribution of CQs: know CQ, #believe CQ, ask CQ, #wonder CQ
- Why non-relational nouns make bad concealed questions?
- ...

Next

- An open problem
- A puzzle of knowing who

An open problem: prices, temperatures, . . .

- Sentence (95-a) involves quantification over set (95-b):

(95) a. John knows the price that Fred knows.
b. {the price of milk, the price of butter, . . . }

- In a conceptual cover:
  - in each world each individual is identified by at least one concept (existence);
  - in no world is an individual identified twice (uniqueness).
- But (95-b) need not be a conceptual cover:
  - Milk and butter might have the same price (no uniqueness)
  - 1 euro need not be the price of anything (no existence)
  - The price of milk might have not been fixed yet (no total functions)
- Same problem with temperatures, dates of birth, etc.

A possible solution

Distinction between basic and derived covers

- Only basic covers must satisfy the original requirements of uniqueness and existence;
- Derived covers are obtained from basic covers C and functions $f_{\langle s,\langle e,e\rangle\rangle}$ as:

  (96) $\{c \mid \exists c' \in C.\forall w.\ c(w) = f(w)(c'(w))\}$

Examples of derived covers

(97) {the capital of Italy, the capital of Germany,...}
based on {Italy, Germany,...} and the capital-of function

(98) {the price of milk, the price of butter, ...}
based on {milk, butter, ...} and the price-of function

Problems with *de dicto* representations of definite CCQs

- Once we allow overlapping concepts, problems arise for *de dicto* representations of definite CCQs:

(99) a. John knows the price that Fred knows.
b. $K_j(\uparrow_n \iota x_n(Px_n \wedge K_f(\uparrow_m x_n)))$

- While sentence (99-a) is intuitively false in scenario (100), analysis (99-b) under resolution (101) predicts it to be true.

(100) (a) Milk and butter both cost 2E. John does not know how much the milk or butter costs, but he knows that they cost the same. (b) Fred knows that the price of milk is 2E, but he does not know what the price of butter is. (c) John is aware that the price that Fred knows is either the price of milk, or the price of butter, but cannot determine which one of those two it is.

(101) a. $n \mapsto \{$the price of milk, the price of butter, $\ldots\}$
b. $m \mapsto \{1E, 2E, 3E, \ldots\}$

- Possible solutions: (i) Ban *de dicto* readings; (ii) more structure in notion of derived cover: we need to be able to distinguish the price of milk from the price of butter, even though they happen to have the same value in the relevant worlds.

A puzzle of knowing who

Subject vs object identity questions

(102) Who$_n$ do you think John is? **[object identity question]**

(103) Who$_n$ do you think is John? **[subject identity question]**

Subject identity questions: two puzzles

- PUZZLE 1 Subject identity question have a restricted range of possible answers:

  (104) Scenario (Heller and Wolter 2013): At a piano trio concert, you know the names of the three musicians (one is John), but you don't know who plays what instrument and what the musicians look like. The musicians come now onstage without their instruments and you ask:

  (105) Who do you think is John?
  a. The man on the left.
  b. #The violinist.

- PUZZLE 2 Not all nominals can appear in subject identity questions:

  (106) Who do you think is John/the violinist/# the man on the left?

- **Heller and Wolter (2013)** propose the following generalizations:
  (i) the answer to a subject identity question must be perceptually grounded;
  (ii) perceptually grounded expressions cannot occur in the post-copular position in identity questions.

  where a **perceptually grounded expression** is an expression whose interpretation depends on the information which is available to the conversational partners via their perception of the physical surroundings.
- Assumptions on the perceptually grounded status of expressions:
  (i) Expressions like 'the man on the left' always perceptually grounded
  (ii) Names like 'John' never perceptually grounded (they denote a 'sort')
  (iii) Descriptions like 'the violinist' sometimes perceptually grounded
- Illustration of (iii): As soon as we modify context (104) assuming that when the musicians come onstage they are carrying their instruments, the status of *the violinist* changes, (107-b) is now a felicitous answer to (107), while question (108) becomes infelicitous:

(107) Who do you think is John?
  a. The man on the left
  b. The violinist

(108) #Who do you think is the violinist?

- PROBLEM: Heller and Wolter's analysis not extendable to following cases of subject identity questions with a description in post-copular position rather than a name:

(109) a. Who do you think is the best singer of all time and why?
b. Luciano Pavarotti. I am basing this on the power, range, tone and control that he has with his voice. [Google]

(110) a. Who do you think is the most envied woman in the world?
b. Angelina Jolie. [Google]

'Luciano Pavarotti' and 'Angelina Jolie' can serve as answers but are not perceptually grounded.

- **Percus (2003)** proposes the following analysis for subject identity questions:

  (111) a. Who do you think is α?
  b. $\{$that d_1 is α, that d_2 is α, $\ldots\}$

  A proper answer to such questions should involve a term which rigidly refers to the same individual in all possible worlds in the conversationalist context set (in the sense of Stalnaker).
- Subjects vs object identity questions:
  - In subject identity questions: wh-pronouns range over objects (are of type e).
  - In object identity questions: wh-pronouns range over concepts (are of type $\langle s, e \rangle$).
- Assumption on the status of expressions:
  (i) 'the man on the left' and pronouns always rigid
  (ii) 'John' and 'the violinist' rigid only in certain contexts (intuitively when one knows who the referent is)
- Percus (2003) explains the contrast in (105), and the infelicity of (106), but also examples (109) and (110).
- While there is no privileged piece of information in virtue of which one knows who α is, there seem to be one in virtue of which one knows who is α, namely you should be able to identify α as one and the same individual in all worlds in your context set, or, at least, this seems to be what Percus proposes.

- PROBLEM: Percus (2003) cannot explain the following example:

(112) Scenario: Maria's son Lorenzo had a test at school this morning where he was asked to name the presidents of several countries. In the evening at home, Maria's husband asks Maria (113-a). Knowing that her son knows everything about Nauru, Maria correctly answers (113-b). Assume that neither Maria nor her husband recall who the president of Nauru actually is, it might be Baron Waqa or Marcus Stephen.

(113) a. Who do you think is the only president Lorenzo knew?
b. The president of Nauru.

To account for the felicity of (113-b) Percus would have to model the description 'the president of Nauru' as a rigid designator within the relevant context set, but this is very counterintuitive because the same context set should also model that the interlocutors don't know who the president of Nauru is, while Lorenzo knows.

- The conceptual cover account has a ready account of (113) but involves abandoning a two way distinction between rigid and non-rigid designators/methods of identification: the relevant individual can be identified here in three possible ways as Baron Waqa, as the president of Nauru, or as the president that Lorenzo knows, and all three identification methods play a crucial role in our interpretation of this example [possible exercise: work out the details]

Towards a solution

- A different hypothesis can at least be formulated in the present framework which captures all four cases discussed above.
  1. There seems to be an inherent ordering of identification methods, to which identity statements appear to be sensitive:

     (114) ostension $>$ naming $>$ description
  2. The preliminary observations in the previous slides suggest the following generalization, which refers to the ranking in (114):

     (115) HYPOTHESIS: In identity statements the identification method used to identify the subject (pre-copular element) should be higher in order than the identification method used to identify the object (post-copular element).
- The following apparent counterexample to (115) isn't such because it is arguably an example of a specificational sentence rather than an identity one (Higgins, 1973, p. 133)

  (116) The number of planets is eight.
- Although more empirical investigation is needed to test the validity of this hypothesis, it is easy to see that (115) covers the four cases discussed above, and also explains the tendency to prefer descriptive answers to object identity questions like (102). The question remains of why it is so.

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Some challenging data: Greenberg's Observation

The observation

(117) John found out the murderer of Smith.

(118) John found out who the murderer of Smith was.

(118) does not necessarily entail that John found out of the murderer of Smith <u>that he murdered Smith</u>; (117) does.

The problem

(119) a. John found out the murderer of Smith.
b. $\exists y_m(y_m = \iota x.\textsc{murderer-of-Smith}(x) \wedge F_j(\uparrow_{(n,P)} y_m))$

(119-b) does not necessarily entail that John solved Smith's murder:
P need not be MURDERER-OF-SMITH, m, n need not range over $\{$the murderer of Smith, ...$\}$.

Exceptions to Generalization of Greenberg's Observation

Arequipa

Context: Tomas is confronted with the following list of South American cities: Caracas, Montevideo, Lima, Porto Alegre, Quito, Arequipa. He is challenged to say which of these cities are capitals and which are not. His wife Tereza reports:

(120) He only knew the city we visited on our honeymoon last year.

On its most natural reading, this sentence conveys that Tomas only knew of the city that he and Tereza visited on their honeymoon last year, say Arequipa, whether or not it was a capital city. Crucially, Tereza does not report that Tomas only knew that Arequipa was the city that they visited on their honeymoon last year.

Exceptions to Generalization of Greenberg's Observation

Obama's daughters

Context: Michelle Obama talking to her daughters:

(121) Today I went to visit a primary school in the neighborhood. There was this child, John, who had a very tough day. He was asked to learn the presidents of all American countries, but during the exam he only knew your father.

On its most natural reading, the last sentence means that John only knew the president of the US. Crucially it does not entail that he knew that Barack Obama is Malia Ann's and Sasha's father.

Towards a Pragmatic Solution

- These counterexamples are hard, if not impossible, to explain on a <u>structural</u> account of Greenberg's contrast (e.g. Frana);
- Our pragmatic theory is flexible enough to capture exceptions to a generalization of Greenberg's observation, but it might overgenerate;
- To avoid excess meanings we need to properly constrain the contextual process of index resolution.

One last example (from Romero 2009)

Lucia

Lucia 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 Lucia learnt today/the capital that Lucia 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 capital Mommy knows, but now he can tell what capital Lucia knows. This means that Lucia's mom won't be able to play her guessing game, because ...

(122) a. ... Martin already knows the capital that Lucia knows.
b. ... #Lucia knows the capital that Martin (already) knows.

Constraints on resolutions (building on Aloni 2001)

Default resolutions for P and n

- P is typically resolved to
  - the identity property;
  - the property expressed by the CQ noun phrase.
- Cover indices n are typically resolved to
  - the rigid cover (if available);
  - naming;
  - a derived cover based on a relational CQ noun (if salient).

Exceptional resolutions

We shift to other *salient* properties/covers only:

(i) to avoid trivial/contradictory/irrelevant meanings [quality, quantity relevance]

(ii) unless the same meaning can be expressed by a more perspicuous/effective form [manner as **blocking**]

Applications: Greenberg's example

Possible representation and salient values

(123) John found out the murderer of Smith.

a. $F_j(\uparrow_{(n,P)} \iota x.\text{MURDERER-OF-SMITH}(x)))$

b. $\exists y_m(y_m = \iota x.\text{M-OF-S}(x) \wedge F_j(\uparrow_{(n,P)} y_m)$

In a neutral context:

- Salient cover: naming
- Salient properties: identity, MURDERER-OF-SMITH

Predicted resolutions

- For (123-a): $P \rightarrow$ Id & $n \rightarrow$ naming [$P \rightarrow$ M-OF-S $\Rightarrow$ trivial]

  'John found out who is the murderer of Smith'

- For (123-b): $P \rightarrow$ M-OF-S & $m \rightarrow$ naming [$P \rightarrow$ Id $\Rightarrow$ trivial]

  'Of the murderer of Smith John found out whether he is the murderer of Smith'

See Aloni and Roelofsen (2011) example (63) for analysis of Greenberg's non-concealed question example "John found out who the murderer of Smith was."

Applications: Arequipa

Possible representation and salient values

(124) Tomas only knew the city we visited on our honeymoon.

a. $K_t(\uparrow_{(n,P)} \iota x.\textsc{city-visited-on-honeymoon}(x)))$

b. $\exists y_m(y_m = \iota x.\textsc{city-visited-on-honeymoon}(x) \wedge K_t(\uparrow_{(n,P)} y_m)$

- Salient cover: naming
- Salient properties: identity, CITY-VISITED-ON-HONEYMOON, <u>CAPITAL</u>

Predicted resolution

- For (124-a): $P \rightarrow$ <u>CAPITAL</u> [others trivial or irrelevant]
  'Tomas only knew whether the city that he and Tereza visited on their honeymoon was a capital city or not'
- For (124-b): $P \rightarrow$ <u>CAPITAL</u> & $m \rightarrow$ naming [others trivial or irrelevant]
  'Tomas only knew of the city that he and Tereza visited on their honeymoon whether or not it was a capital city'
- Blocking check: Is there another more effective way to express this meaning in context? No.

Applications: Obama's daughter

Possible representation and salient values

(125) John knew your father.

a. $K_j(\uparrow_{(n,P)}\ \iota x.\text{YOUR-FATHER}(x))$

b. $\exists x_m(x_m = \iota x.\text{YOUR-FATHER}(x) \wedge K_j(\uparrow_{(n,P)}\ x_m))$

- Salient cover: naming, presidents
- Salient properties: identity, YOUR-FATHER, ...

Predicted resolution

- For (125-a): either trivial [$P \to$ YOUR-FATHER] or irrelevant [$P \to Id$]
- For (125-b): $P \to Id$ & $m \to$ presidents & $n \to$ naming [others triv or irr]

  'John knew who is the president of the US'
- Blocking check: Is there another more effective way to express this meaning in context? No ('your father' better than 'the president of US')

Applications: Lucia

Possible representation and salient values

(126) Lucia knows the capital that Martin already knows.

a. $K_l(\uparrow_{(0,P_0)} \iota x_0[C(x_0) \wedge K_m(\uparrow_{(1,P_1)} x_0)])$

b. $\exists x_0(x_0 = \iota x_0[C(x_0) \wedge K_m(\uparrow_{(1,P_0)} x_0)] \wedge K_l(\uparrow_{(2,P_1)} x_0))$

- Salient cover: naming, capitals
- Salient properties: identity, CAPITAL-M-KNOWS, <u>CAPITAL-L-KNOWS</u>, ...

Resolutions

- For (126-a): all either trivial or irrelevant
- For (126-b): $0 \rightarrow$ capitals & $P_0 \rightarrow$ CAP-L-KNOWS & $P_1 \rightarrow$ Id & $2 \rightarrow$ naming [others trivial or irrelevant]

  'Martin already knows the capital that Lucia knows'
- Blocking check: Is there another more effective way to express this meaning in context? **Yes!** $\Rightarrow$ back to irrelevant meaning