**'Propositional attitudes' taxonomy.**

(B stands for 'believing', 'knowing', etc.)

$Ch$ / $\iota$ is an agent; $a \to \iota$, or $a \to \iota_{\tau\omega}$ is a subject of the attitude;
$P \to (o\iota)_{\tau\omega}$ is a construction of the property ascribed to $a$.

I.    **Implicit (propositional) attitudes:** $B \to (o\iota o_{\tau\omega})_{\tau\omega}$

   a. *De dicto*:     Ch Bs that $a$ is P.

   b. *De re*:

       **i.** $a$ is B-ed by Ch to be a P.           *passive variant*

       **ii.** Ch Bs of $a$ that *he* (namely $a$) is a P.    *active variant with*
                                                        *anaphoric reference he*

II.   **Explicit (hyper-propositional) attitudes:** $B^* \to (o\iota^*_n)_{\tau\omega}$

   c. *De dicto*:     Ch B*s that $a$ is P.

   d. *De re*:

       **i.** $a$ is B*-ed by Ch to be a P.        *passive variant*

       **ii.** Ch B*s of $a$ that *he* (namely a) is a P.    *active variant with*
                                                         *anaphoric reference he*

III.  **Analytic schemes.**

If $a$ is a construction of an $\iota$-office, $a \to \iota_{\tau\omega}$, the analytic schemes are as follows:

**Ad I) Implicit (propositional) attitudes**

**I. a. *de dicto*:**    $\lambda w \lambda t\, [B_{wt}\, {}^{0}Ch\, \lambda w \lambda t\, [P_{wt}\, a_{wt}]]$

**I. b. i.)**    *de re passive variant*

First, $BCP$ / $(o\iota)_{\tau\omega}$ – the property of being B-ed by Ch to be a P, $x \to \iota$:

$${}^{0}BCP = \lambda w \lambda t\, [\lambda x\, [B_{wt}\, {}^{0}Ch\, \lambda w \lambda t\, [P_{wt}\, x]]]$$

Second, a course-grained analysis: $\lambda w \lambda t\, [{}^{0}BCP_{wt}\, a_{wt}]$

Third, the best literal analysis of **I.b.i**):

$$\lambda w \lambda t\, [[\lambda w \lambda t\, [\lambda x\, [B_{wt}\, {}^{0}Ch\, \lambda w \lambda t\, [P_{wt}\, x]]]]_{wt}\, a_{wt}],$$

Which can be $\beta_i$-reduced to:

$$\lambda w \lambda t\, [\lambda x\, [B_{wt}\, {}^{0}Ch\, \lambda w \lambda t\, [P_{wt}\, x]]\, a_{wt}].$$

Further 'syntactic' $\beta$-reduction is not possible, because we would substitute the *de re* occurrence of $a_{wt}$ for $x$ into the *de dicto* context of $\lambda w \lambda t\, [P_{wt}\, x]$, which is not an equivalent transformation due to partiality (but it is not the problem of collision of variables).

**I. b. ii.)** *de re active variant*

First, a coarse-grained analysis:

$$\lambda w \lambda t\ [{}^{0}B\text{-}of_{wt}\ {}^{0}Ch\ a_{wt}\ \lambda w \lambda t\ [P_{wt}\ \boldsymbol{he}]];\ B\text{-}of\ /\ (\text{οιο}_{\tau\omega})_{\tau\omega},\ \boldsymbol{he} \rightarrow \iota.$$

Second, we have to define *B-of* (*x-who, y-whom)-that-he=whom-P*:

$$[{}^{0}B\text{-}of_{wt}\ x\ y\ \lambda w \lambda t\ [P_{wt}\ he]] = [{}^{0}B_{wt}\ x\ {}^{2}[{}^{0}Sub\ [{}^{0}Tr\ y]\ {}^{0}he\ {}^{0}[\lambda w \lambda t\ [P_{wt}\ he]]]];$$
$$x,y,\ \rightarrow \iota.$$

Third, the best literal analysis of **II.b.ii.)** is obtained by substituting ${}^{0}Ch$ for $x$, $\boldsymbol{a_{wt}}$ for $y$:

$$\lambda w \lambda t\ [{}^{0}B_{wt}\ {}^{0}Ch\ {}^{2}[{}^{0}Sub\ [{}^{0}Tr\ \boldsymbol{a_{wt}}]\ {}^{0}he\ {}^{0}[\lambda w \lambda t\ [P_{wt}\ \boldsymbol{he}]]]].$$

## Ad II) Explicit (hyper-propositional) attitudes

**II. a.** *de dicto*    $\lambda w \lambda t\ [B^{*}_{wt}\ {}^{0}Ch\ {}^{0}[\lambda w \lambda t\ [P_{wt}\ a_{wt}]]]$

**II. b. i.)** *de re passive variant*

First, $B^{*}CP\ /\ (\text{οι})_{\tau\omega}$ – the property of being $B^{*}$-ed by Ch to be a P, $x \rightarrow \iota$:

$${}^{0}B^{*}CP = \lambda w \lambda t\ [\lambda x\ [B^{*}_{wt}\ {}^{0}Ch\ [{}^{0}Sub\ [{}^{0}Tr\ x]\ {}^{0}x\ {}^{0}[\lambda w \lambda t\ [P_{wt}\ x]]]]]$$

Second, a course-grained analysis: $\lambda w \lambda t\ [{}^{0}B^{*}CP_{wt}\ a_{wt}]$

Third, the best literal analysis of **II.b.i**):

$$\lambda w \lambda t\ [\lambda w \lambda t\ [\lambda x\ [B^{*}_{wt}\ {}^{0}Ch\ [{}^{0}Sub\ [{}^{0}Tr\ x]\ {}^{0}x\ {}^{0}[\lambda w \lambda t\ [P_{wt}\ x]]]]]_{wt}\ a_{wt}],$$

Which can be $\beta_i$-reduced to:

$$\lambda w \lambda t\ [\lambda x\ [B^{*}_{wt}\ {}^{0}Ch\ [{}^{0}Sub\ [{}^{0}Tr\ x]\ {}^{0}x\ {}^{0}[\lambda w \lambda t\ [P_{wt}\ x]]]\ a_{wt}].$$

Further 'syntactic' $\beta$-reduction *is* an equivalent transformation. However, performing it we obtain the active variant ad II.b. II):

$$\lambda w \lambda t\ [B^{*}_{wt}\ {}^{0}Ch\ [{}^{0}Sub\ [{}^{0}Tr\ a_{wt}]\ {}^{0}x\ {}^{0}[\lambda w \lambda t\ [P_{wt}\ x]]]].$$

$$\Leftrightarrow de\ re\ active\ variant$$

**II. b. ii.)** *de re active variant*

First, a coarse-grained analysis:

$$\lambda w \lambda t\ [B^{*}\text{-}of_{wt}\ {}^{0}Ch\ a_{wt}\ {}^{0}[\lambda w \lambda t\ [P_{wt}\ \boldsymbol{he}]]];\ B^{*}\text{-}of\ /\ (\text{οι}^{*}_{n})_{\tau\omega},\ \boldsymbol{he} \rightarrow \iota.$$

Second, we have to define *B*-of* (*x-who, y-whom)-that-he=whom-P*:

$$[B^{*}\text{-}of_{wt}\ x\ y\ {}^{0}[\lambda w \lambda t\ [P_{wt}\ he]]] = [B^{*}_{wt}\ x\ [Sub\ [{}^{0}Tr\ y]\ {}^{0}he\ {}^{0}[\lambda w \lambda t\ [P_{wt}\ he]]]];$$
$$x,y,\ \rightarrow \iota.$$

Third, the best literal analysis of **II.b.ii.)** is obtained by substituting ${}^{0}Ch$ for $x$, $\boldsymbol{a_{wt}}$ for $y$:

$$\lambda w \lambda t\ [B^{*}_{wt}\ {}^{0}Ch\ [Sub\ [{}^{0}Tr\ \boldsymbol{a_{wt}}]\ {}^{0}he\ {}^{0}[\lambda w \lambda t\ [P_{wt}\ \boldsymbol{he}]]]].$$

**III.** *Remark***:**

If *a* is a *rigid designator* of an individual, i.e., $a \rightarrow \iota$ and *a* is ***not v-improper in any w,t***, the ***de dicto*** **and *de re* attitudes are equivalent**; proof in section 4.9.:

**I. Implicit propositional attitudes:**

$\lambda w \lambda t \ [B_{wt} \ ^0Ch \ \lambda w \lambda t \ [P_{wt} \, a]] =$

$\lambda w \lambda t \ [\lambda x \ [B_{wt} \ ^0Ch \ \lambda w \lambda t \ [P_{wt} \, x]] \ a] =$

$\lambda w \lambda t \ [B_{wt} \ ^0Ch \ ^2[^0Sub \ [^0Tr \ a] \ ^0x \ ^0[\lambda w \lambda t \ [P_{wt} \, x]]]]$

**II. Explicit hyper-propositional attitudes:**

$\lambda w \lambda t \ [B^*_{wt} \ ^0Ch \ ^0[\lambda w \lambda t \ [P_{wt} \, a]]] =$

$\lambda w \lambda t \ [\lambda x \ [B^*_{wt} \ ^0Ch \ [^0Sub \ [^0Tr \ x] \ ^0x \ ^0[\lambda w \lambda t \ [P_{wt} \, x]]] \ a] =$

$\lambda w \lambda t \ [B^*_{wt} \ ^0Ch \ [^0Sub \ [^0Tr \ a] \ ^0x \ ^0[\lambda w \lambda t \ [P_{wt} \, x]]]]$