

An Explanation of Condition C effects under Apparent Reconstruction

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1. Condition C effects and the Syntax/Semantics interface

1.1 The issue: The interpretation of syntactic objects

- Syntactic structures are interpreted directly (“Direct Compositionality”, “Surface interpretation”)
- Interpretation requires a distinct level of syntactic representation. (“LF interpretation”)

1.2 The case: Reconstruction phenomena

- (1) *Someone from New York is likely to win the lottery.*
a) ‘There is a person from New York, and this person is likely to win the lottery.’
b) ‘It is likely that there is a person from New York that will win the lottery.’

Fox (1999) opposes “syntactic” accounts and “semantic” accounts:

- **Syntactic accounts** (LF interpretation)

Subject can be interpreted in surface position, or in position of its trace:

- (2) a. LF₁: [*someone from NY*]₁ is likely [_{t₁} to win the lottery]
b. LF₂: is likely [[*someone from NY*]₁ to win the lottery]

Alternatively, in copy theory of movement, subject can be interpreted in a higher or lower position:

- (3) a. [*someone from NY*]₁ is likely [[~~*someone from NY*~~]₁ to win the lottery]
b. [~~*someone from NY*~~]₁ is likely [[*someone from NY*]₁ to win the lottery]

- **Semantic accounts** (surface interpretation)

Trace can be of type *e* for entities (*x*), or of type $\langle\langle e,t \rangle t\rangle$ for quantifiers (*Q*)

- (4) a. [*someone from NY*] λx [*is very likely* [*x* to win the lottery]]
b. [*someone from NY*] λQ [*is very likely* [*Q* to win the lottery]]

1.3 The argument for the syntactic account from Condition C effects

Condition C: An r(eferential) expression (proper name or definite description) cannot be in the scope of (i.e. be c-commanded by) a coreferential expression, especially if this expression is a pronoun.

The predictions

Partly following Lebeaux (1990), Heycock (1995), Fox considers structures like

- (5) [_{QP} . . . r-expression₁ . . .]₂ [. . . pronoun₁ . . . [. . . t₂ . . .] . . .]

Prediction under “syntactic” accounts:

- Wide-scope interpretation of QP is consonant with Condition C, and should be possible.
- Narrow-scope interpretation of QP violates Condition C, and should be ruled out:

- (6) * [. . . pronoun₁ . . . [. . . [_{QP} . . . r-expression₁ . . .]₂ . . .] . . .]

Prediction under “semantic” account:

- Condition C is checked on syntax, and hence should be possible under both readings, as it cannot make reference to the semantic type of the trace.

- (7) [_{QP} . . . r-expression₁ . . .] $\lambda x/Q$ [. . . pronoun₁ . . . [. . . x/Q . . .] . . .]

Evidence: \bar{A} -Binding

Following Heycock (1995):

- (8) [*How many stories*] is *Diana likely to invent*?
a. ‘What’s the number *n* such that *Diana* is likely to invent *n*-many stories?’
b. *‘What’s the number *n* s.th. there are *n*-many stories that *D.* is likely to invent?’
↪ reconstruction of *how many stories* enforced
- (9) [*How many stories*] is *Diana likely to reinvent / recall*?
a. ‘What’s the number *n* such that *Diana* is likely to reinvent *n*-many stories?’
b. ‘What’s the number *n* s.th. there are *n*-many stories that *D.* is likely to reinvent?’
↪ reconstruction of *how many stories* possible, but not enforced

Prediction under syntactic account: This is reflected in Condition C violations:

- (10) **How many stories about Diana₁’s brother is she₁ likely to invent*?
(11) *How many stories about Diana₁’s brother is she₁ likely to reinvent*?
b. ‘What’s the number *n* s.th. there are *n*-many stories about *Diana*’s brother that *Diana* is likely to re-invent?’

Prediction under semantic account: Both sentences should be possible.

Contrast this with cases in which no Condition C violation can occur:

- (12) *How many stories about her₁ brother is Diana₁ likely to invent*?

Evidence: A-Binding

Prediction under syntactic account: Only wide-scope reading (a), otherwise violation.

Prediction under semantic account: Both readings should be possible.

- (13) [*A student of David₁'s*] *seems to him₁ t to be at the party.*
 a. 'There is a student of David's x s.th. it seems to David that x is at the party.'
 b. *'It seems to David that there is a student of him at the party.'

Contrast this with cases in which no Condition C violation can occur:

- (14) [*A student of his₁*] *seems to David₁ t to be at the party.*
 (both readings a and b).

1.4 Making the argument with relative clauses

Assume head-raising analysis of relative clauses:

- (15) **the (dozens of) stories about Diana₁'s brother that she₁ is likely to invent*

For semantic reasons, the head (*dozens of*) *stories about Diana's brother* has to "reconstruct" into the object position of *invent*, leading to a Condition C violation.

- (16) *the dozens of stories about Diana₁'s brother that she₁ is likely to reinvent / recall*
 The head does not have to reconstruct, allowing for a reading without Condition C violation.

Cf. already Munn (1994), under copy-theory of movement:

➤ The lower copy can (and perhaps must) be deleted, resulting in no Condition C violation:

- (17) *the picture of Bill₁ that he₁ likes*
 [*the picture of Bill₁*] [[*which picture of Bill₁*] [*he₁ likes [~~which picture of Bill₁~~]*]]

➤ The lower copy cannot be deleted, due to idiomaticity (*take a picture*):

- (18) **the picture of Bill₁ that he₁ took*
 [*the picture of Bill₁*] [[*which picture of Bill₁*] [*he₁ took [*which picture of Bill₁*]*]]

Cf. also Sauerland (2003), Salzmann (2006).

1.5 The relevance of Condition C effects for the debate

Jacobson (2004), a paper arguing for Direct Compositionality, identifies Condition C effects as a particularly challenging case, ends with:

I would thus argue that these [arguments] cannot be taken as a serious challenge to direct compositionality. Rather, a faith in direct compositionality should inspire us to look for a more explanatory account of things like Condition C effects.

2. A new analysis of Condition C effects

2.1 What makes the difference?

When do we find Condition C violations?

One class of cases: With verbs of creation that do not presuppose existence (Heycock 1995):

- (19) a. *Bill likes a picture.* ⇒ the picture exists before.
 b. *Bill takes a picture.* ⇏ the picture does not exist before.

- (20) *the picture of Bill₁ that he₁ likes / *took*

Idiomaticity does not appear to be the issue:

- (21) **the picture of Bill₁ that he₁ made*

Similar in other cases:

- (22) a. *Diana invented a story.* => the story does not exist before.
 b. *Diana reinvented a story.* => the story existed before.

- (23) *the stories about Diana₁'s brother that she₁ is likely to reinvent / *invent*

Cf. also other examples by Fox:

- (24) a. **How many houses in John₁'s city does he₁ think should be build?*
 b. *How many houses in John₁'s city does he₁ think should be demolished?*

they build houses => the houses do not exist before

they demolish houses => the houses exist before

- (25) a. **How many papers that John₁ writes does he₁ think will be published?*
 b. *How many papers that John₁ wrote does he₁ think will be published?*

John writes / will write papers => the papers do not exist yet

John wrote papers => the papers exist already

This again translates into asymmetries with relative clauses:

- (26) *the houses in John₁'s city that he₁ thinks should be *build / demolished*

Heycock expresses this differences in terms of **referential** vs. **non-referential**, and points out that non-referential expressions are like predicates, which also are forced to reconstruct.

2.2 Condition C effects without reconstruction

Sketch of alternative proposal within the semantic account:

➤ Condition C is not an independent principle (Reinhart 1986, Levinson 1987) but follows from a pragmatic principle to use the most specific grammatical form: "When no competing needs exist, use bound anaphora for expressing coreference!"

- (27) a. *the stories about her₁ brother that Diana₁ is likely to invent / reinvent*
 b. *the stories about Diana₁'s brother that she₁ is likely to invent / reinvent*

(a) generally preferred over (b), as *her* can be bound by *Diana* in (a) but not in (b).

➤ The need for **forming a cognitively accessible concept**, e.g. for identifying the reference set of a head noun, may compete with Condition C, and hence may block its application:

- (28) *the stories about Diana₁'s brother that she₁ is likely to reinvent / recall*

can be uttered in a situation in which there is a concept of stories about Diana's brother to which the speaker wants to point the addressee's attention, e.g. because they are identifiable, present in the common ground;

in this case, the speaker will want to describe the concept ‘stories of Diana’s brother’ with the head noun of the relative clause;

this concept can be formed only if the head noun contains the referring expression, not the bound pronoun:

stories about Diana’s brother

=> instruction: form concept $\lambda x[x$ a story about Diana’s brother]

... *that she is likely to reinvent*

=> intersect this set with $\lambda x[$ she (Diana) is likely to reinvent / recall x]

where *she* is anaphoric, not bound.

Hence need to express the concept outcompetes Condition C, i.e. the general preference of (27)(a) over (b).

- In the case of verbs of creation, this concept formation is unlikely, as the entities in question do not exist yet, hence cannot be part of the common ground; therefore prior identification of concept does not compete with Condition C, in particular: with the general preference of (27)(a) over (b).
- If the head NP contains a pronoun, this can also be interpreted anaphorically if the context provides for an antecedent. In this case, formation of a concept is possible, as the pronoun is not bound (as a variable).

(29) *All this fuzz about Diana₁! And they all think what she claims is true. At least, the stories about her₁ brother that Diana / she₁ told the journalists, no-one believes.*

➤ The bound pronoun reading

(30) *The stories about her₁ brother that she₁ is likely to invent*

2.3 Consequences of the analysis

- If no reference to identifiable entities is intended, no concept is formed, and r-expressions should be dispreferred: Predicted judgments:

(31) a. *the / *any stories about Diana₁’s brother that she₁ is likely to reinvent / recall*
 b. *the / *any picture of Bill₁ that he₁ likes*

- Reference to identifiable entities is an information-structural notion. This relates to the observation by Salzmann (2005) that stressing improves acceptability, cf. (32).

(32) *die Nachforschungen über Peter₁, die er₁ mir lieber verschwiegen hätte*
 ‘the investigations about Peter that he would rather have concealed from me’
 (Salzmann 2005)

I don’t think that stressing the antecedent is at stake – rather, it is stressing the final constituent of the head noun, which indicates a prosodic boundary, (33)

(33) *die Nachforschungen über Peter₁ in Wien), die er₁ mir lieber verschwiegen hätte*
 ‘the investigations about P. in Vienna that he would rather have concealed from me’

- Topic marking of head forces that the head is a concept, and hence should improve sentences with preceding r-expressions, cf. second-position discourse particle and other topic-marking constructions in German:

(34) *die Geschichten über Diana₁’s Bruder jedoch), die sie₁ wahrscheinlich erfinden wird, darf man nicht für ernst nehmen*
 ‘the stories about Diana’s brother PARTICLE), which she will probably invent, one should not take serious’

(35) a. *was die Geschichten über Diana₁’s Bruder betrifft, die sie₁ wahrscheinlich erfinden wird*

‘as for the stories about Diana’s brother) that she₁ is likely to invent

b. *was das Foto von Bill₁ betrifft, das er₁ aufnehmen wird*
 ‘as for the picture of Bill₁) that he₁ will take

- Non-adjacency of head with relative clause generally blocks application of Condition C; reason: this also requires that a concept has been formed.¹

(36) *Wir werden uns morgen wohl die Geschichten über Diana’s Bruder anhören müssen), die sie wahrscheinlich erfinden wird.*

‘We will probably have to listen to the stories about Diana’s brother tomorrow that she is likely to invent.’

- Focus in the relative clause improves acceptability (Repp, pers. comm.). Reason: Focus indicates that there are alternatives of referents of the head noun (i.e. different pictures of Bill), hence the relevant concept has to be present.

(37) a. *the picture of Bill₁ [that he₁ took in Vienna]_F*
 b. *the picture of Bill₁ [that he₁ took himself]_F*

3. Non-reconstruction analysis of apparent head raising in intensional contexts

In this section, I will recall the non-reconstruction analysis of apparent head-raising cases in intensional contexts (cf. Grosu & Krifka 2008), as it will bear on the analysis of apparent reconstruction phenomena with verbs of creation.

3.1 The standard inteseective interpretation of restrictive relative clauses

Intersection of the interpretation of the head and the interpretation of the relative clause:

(38) $[[_{DP} the [_{NP} [_{NP} apple] [_{CP} that_1 [Adam ate t_1]]]]]$

(39) a. $[[[_{NP} apple]]] = \lambda i \lambda u [APPLE(i)(u)]$, i.e. u (type e) is an apple in the world i

b. $[[[_{CP} that_1 [Adam ate t_{e,1}]]] = \lambda i \lambda u_1 [EAT(i)(u_1)(ADAM)]$ disregarding tense

c. $[[[_{NP} [_{NP} apple] [_{CP} that_1 Adam ate t_{e,1}]]] = \lambda i [[[_{NP} apple]]](i) \cap [[[_{CP} that_1 Adam ate t_{e,1}]]](i)]$
 $= \lambda i [\lambda u [APPLE(i)(u)] \cap \lambda u_1 [EAT(i)(u_1)(ADAM)]]$
 $= \lambda i \lambda u [APPLE(i)(u) \wedge EAT(i)(u)(ADAM)]$

¹Cf. also observation in Hulsey & Sauerland (2006) re: failure of reconstruction of idiom chunks with extraposed relative clauses: *Mary praised the headway (*last year) that John made*. New explanation: This requires that *headway* forms an independent concept, which is problematic for idioms chunks.

3.2 Relative clauses with individual concepts

Grosu & Krifka (2008) treat cases in which the head apparently has to be reconstructed.

- (40) *the gifted mathematician that Bill claims to be*
=> ‘Bill claim to be a gifted mathematician’

Non-reconstruction analysis, under the assumption of individual concepts (functions from possible worlds to individuals, type (s,e)), here: variables x.

➤ Interpretation of head noun is shifted to a property of individual concepts:

- (41) $\llbracket \text{gifted mathematician} \rrbracket$
= $\lambda i \lambda u [\text{GIFTED MATH}(i)(u)]$, regular, property of individuals
= $\lambda i \lambda x \forall i' \in \text{DOM}(x) [\text{GIFTD MATH}(i')(x(i'))]$, shifted, property of individual concepts
the set of all individual concepts x that are gifted mathematicians for all indices for which they are defined.

➤ Interpretation of relative clause with individual concept trace:

- (42) $\llbracket \text{that}_1 \text{ Bill claims to be } t_{1,(s,e)} \rrbracket = \lambda i \lambda x \forall i' \in \text{CLAIM}(i)(\text{BILL}) [\text{BILL} = x(i')]$
the set of all individual concepts x such that in the worlds i' of Bill's claims in i, Bill is identical to the entity that x maps i' to. (Names are rigid designators, for simplicity).

➤ Regular intersective interpretation, as before:

- (43) $\llbracket [\text{NP } \llbracket \text{gifted mathematician} \rrbracket]_{\text{CP}} [\text{that}_1 \text{ Bill claims to be } t_1] \rrbracket$
= $\lambda i [\llbracket \text{gifted mathematician} \rrbracket(i) \cap \llbracket \text{that}_1 \text{ Bill claims to be } t_1 \rrbracket(i)]$
= $\lambda i \lambda x [\forall i' \in \text{DOM}(x) [\text{GIFTED MATH}(i')(x(i'))] \wedge \forall i' \in \text{CLAIM}(i)(\text{BILL}) [\text{BILL} = x(i')]]$
maps possible worlds i to the set of individual concepts x such that x is a gifted mathematician for all worlds i' for which x is defined, and for all worlds i' that are compatible with the claims of Bill in i, Bill is identical to x in i'.

This entails that

- In all claim-worlds, Bill is a gifted mathematician.
➤ The individual concepts x identify Bill in all claim-worlds.

Grosu & Krifka interpret the definite article *the* in such a way that it identifies that x that is defined for exactly the claim worlds.

The head noun *gifted mathematician* appears to be in the scope of *claims*, but it isn't.

3.3 Individual concept relative clauses and Condition C effects

We find the same Condition C effects as with verbs of creation:

- (44) a. *The responsible guardian of his₁ sister that Bill₁ claims to be*
b. **The responsible guardian of Bill₁'s sister that he₁ claims to be*

Explanation:

- The individual concept denoted by the head *responsible guardian of Bill's sister* in the required reading is non-referential. It is not a natural concept, as the individual concept

are not anchored to the real world. Hence alternative (a) using a bound pronoun is preferred.

- In contrast, the individual concept denoted by the full phrase *responsible guardian of his₁ sister that Bill₁ claims to be* is a natural concept; the individual concepts are anchored to Bill and his claim-worlds; it is presupposed that Bill claims to be a gifted mathematician.

Notice that prosodic boundaries block the required readings.

- (45) a. *the gifted mathematician) that Bill claims to be*
b. *der begabte Mathematiker jedoch, der Bill zu sein behauptet*
(46) *der verantwortliche Vormund seiner Schwester jedoch, der Bill zu sein behauptet*
only reading: *seiner* does refer to a person different from Bill. ²

4. Individual concepts and verbs of creation

4.1 The semantics of verbs of creation: Previous accounts

Verbs of creation are peculiar, as their theme argument does not exist before the event of creation (the time at which the verb of creation is true).

- (47) a. *They are visiting a castle in the center of Berlin.*
⇒ there is a castle in the center of Berlin.
b. *They are building a castle in the center of Berlin.*
⇏ there is a castle in the center of Berlin.

A variety of semantic proposals exist – cf. Dowty (1979), von Stechow (2001), Piñon (2007). Von Stechow: verbs of creation subcategorize for a property, like intensional verbs as *seek*. Possible problem: definite descriptions, names:

- (48) a. *They are building the new castle in the center of Berlin.*
b. *We are in Florence, 1509. Leonardo is painting the Mona Lisa.*

Von Stechow defends a property analysis in this case as well (singleton properties).

4.2 Verbs of creation as as involving individual concepts

Proposal: Verbs of creation select for individual concepts (cf. Krifka 2009 for a special case).

- (49) $\text{BUILD}(i)(x)(u)$ iff u builds x at the world-time(interval) i,
where $x(i')$ is undefined for all $i' < i$,
and there is an $i', i < i'$, such that $x(i'')$ is defined for all $i < i'' \leq i'$,
(undecided about i itself).

That is, the individual concept evaluates to an entity after the time of the building, is undefined before.

²Another possible line of explanation of accentual effects (H. Truckenbrodt, pers. comm.) in line with the head raising account: *gifted mathematician* receives focal accent in base position, leading to a realization within one accentual phrase.

$[\text{the } \llbracket \text{gifted mathematician} \rrbracket]_i [\text{that Bill claims to be } \llbracket \text{gifted mathematician} \rrbracket]_F$

The individual concepts that are created are supposed to have a certain rigidity, i.e. they will typically evaluate to the same entity for all indices – but there are exceptions, e.g. ship of Theseus, where every part is replaced over time.

4.3 Relative clauses with verbs of creation

Similar to derivation of (43):

- (50) $\llbracket \llbracket \llbracket \text{NP } \textit{story} \rrbracket \llbracket \text{CP } \textit{that}_1 \textit{ Diana will invent } t_{1,(s,e)} \rrbracket \rrbracket \rrbracket$
 $= \lambda i \lambda x [\forall i' \in \text{DOM}(i) [\text{STORY}(x(i'))] \wedge \exists i'' [i < i'' \wedge \text{INVENT}(i'')(x)(\text{DIANA})]]]$
 a property of individual concepts x that are stories and that start their life span at some later time by being invented by Mary.

The head noun *story* as a property of individual concepts is not a natural cognitive concept, as the individual concepts are not restricted by the actual index.

5. Making sense of “concept formation”

5.1 Recall main argument

- (51) a. *the story about Diana₁'s brother that she₁ will reinvent / recall*
 b. **the story about Diana₁'s brother that she₁ will invent*
- (a) is fine as *reinvent / recall* suggest that a concept *story about Diana's brother* is formed; for this it is necessary to use a referring expression, allowing for a non-bound reading.
 - (b) is bad, as the verb *invent* makes it unlikely that this concept is formed, as the the stories do not exist yet; hence a bound reading of *she* is preferred, which is possible with the competing clause (c):
- c. *the story about her₁ brother that Diana₁ will invent*

5.2 Some related ideas

- In phase theory (Chomsky 2001) syntactic objects are built and then “sent to interpretation” (?)
 - In Jacobs (1997), prosodic integration is related to instructions to build up a semantic interpretation in the mind of the addressee. E.g.thetic vs. categorical sentences:
- (52) a. *The pope died.* -- one step: \downarrow [the pope] died \downarrow
The pope died – two steps: \downarrow [\downarrow the pope \downarrow] died \downarrow or [\downarrow the pope \downarrow \downarrow died \downarrow]
- Discourse representation theory (Kamp 1981) proposes two tasks of semantics: (a) describing truth conditions, (b) describing mental representations; DRSs are meant to describe the latter.

5.3 Possible evidence for cognitive concepts

- Topics must be concepts

- Semantic entities asked for in constituent questions must be concepts
- Focus (phrases) must be concepts.

5.4 What are cognitive concepts?

One possible line: Cognitive concepts as subsets of semantic domains that are cognitively accessible.

- Semantic domains, the set of all objects used in interpretation;
- Cognitive concepts, subsets of semantic domains that agents have cognitive access to; the accessible concepts change over time.

More formally:

- the full space of semantic denotations $\mathbf{D} = \cup \{D_\tau \mid \tau \text{ is a type}\}$, where e, s, t are basic types and if σ, τ are types, then (σ, τ) is a type, and D_e = set of entities; D_s = set of indices; D_t = set of truth values, $D_{(\sigma,\tau)}$ = set of (partial) functions from D_σ to D_τ
- the cognitive concepts accessible (by an agent, at some time) $\mathbf{C} \subset \mathbf{D}$; where for each type τ , C_τ is the set of cognitive concepts accessible by the agent.

Examples:

- (53) a. C_e : The set of entities (persons, things) that are known to the agent; in particular: referents of proper names.
- b. $C_{(s,e)}$: The set of individual concepts that are known to the agent; e.g. $\llbracket \textit{the Pope} \rrbracket$, $\llbracket \textit{Miss America} \rrbracket$ etc.
- c. $C_{(s,(e,t))}$: The set of properties that are known to the agent; natural/social kinds, familiar sets, e.g. $\llbracket \textit{tiger} \rrbracket$, $\llbracket \textit{plumber} \rrbracket$, $\llbracket \textit{things in my drawer} \rrbracket$

Examples of cognitive concept formation:

- (54) *Contemplating a blocked pipe, middle-aged plumbers in cloth caps often bemoan the demise of apprenticeships and pour scorn on the training, or lack of it, received by today's youngsters.* (<http://www.tes.co.uk/article.aspx?storycode=330608>)

The concept (underlined) probably does not exist in the reader's mind yet, but has to be formed – it's a generic sentence, where the restrictor is a topic, hence a concept.

The concept can be formed with available concepts and semantic operators, e.g.:

- (55) $\llbracket \textit{plumber} \rrbracket = \lambda i \lambda u [\text{PLUMBER}(i)(u)] \in C_{(s,(e,t))}$
 $\llbracket \textit{middle-aged} \rrbracket = \lambda i \lambda P \lambda u [P(u) \wedge \text{MIDDLE-AGED}(i)(P)(u)]$.
 not a concept; perhaps *middle-aged* in the sense of *middle-aged person* is one.
 $\llbracket \textit{middle-aged plumbers} \rrbracket = \lambda i [\llbracket \textit{middle-aged} \rrbracket (i)(\llbracket \textit{plumbers} \rrbracket (i))]$
 $= \lambda i \lambda u [\text{PLUMBER}(i)(u) \wedge \text{MIDDLE-AGED}(i)(P)(u)]$

Enforce concept formation:

$\llbracket \llbracket \textit{middle-aged plumbers} \rrbracket_c \rrbracket =$ as before, add this meaning to the concepts.

General interpretation format:

- Interpretation is with respect to a set of concepts \mathbf{C} ;

➤ concept formation is indicated in syntax/prosody, here by subscript c.

- (56) a. $\llbracket [\alpha]_c \rrbracket^c = \llbracket \alpha \rrbracket$, provided that $\llbracket \alpha \rrbracket \in C$
 b. if this provision is not satisfied: Accomodate C,
 i.e. $C := C \cup \{\llbracket \alpha \rrbracket\}$;
 this accomodation is cheap if $\llbracket \alpha \rrbracket$ is a natural meaning for a concept;
 it is costly if $\llbracket \alpha \rrbracket$ is not a natural meaning for a concept.

This does not state what concepts actually are good for, which role they play in processing – desideratum for the proposal developed here.

Depending on the relation to other concepts and to general experience, accomodation of C with new concepts can be more or less costly.

Example of costly concept:

- (57) $\llbracket \textit{gifted mathematician} \rrbracket$, shifted (cf. (41)):
 $\lambda i \lambda x \forall i' \in \text{DOM}(x) [\text{GIFTD MATH}(i')(x(i'))]$,
 as the individual concepts are not anchored (alined) with particular individuals

Example of relatively cheap concept:

- (58) $\llbracket \textit{gifted mathematician that Bill claims to be} \rrbracket$, cf. (43):
 $\lambda i \lambda x [\forall i' \in \text{DOM}(x) [\text{GIFTED MATH}(i')(x(i'))] \wedge \forall i' \in \text{CLAIM}(i)(\text{BILL}) [\text{BILL} = x(i')]]$
 as the individual concepts in this set are anchored to an individual, Bill;
 the concept of ‘Bill at those indices at which he is according to Bill’s claims,
 where he is a gifted mathematician at these indices’

Example of costly concept:

- (59) $\llbracket \textit{story about Diana's brother} \rrbracket$, shifted:
 $\lambda i \lambda x \forall i' \in \text{DOM}(x) [\text{STORY}(i')(x(i')) \wedge \text{ABOUT}(i')(\text{BROTHER}(i)(\text{DIANA})) (x(i'))]$

5.5 Functional concepts

Important for our purpose: We assume that functional concepts are costly.

➤ They do exist, cf. answer to functional questions, but they are complex:

- (60) a. *What did every guest contribute to the book?*
 b. *The recipe of his favorite dish.*
 function that maps every (male) guest x to x’s favorite dish
 $\lambda u \in \text{MALE.GUEST}(i) [\text{FAVORITE}(i)(\text{DISH}(i))(u)]$

➤ But typically they are avoided:

- (61) a. $\llbracket \textit{story about Diana's brother} \rrbracket$, not shifted
 $= \lambda i \lambda u [\text{STORY}(i)(x) \wedge \text{ABOUT}(i)(\text{BROTHER}(i)(\text{DIANA}))(u)]$ -- a good concept
 b. $\llbracket \textit{story about her brother} \rrbracket$ (with *her* a bound pronoun)
 $= \lambda u'. \text{FEMALE}(u') \lambda i \lambda u [\text{STORY}(i)(u) \wedge \text{ABOUT}(i)(\text{BROTHER}(i)(u'))(u)]$ -- a bad concept
 c. $\llbracket \textit{story about her brother} \rrbracket$ (with *her* an anaphoric pronoun bound to Diana)
 (same as a) -- a good concept

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