Bodyguards Under Cover: The Status of Individual Concepts

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SALT XVII, UConn, May 10-13, 2007

Introduction

- capture the semantics of subject intensional verbs like *change* and *rise*, intuitively true of functions from world/time to values (= individuals) - true of individual concepts

  - Where do these individual concepts come from?

- Montague (1974): individual concepts come from the lexicon: common nouns have $\langle\langle s, e\rangle, t\rangle$-extensions (solves the temperature paradox)

- Lasersohn (2005): derives individual concepts during semantic composition (as intensions of Fregean definite descriptions); extensions of common nouns are $\langle e, t\rangle$

- problem for Lasersohn (2005): hinges on uniqueness on two levels (i) the temperature of only one location is relevant (fails for quantificational examples)

  (ii) functionality (e.g. *temperature, father*): if intensional verbs like *change*, *rise* combine with properly relational nouns (e.g. *critical value, bodyguard, brother*): where do the individual concepts come from?

- switch perspective: quantification under cover takes into account how we individuate individuals - brings in individual concepts (pragmatics)

1 Individual Concepts from the Lexicon

1.1 Functions and Values: *The Temperature Paradox*

- the classic (Barbara Partee):

(1) a. The temperature is rising.
 b. The temperature is ninety.
 $\not\Rightarrow$

c. Ninety is rising.

variation from Löbner (1981):

(2) a. Right now, the temperature of the air in my refrigerator is the same as the temperature of the air in your refrigerator.
b. The temperature of the air in my refrigerator is rising.
$\not\Rightarrow$
c. The temperature of the air in your refrigerator is rising.

- independence of numbers, maths and physics (Löbner 1981; Janssen 1984)

(3) a. The mayor of Frankfurt is Petra Roth.
b. The mayor might change on Sunday.
$\not\Rightarrow$
c. Petra Roth might change on Sunday.

for the rest of the talk: ignore the `partial change`-reading (= a particular individual changes with respect to some property)

- function/value; role/occupant;...

1.2 Montague's (1974) solution in PTQ

- (translated to a version of Ty2)
- at an index (w, t), nouns cannot just denote sets of individuals ($\langle e, t\rangle$), they denote sets of individual concepts (= functions from indices to individuals); type $\langle\langle s, e\rangle, t\rangle$
- the model contains an abstract degree individual "90-degrees-Fahrenheit", picked out by the type e-constant **90F** at each index (in IL, a meaning postulate ensures that its intension is constant)

  ninety $\mapsto$ the set of properties this 90-degrees-Fahrenheit-individual has: $\boldsymbol{\lambda P.P_{(w,t)}(\lambda(w,t).\mathbf{90F})}$

- *the* as Russellian quantifier, *be* as extensional identity:

(4) a. $\mathbf{the} \equiv \boldsymbol{\lambda P_{\langle\langle s,e\rangle,t\rangle}\lambda Q_{\langle\langle s,e\rangle,t\rangle}.\exists x[\forall y[P(y) \leftrightarrow y = x] \wedge Q(x)]}$
b. $\mathbf{be} \equiv \boldsymbol{\lambda \mathscr{P}_{\langle s,\langle s,\langle\langle s,e\rangle,t\rangle\rangle\rangle}\lambda x_{\langle s,e\rangle}.\mathscr{P}_{(w,t)}(\lambda(w,t)\lambda y.x(w,t) = y(w,t))}$

- PTQ-translation of the temperature paradox:

(5) $\boldsymbol{\exists x[\forall y[\mathbf{temperature}_{(w,t)}(y) \leftrightarrow x = y] \wedge \mathbf{rise}_{(w,t)}(x)]}$

(6) $\exists x[\forall y[\textbf{temperature}(y) \leftrightarrow x = y] \wedge x((w,t)) = \textbf{90F}]$

(7) $\textbf{rise}_{(w,t)}(\lambda(w,t).\textbf{90F})$

- the temperature at the index of evaluation is 90 F (32C); *rise* is true of the unique individual concept that describes the salient temperature at the index of evaluation; but: rising cannot be a property of the individual picked out by the constant **90F** (nor of the corresponding individual concept $\lambda(w,t).\textbf{90F}$)

1.3 The Temperature Price Puzzle

- Anil Gupta; discussed by Dowty, Wall, and Peters (1981)
- related type of inference (think of *the Starbucks policy*: energy costs are rising, so if you want your coffee hotter...):

(8) a. Necessarily, the temperature is the price.
b. The temperature is rising.
intuitively: $\Rightarrow$; *prediction Montague*: $\not\Rightarrow$
c. The price is rising.

<u>remark:</u> Romero (2006a) points out that many (natural) examples lack the habitual ("at all times") component Montague attributes to *necessarily*; she can avoid many (but not all) counterintuitive predictions already by taking serious habitual quantification

- a variation of the original along the lines of Löbner (1981):

(9) a. At all worlds and times, the temperature of the air in my refrigerator is the same as the temperature of the air in your refrigerator.
b. The temperature of the air in my refrigerator is rising.
intuitively: $\Rightarrow$; *prediction Montague*: $\not\Rightarrow$
c. The temperature of the air in your refrigerator is rising.

- prediction: not valid.

(10) $\Box\exists x[\forall y[\textbf{temperature-in-my-refrigerator}(w,t)(y) \leftrightarrow x = y] \wedge \exists z[\forall y[\textbf{temperature-in-your-refrigerator}_{(w,t)}(y) \leftrightarrow z = y] \wedge x(w,t) = z(w,t)]]$

(11) $\exists x[\forall y[\textbf{temperature-in-my-refrigerator}_{(w,t)}(y) \leftrightarrow x = y] \wedge \textbf{rise}_{(w,t)}(x)]$

(12) $\exists \boldsymbol{x}[\forall \boldsymbol{y}[\textbf{temperature-in-your-refrigerator}_{(\boldsymbol{w},\boldsymbol{t})}(\boldsymbol{y}) \leftrightarrow \boldsymbol{x} = \boldsymbol{y}] \wedge \textbf{rise}_{(\boldsymbol{w},\boldsymbol{t})}(\boldsymbol{x})]$

- Montague's semantics for $\Box$:

(13) $[\![\Box_{(\boldsymbol{w},\boldsymbol{t})}\boldsymbol{\lambda(w,t).\phi}]\!] = 1$ iff $[\![\boldsymbol{\lambda(w,t).\phi}]\!](w,t) = 1$ for all $w \in W$ and $t \in T$.

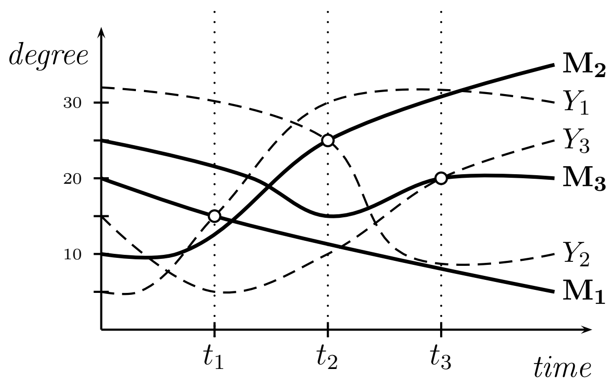
semantics for *rise*:

(14) $[\![\textbf{rise}]\!](w,t)(f_{\langle s,e\rangle}) = 1$ iff for all t', t'' in a contextually given interval T that includes t: if $t' < t''$, then $f(w)(t') < f(w)(t'')$.

- consider a model M with one world w and three temporal instants t_1, t_2, t_3:

(15) a. $[\![\textbf{temp-in-my-ref'}]\!]((w,t)) = \{M_1\}$, $[\![\textbf{temp-in-my-ref'}]\!](\langle w,t_2\rangle) = \{M_2\}, \ldots,$ $[\![\textbf{temp-in-your-ref'}]\!](\langle w,t_1\rangle) = \{Y_3\}$
b. $M_1 = \{\langle(w,t_1),15\rangle, \langle(w,t_2),12\rangle, \langle(w,t_3),8\rangle\}$,
$M_2 = \{\langle(w,t_1),12.5\rangle, \langle(w,t_2),25\rangle, \langle(w,t_3),30\rangle\}, \ldots$

(16) graphically:



1.4 Locating the Problem: $\langle s, \langle\langle s,e\rangle,t\rangle\rangle$

- the double index dependence of *temperature*:
  - at a fixed index, it denotes a set functions that assign individuals (degrees) to indices (individual concepts) - inner index dependence (IID)
  - it can denote different such sets at different indices - outer index dependence (OID)

- various ways out:

    1. **meaning postulate** (= give up *outer index dependence*)
    2. intensions of **Fregean definite descriptions** (Lasersohn 2005) (= give up *inner index dependence*)
    3. **conceptual covers**: *outer index dependence* = semantics, *inner index dependence* = pragmatics
    4. intensional identity (stronger version of *be*)
    5. habitual vs. punctual identity + meaning postulate only across OID within one world (Romero 2006a)
    6. type shift value to function time-value (cf. Schwager 2006)

1.5 Montague's Forgotten Meaning Postulate

- do away with/constrain outer index dependence

- cf. Dowty, Wall, and Peters (1981); spelt out as (17) by Lasersohn (2005):

(17) $\forall \boldsymbol{x} \forall (\boldsymbol{w}, \boldsymbol{t})[\boldsymbol{\alpha}_{(\boldsymbol{w},\boldsymbol{t})}(\boldsymbol{x}) \rightarrow \forall (\boldsymbol{w}, \boldsymbol{t}) \boldsymbol{\alpha}_{(\boldsymbol{w},\boldsymbol{t})}(\boldsymbol{x})]$,
where $\boldsymbol{\alpha}=$ **temperature** or **price**

- That works for the temperature-price puzzle/my & your refrigerator.

- problem: should be refined to take into account the implicit argument

  if more than one temperature is under consideration (e.g. *the temperature of the milk* and *the temperature of the tea*) it is not enough to say *"once a temperature - always a temperature"*; this still allows for the *tea & milk-confusion*:

  (18) a. Necessarily, the temperature of the tea, not of the milk, is the price of the tea!
  b. The temperature of the tea is rising.
  intuitively: $\Rightarrow$; *prediction Montague*+MP(17): $\not\Rightarrow$
  c. The price of the tea is rising.

  (does not follow at an index $\langle w, t\rangle$ where the *temperature of the tea* is the individual concept which is normally the *temperature of the milk* and happens to be extensionally equivalent to it at $\langle w, t\rangle$)

- Zimmermann (1999) for a critical view on Meaning Postulates.

2 Lasersohn: Deriving Individual Concepts

- Fregean definite descriptions are type $e \Rightarrow$ their intensions are $\langle s, e\rangle$ (individual concepts!)
- ad *outer index dependence* (OID): objects that fall under the denotation of common nouns should be allowed to vary from index to index (*keep!*)
- ad *inner index dependence* (IID): forced by the Montagovian treatment of the definite article as a Russellian definite description (*give up!*)

(19) $\mathbf{the} \equiv \boldsymbol{\lambda P_{\langle\langle s,e\rangle,t\rangle}\lambda Q_{\langle\langle s,e\rangle,t\rangle}.\exists x[\forall y[P(y) \leftrightarrow y = x] \wedge Q(x)]}$

(*rise* requires an intensional argument, so, the first argument of the quantifier has to be of that type, too)

- start out from *temperature* as "actual temperature values" - use the intension of *(the unique) temperature (value)* when you need the function
- proposal Lasersohn:
  - Fregean (presuppositional) *the*:

    (20) $\mathbf{the} \equiv \boldsymbol{\lambda P_{\langle \mathrm{s},\langle \mathrm{e},\mathrm{t}\rangle\rangle}\lambda Q_{\langle\langle s,e\rangle,t\rangle}.Q(\lambda(w,t).\iota u[P_{(w,t)}(u)])}$

    (21) $[\![\boldsymbol{\iota u\phi}]\!]^g(w,t)$ is the unique object d
    such that $[\![\boldsymbol{\phi}]\!]^{g[\mathbf{u}/d]}(w,t) = 1$
    if such an object d exists; undefined otherwise.

  - **temperature** is a constant of type $\langle s, \langle e, t\rangle\rangle$
  - untouched: **rise**, constant of type $\langle\langle s, e\rangle, t\rangle$
    Consequently, $\boldsymbol{\lambda w.\iota u}[\mathbf{temperature}_{(w,t)}\boldsymbol{(u)}]$ denotes always the same function that picks out the temperature at each index.
  - Lasersohn's translation for the temperature-paradox:

    (22) a. $\mathbf{rise}_{(w,t)}\boldsymbol{(\lambda(w,t).\iota u}[\mathbf{temperature}_{(w,t)}\boldsymbol{(u)}])$
    b. $\boldsymbol{\iota u}[\mathbf{temperature}_{(w,t)}\boldsymbol{(u)}] = \mathbf{90F}$
    c. $\mathbf{rise}_{(w,t)}\boldsymbol{(\lambda(w,t).}\mathbf{90F)}$

  - Lasersohn's translation for the temperature-price puzzle (my/your refrigerator):

    (23) a. $\Box_{(w,t)}\boldsymbol{(\lambda wt.\iota u}[\mathbf{temp\text{-}in\text{-}my\text{-}ref}_{(w,t)}\boldsymbol{(u)} = \boldsymbol{\iota u}[\mathbf{temp\text{-}in\text{-}your\text{-}ref}_{(w,t)}\boldsymbol{(u)}])$
    b. $\mathbf{rise}(\boldsymbol{\lambda(w,t).\iota u}[\mathbf{temp\text{-}in\text{-}my\text{-}ref}_{(w,t)}\boldsymbol{(u)}])$

c. $\mathbf{rise}_{(w,t)}(\boldsymbol{\lambda}(\boldsymbol{w},\boldsymbol{t}).\boldsymbol{\iota u}[\mathbf{temp\text{-}in\text{-}your\text{-}ref}_{(w,t)}(\boldsymbol{u})])$

- Summing up:
  - solves temperature-paradox and temperature-price puzzle
  - does so by removing the unintuitive mulitiplicity of temperature functions at different indices
  - simplifies types

2.1 When Uniqueness Fails

2.1.1 Other (True) Quantifiers

- Lasersohn: only motivation for Montagovian type assignment of *temperature*: Russellian definite description - other quantifiers?
- *temperature*: inherently functional (semantic definiteness, cf. Löbner 1985)

  temperature as *temperature at the salient location* - singleton set, not an appropriate restrictor for generalized quantifiers
- scenario: weather station where different cities are monitored for their respective temperatures:

  (24) a. Three temperatures are rising.
  b. Many temperatures are rising.
  c. All temperatures are rising.
  d. A few temperatures are rising.
  e. No temperature is rising.
  f. Every temperature is rising.

- Romero (2006a): we need $\langle\langle s, e\rangle, t\rangle$-extensions for nouns after all
- take (24f): getting rid of uniform type assignment by fiddling around with *every*?

  (25) $\boldsymbol{\lambda P}_{\langle\langle s,e\rangle,t\rangle}\boldsymbol{\lambda Q}_{\langle\langle s,e\rangle,t\rangle}\forall \boldsymbol{x}[\boldsymbol{P}(\boldsymbol{x}) \rightarrow \boldsymbol{Q}(\boldsymbol{x})]$

  (26) $\boldsymbol{\lambda P}_{\underline{\langle e,t\rangle}}\boldsymbol{\lambda Q}_{\langle\langle s,e\rangle,t\rangle}\forall \boldsymbol{u}_{\underline{e}}[\boldsymbol{P}(\boldsymbol{u}) \rightarrow \boldsymbol{Q}(\boldsymbol{\lambda}(\boldsymbol{w},\boldsymbol{t}).\boldsymbol{u})]$

  failure: $\lambda(w, t).u$ is constant for u of type e

  (27) $\boldsymbol{\lambda P}_{\underline{\langle e,t\rangle}}\boldsymbol{\lambda Q}_{\langle\langle s,e\rangle,t\rangle}\forall \boldsymbol{x}_{\underline{\langle s,e\rangle}}[\boldsymbol{P}(\boldsymbol{x}(\boldsymbol{w},\boldsymbol{t})) \rightarrow \boldsymbol{Q}(\boldsymbol{x})]$

failure: if individual $90F$ occcurs as a temperature at an index $\langle w, t\rangle$, any function f that has it as a value at $\langle w, t\rangle$ would have to be rising

consider temperature of Frankfurt f, and t-mirror temperature of Frankfurt $f_{m,t}$:

(28) for any world w: $f_{m,t}(w,t) = f(w,t)$, and for any amount of time n, $f_{m,t}(w, t+n) = f(w, t-n)$

then, at any index either the temperature in Frankfurt f is falling, or $f_{m,t}$ is falling, or both are constant

- **reconsider *temperature*** - means: *of something/at a location*

  ⇒ treat it as a relational or functional noun

- try: extend Lasersohn (2005) via quantification over implicit arguments

2.1.2 Extending Lasersohn: Quantification over Implict Arguments

- quantification over implicit arguments (cf. Partee 1989; Cresswell 1996; Condoravdi and Gawron 1996; Asudeh 2005)

(29) Every farmer knows a neighbour.
(*preferred: Every farmer knows a neighbour of his.*)

- extend Lasersohn's treatment to the quantified examples in (24) by quantifying over the implicit argument

(30) *all objects are such that their temperature is rising*

  - translate *temperature* as relational noun constant **temperature** of type $\langle s, \langle e, \langle e, t\rangle\rangle\rangle$
  - first argument has to be saturated (e.g. by combining with a context dependent variable in the syntax) before combining with the definite article
  - *every, most,*... are ambiguous; alternative translations:

(31) *every*$_2$ translates into
$$\boldsymbol{\lambda P_{\langle s,\langle e,\langle e,t\rangle\rangle\rangle}\lambda Q_{\langle\langle\langle s,e\rangle,t\rangle\rangle}.\forall u[C(u) \rightarrow Q(\lambda(w,t).\iota v[P_{(w,t)}(u)(v)])]}$$

(32) *most*$_2$ translates into
$$\boldsymbol{\lambda P_{\langle s,\langle e,\langle e,t\rangle\rangle\rangle}\lambda Q_{\langle\langle\langle s,e\rangle,t\rangle\rangle}.\mathrm{most}(\lambda u.C(u))(\lambda u.Q(\lambda(w,t).\iota v[P_{(w,t)}(u)(v)]))}$$

(33) Most temperatures are rising.
$\mathbf{most}(\boldsymbol{\lambda u.C(u)})(\boldsymbol{\lambda u.}\mathbf{rise}_{(w,t)}(\boldsymbol{\lambda(w,t).\iota v}[\mathbf{temperature}_{(w,t)}(\boldsymbol{u})(\boldsymbol{v})]))$
(*for most contextually given objects u, the function constituted by the intension of being u's unique temperature is rising*)

caveat: proportion problem for non-classical quantification over implicit arguments (propsed by Löbner (1985))

(34) a. Every mother loves her child.
b. Every child's mother loves him.

(35) a. Most mothers love their children.
b. Most children's mothers love them.

(36) a. Most temperatures are rising.
b. Most objects are such that their temperatures are rising.

we should be able to test it for temperatures, too

(37) a. *mother(x,y)*: not injective
b. *temperature(x,y)*: (i) value reading: not injective;
(ii) function-reading derived as $\boldsymbol{\lambda(w,t).\iota v}[\mathbf{temperature}_{(w,t)}(\boldsymbol{u})(\boldsymbol{v})]$: not injective if two objects can have the same temperature at all worlds and times

hard to decide: would we then want to count objects or temperature functions? (political functions,... that are the same across world/time - two names for one thing) - this analysis: counts them twice

problem: overgeneration - *every* quantifying over implicit arguments cannot be used for properly relational nouns: (more than one senator per state/photograph per object does not lead to a presupposition failure for (38a))

(38) a. Every senator was late.
b. Three photographs were given to the press.

wanted here: existential quantification (turning relational into sortal nouns)

(39) a. Every person x, such that there is a state y and x is senator from y, was late.
b. Three x such that there is an object y and x is a photograph of y were given to the press.

2.1.3 Problem: Two Types of Properly Relational Nouns

- not all nouns in subject position of *rise* are functional

`Funktionenbündel` (*bundle of functions*, cf. Löbner 1979)

(40) a. One value (*of patient Smith*) is rising.
b. Two of his critical values are rising.

- naive extension of quantification over implicit arguments predicts presupposition failure for these cases.

(41) Three critical values are rising.

(42) $\mathbf{three}_{\boldsymbol{RN}} \equiv$
$\boldsymbol{\lambda P_{\langle s,\langle e,\langle e,t\rangle\rangle\rangle}\lambda Q_{\langle\langle\langle s,e\rangle,t\rangle\rangle}.card(\{u \mid Q(\lambda(w,t).\iota v[P_{(w,t)}(u)(v)])\}) = 3}$

(i) we do not want to count patients (we are talking about one patient only, Smith), and (ii) there is no unique critical value (presupposition failure)

<u>wanted:</u> use different roles (e.g. Smith's critical values can be distinguished as being his (unique) *blood pressure*, his (unique) *body temperature*, his (unique) *concentration of cholesterol*); also: *ministers* - their resorts,...

(43) $\boldsymbol{card(\{f \in\{\lambda(w,t).\iota u[\textbf{critical-value}(\textbf{smith})_{(w,t)}(u)\ \&\ P(\textbf{smith})(u) \mid P \in\{\textbf{bl-press}, \textbf{conc-chol}, \textbf{temperature}\}\} \mid \textbf{rise}(f)\}\}) = 3}$

<u>`Sets without roles`</u>

(44) Three bodyguards (*of Arnold*) have changed.

- *temperatures*: plurality of functions that could be distinguished via implicit argument (e.g. *cities*)

  critical values/bodyguards: plurality of functions (but: *bodyguards*?!) which cannot be distinguished by their implicit arguments, since there is only one (*patient Smith/Arnold*)

- sets of objects that come without particular roles: e.g. *bodyguards, members of the jury, senators,...*

- *bodyguards* also cannot be construed w.r.t. an implicit argument as functions from an index to a unique individual (derived $\langle s, e\rangle$) (vs. *temperature, mayor*, cannot be narrowed down thanks to a special role w.r.t one and the same implicit argument either (vs. *critical value*)

2.1.4 Two Tasks Open

1. account for quantification with functional and properly relational nouns (*critical values, bodyguards,...*)

2. Nathan's (2005) puzzle (cf. also Romero 2006a):

   overall change of the set required in (45a) (**set change**); swapping (change 'within the set') is sufficient (45b) (**pointwise change**)

   (45) a. The pictures on Jordan's wall have changed.
        b. The governors have changed.

   - Nathan (2006)/Romero (2006a): "relational/non-relational"

     (46) a. Three bodyguards (of Arnold) have changed.
          b. Three governors have changed.

     both are relational; rather: difference in how easily a "role" reading is available (instead of an "occupant" reading)

   - Romero (2006b) proposes a solution for definite descriptions:

     derive individual concepts at two levels: extension of *governor* (= a set of individual concepts), intension of the plural individual picked out by *the pictures on the wall* ($\langle s, \oplus e\rangle$)

     notes: does not carry over to quantificational cases

     (47) Most pictures on Jordan's wall changed.

3 Quantification Under Cover

- suggestion Ede Zimmermann (p.c.): quantification proceeds under cover
- nouns denote sets of individuals (like Lasersohn 2005) - individual concepts come in because we have to individuate them somehow
- Aloni (2000): quantification, questioning and belief attribution proceed with respect to methods of identification

  modelled as conceptual covers (over the domain of individuals) (*here:* plus temporality):

  (48) Given a set of indices ($W \times T$) and a universe of individuals D, a conceptual cover CC based on ($W \times T, D$) is a set of functions $(W \times T) \rightarrow D$ such that:
  $(\forall(w,t) \in W \times T)(\forall d \in D)(\exists! c \in CC)[c((w,t)) = d]$

a CC: a set of individual concepts obeying two restrictions: (i) all individuals are picked out (`existence`) at all indices, and (ii) at each index, each individual is picked out by only one individual concept (`uniqueness`)

- which cover is salient depends on the contextual perspective:

(49) Who was president of Mali in 2000?
  a. Him! (pointing at someone) (*at a cocktail reception*)
  b. Alpha Oumar Konaré. (*at a history exam*)

assume K = set of proper names in L:

(50) a. $\text{RC} = \{\lambda(w,t).d \mid d \in D\}$ (rigid cover, used in pointing)
  b. $\text{NC} = \{\lambda(w,t).a(w,t) \mid a \in K\}$ (naming)

what counts as a legitimate answer depends on the salient perspective: if RC is salient, (49a) is felicitious, if NC is salient, (49b) is.

- claim:
  - quantification proceeds under cover
  - the difference between *bodyguards* and *mayors* depends on the different perspectives (covers) they render salient

- to capture **change**: an individual concept is undefined at the very point of change

  D contains the absurd individual ✪ (ignored by the cover condition *uniqueness*; $\lambda(w,t).\iota x[x \neq x]$ may be part of any cover and is a constant function to ✪)

(51) $[\![\textbf{change}]\!](w,t)(f) = 1$ iff $f(w,t) = ✪$, and
$f(w,t^-) \neq f(w,t^+)$, where $t^- <^! t <^! t^+$.
($<^!$ the relation of immediate precedence)

If the denotation of a common noun α (type $\langle s, \langle e,t\rangle\rangle$) changes at (w,t), ✪ is element of $\alpha(w,t)$.

- pointwise application of a set of functions $F = \{f_1, \dots, f_n\}$:

(52) $F[w,t] := \{f_i(w,t) \mid f_i \in F\}$

- determiners of "generalized quantifiers under cover":

(53) $[\![\textbf{most/every/three/}\ldots]\!]^{\Pi}(w,t)(Q_{\langle s,\langle e,t\rangle\rangle})(P_{\langle\langle s,e\rangle,t\rangle}) = 1$ iff
for every $F \in \Pi$ and $F_1 = \{f_1, \ldots, f_n\} \subseteq F$ such that either
(i) for all $f_i \in F_1$: $f_i(w,t) \neq$ ✪ and $F_1[w,t] = Q(w,t)$, or
(ii) $F_1[w,t^-] = Q(w,t^-)$ and $F_1[w,t^+] = Q(w,t^+)$:
$\textsc{most/every}/3/\ldots(\lambda f.f \in F_1)(\lambda f.P(f))$

(54) $[\![\textbf{three}]\!]^{\Pi}(w,t)(Q_{\langle s,\langle e,t\rangle\rangle})(P_{\langle\langle s,e\rangle,t\rangle}) = 1$ iff
for every $F \in \Pi$ and $F_1 = \{f_1, \ldots, f_n\} \subseteq F$ such that either
(i) for all $f_i \in F_1$: $f_i(w,t) \neq$ ✪ and $F_1[w,t] = Q((w,t))$, or
(ii) $F_1[w,t^-] = Q(w,t^-)$ and $F_1[w,t^+] = Q(w,t^+)$:
$\mid \{f_i \in F_1 \mid P(f_i)\} \mid \geq 3$

3.1 Nathan's Puzzle in Terms of Types of Covers: *Bodyguards*

- *bodyguards, pictures on the wall*:

(55) $[\![\textbf{three } (\boldsymbol{\lambda(w,t)}.\textbf{bodyguards}_{\boldsymbol{(w,t)}}) \text{ } (\textbf{change}_{\boldsymbol{(w,t)}})]\!]^{\boldsymbol{\Pi}} = 1$iff
for every $F \in \Pi$ and $F_1 = \{f_1, \ldots, f_n\} \subseteq F$ such that either
(i) for all $f_i \in F_1$: $f_i((w,t)) \neq$ ✪ and
$F_1[w,t] = [\![\textbf{bodyguard}]\!]^{\Pi}(w,t)$, or
(ii) $F_1[w,t^-] = [\![\textbf{bodyguard}]\!]^{\Pi}(w,t^-)$ and
$F_1[w,t^+] = [\![\textbf{bodyguard}]\!]^{\Pi}(w,t^+)$:
$\mid \{f_i \in F_1 \mid f_i(w,t^-) \neq f_i(w,t^+)\} \mid \geq 3$

- assume:

(56) $[\![\textbf{bodyguard}]\!]^{\Pi}(w,t^-) = \{$*john, peter, mary, sally*$\}$
$[\![\textbf{bodyguard}]\!]^{\Pi}(w,t) = \{$*sally*, ✪$\}$
$[\![\textbf{bodyguard}]\!]^{\Pi}(w,t^+) = \{$*simon, susi, sandro, sally*$\}$

- bodyguards/pictures on the wall: perceived as a set of individuals - most salient cover is naming or rigid cover (pointing)
- the set of bodyguards contains ✪ at (w,t), hence: (i) is inapplicable, check clause (ii) cover NC = $\{\lambda(w,t).john_{(w,t)}, \lambda(w,t).john_{(w,t)}, \lambda(w,t).john_{(w,t)}, \ldots\}$ does not contain a subset F_1 that describes the bodyguards at both (w,t^-) and (w,t^+)
- Principle of Cooperative Identification

(57) If Π contains no cover that passes condition (i) or (ii), switch to Π' containing less salient covers (may be arbitrary).

(Special case of INFORMATIVITY; cf Aloni (2005) for pragmatic principles in bi-directional OT on what covers are considered.)

Then, all versions of arbitrary aligning the individuals are equally likely - supervaluation over all ways to describe the set of bodyguards before/after the change by 4 individual concepts (= Π').

- If less than 3 set elements change, the bodyguards can also be covered by F where less than 3 individual concepts f_i are such that $f(w,t^-) \neq f(w,t^+)$. Π' cannot ignore the corresponding covers. $\Rightarrow$ **Set Change**-interpretation results.

3.2 Nathan's Puzzle in Terms of Covers: *Mayors*

- *mayors* (functional noun): render salient more interesting covers

  effect: set is irrelevant, as long as there is pointwise change

- mayors render salient: naming NC or job-cover JC

  NC = $\{\lambda(w,t).wolfgang(w,t), \lambda.petra(w,t), \ldots\}$

  JC = $\{\lambda(w,t).\iota u[\textit{mayor-of-frankfurt}_{(w,t)}(u)],\ \lambda(w,t).\iota u[\textit{mayor-of-stuttgart}_{(w,t)}(u)], \ldots\}$

- scenario: Wolfgang and Petra exchange their cities at (w,t)

(58) $[\![$Two mayors changed.$]\!]^{\Pi}(w,t)$ is true if $\Pi = \{\text{JC}\}$ (*pointwise change*), false if $\Pi = \{\text{NC}\}$ (would require *set change* - there is no set change)
(*two of the individual concepts needed to cover the mayors at* (w,t^-) and (w,t^+) *change at* (w,t)

	NC		JC	
	Wolfgang	*Petra*	$mayor_{Frankfurt}$	$mayor_{Stuttgart}$
(w,t^-)	w	p	p	w
(w,t)	(w)	(p)	✪	✪
(w,t^+)	w	p	w	p

3.3 Pragmatic Solution

- pragmatic solution: interpretation depends on the perspective taken on the individuals in the context

- Do we really want a pragmatic solution to the temperature paradox?

(59) The temperature is rising.

first: requires saturating the free variable

(60) *temperature* $\mapsto$ *temperature of contextually salient location*

(61) $[\![\textbf{the}]\!]^{\Pi}(w,t)(\textbf{temperature}_{\langle s,\langle e,t\rangle\rangle})(\textbf{rise}_{\langle s,\langle\langle s,e\rangle,t\rangle\rangle}) = 1$ iff
for every $F \in \Pi$ and $F_1 = \{f_1, \ldots, f_n\} \subseteq F$ such that either
(i) for all $f_i \in F_1$: $f_i(w,t) \neq$ ✪ and
$F_1[w,t] = [\![\textbf{temperature}]\!]^{\Pi}(w,t)$, or
(ii) $F_1[w,t^-] = [\![\textbf{temperature}]\!]^{\Pi}(w,t^-)$ and
$F_1[w,t^+] = [\![\textbf{temperature}]\!]^{\Pi}(w,t^+)$:
$\mid F_1 \mid = 1$ and $\forall f_i \in F_1 : f_i(w,t) \in [\![\textbf{rise}]\!]^{\Pi}(w,t)$.

but why can't we then hear (62) as saying that the temperature of Frankfurt is rising, given that the temperature of Frankfurt is 90?

(62) Ninety is rising.

anaphoric dependence/definite article required (cf. (66b))

3.4 Two Issues in Favor of Context Dependence

- context dependence observed for

(63) Most pictures on Jordan's wall have changed.

(64) Three pictures on Jordan's wall have changed.

a. *pictures by who is on them* $\rightarrow$ SC-interpretation

b. *the picture on the left wall, the picture closest to the window,...* $\rightarrow$ PC-interpretation

- intensional readings for name-like DPs:

(65) In Edes Büro hat's schon 34 Grad, und *(die) 34 Grad
In Ede's office it-has already 34 degrees, and the 34 degrees
werden wohl noch mehr werden.
will PRT still more get
'The temperature in Ede's office is already 34 degrees, and I think it's going to get even warmer.'

(66) a. The temperature in Ede's office is already 34 degrees and I think *(the) 34 degrees will certainly increase.

b. ...that 34 degrees is going up by mid-afternoon.

the requires individuation by individual concept; the abstract degree individual has been introduced as *the temperature in my office* (again, the naming cover containing $\lambda wt.34C((w,t))$ would not pass the restrictor, enforcing switch to Π')

- Try a principle `CC salience`:

(67) If the intension of a DP is a part of a (plausible) cover, that cover is among the maximally salient ones.

- it seems: sometimes, the denotation of the DP has to be ignored:

(68) The lowest temperature is rising.

  a. $\underline{R_{city}}$: the temperature which is lowest right now is rising (it might not be the lowest anymore tomorrow)

  b. $\underline{R_{ranking}}$: each day, the temperature of different objects is taken; the lowest value measured is increasing from day to day

- the readings are independent:

  obviously, $R_{city} \not\Rightarrow R_{ranking}$

  but: $R_{ranking} \not\Rightarrow R_{city}$ (the temperatures measured on the different occasions may come from different cities)

- reminiscent of Heim's (1979) example:

(69) John knows the price Fred knows.

  a. Reading A: John and Fred can answer the same price-question

  b. Reading B: John knows which price question Fred can answer

Cf. Romero (2005) for a solution in terms of knowing extension/intension of *the unique price individual concept x such that Fred knows x.*

4 Temperatures & Prices as Abstract Individuals?

- so far, we have understood temperatures/prices as abstract value individuals (numbers on scales) (to be individuated under cover)

  a closer look at (68) shows that this cannot be right:

  sometimes, we seem to consider concrete realisations of such abstract value-individuals, sometimes, we consider abstract value individuals in the framework proposed above, the perspective seems to determine how we interpret temperature - this can't be right!

- scenario: at t_1, t_2, t_3, we take the temperatures of *Frankfurt*, *Amsterdam* and *New York*

(70) The lowest temperature is rising.

- problem arises if two temperatures are equally low and no other temperature is lower:

  R_{city} counts them twice ("temperatures as concrete instantiations") - presupposition failure.

  $R_{ranking}$ counts them only once ("temperatures as abstract value individuals") - fine.

- *idea:* derive temperature functions by typeshifts using the location("city")-argument? (cf. Schwager (2006))

  but: resulting temperature-functions need not be of the form "temperature of a location"

  e.g. R_{time}: {*the temperature of Boston at 8am, the temperature of Boston at 2pm, the temperature of Boston at 8am*} (each taken on three occasions) - still: count them twice!

- go back to Montague's **temperatures** as $\langle s, \langle\langle s, e\rangle, t\rangle\rangle$? (plus Meaning Postulate) for R_{city}, R_{time}, and Lasersohn-style intensions of definite descriptions for $R_{ranking}$?

  would have to constrain what are admissible "contextually salient" sets of temperatures to quantify over:

  (71) Most temperatures are rising.

  what are temperatures and what are "derived" temperatures?

- functional nouns with concrete values do not seem show this dependence (e.g. *mayors*)

  (72) Der dickste Bürgermeister wird ausgetauscht.
  the fattest mayor gets exchanged

  - if two are equally fat, and no-one is fatter - presupposition failure under both readings.

5 Conclusions & To Do-List

- nouns like *mayor,temperature* can be understood as referring to the (actual) value or to an entire function
- Lasersohn (2005) captures this by using extension or intension of the ι-ized expression (deriving non-lexical individual concepts)
- quantificational examples seem problematic at first sight, for some cases (functional nouns), quantification over implicit arguments proves helpful
- Funktionenbündel (*critical values*) and Sets without Roles (*bodyguards*) motivate quantification under covers (individual concepts as part of contextual perspectives!)
- virtues of quantification under conceptual covers:
  - possible to account for quantification over sets without roles in intensional subject positions
  - accounts more naturally for *funktionenbündel* in intensional subject positions
  - explanation for the different interpretation of *change* with *bodyguards* vs. *mayors*

    and fits speaker intuitions of high context dependence of this phenomenon
  - surprising intensional readings for rigid DPs can be captured (*the/that 34 degrees*)
- the approach does not carry over straightforwardly to functional nouns with abstract values (*temperatures*, *prices*)
- To Do:
  - what determines which cover is salient? (starting point Aloni (2000): bi-directional OT)
  - find out more about nouns with abstract values

    decide: pragmatic solution for all cases?
  - distinguish only modally/only temporally intensional predicates?
  - look at concealed questions

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