SOLUTIONS: Assignment for Week 3 (Feb. 24)

[From Heim & Kratzer] Exercise 2 parts e-h (pp. 39-40)

[Note: I’ve put some items in bold to bring attention to the parts of the expression that are relevant at each step. You don’t have to do this.]

- (e):

\[ \lambda f . (\lambda x . f(x) = 1 \text{ and } x \text{ is gray}) \] (\[\lambda y . y \text{ is a cat}\])

\[ = (\lambda x . (\lambda y . y \text{ is a cat}) \ (x) = 1 \text{ and } x \text{ is gray}) \]

\[ = (\lambda x . \text{x is a cat} \text{ and } x \text{ is gray}) \]

- (f):

\[ \lambda f . (\lambda x . f(x)(Ann) = 1) \] (\[\lambda y . (\lambda z . z \text{ saw } y) \] )

\[ = (\lambda x . (\lambda y . (\lambda z . z \text{ saw } y) \ (x)(Ann) = 1) \]

\[ = (\lambda x . (\lambda z . z \text{ saw } x)(Ann) = 1) \]

\[ = (\lambda x . Ann \text{ saw } x) \]

- (g):

\[ (\lambda x . (\lambda y . y>3 \text{ and } y<7) \ (x) \]

\[ = (\lambda x . x>3 \text{ and } x<7) \]

- (h):

\[ (\lambda z . (\lambda y . (\lambda x . x>3 \text{ and } x<7) \ (y) \ (z) ) \]

\[ = (\lambda z . (\lambda y . y>3 \text{ and } y<7) \ (z) ) \]

\[ = (\lambda z . z>3 \text{ and } z<7) \]

[From von Fintel & Heim] Exercise 1.2 (p. 10)

[Also see the handout from 2/10/09, p. 4]

For the purposes of this solution, I’m going to skip the steps of putting together the parts of the sentential argument a famous detective lives at 221B Baker St. (let’s call this S):

- Intension of S: \[\lambda w' . \text{ a famous detective lives at 221B Baker St. in } w'\]

At this point in the reading we’re working with the most simple lexical entry for in the world of Sherlock Holmes, where we’ve further stipulated that \(w_9\) is the world as presented in the Sherlock Holmes stories:

- \[\lambda y . (\lambda z . z>3 \text{ and } z<7) \ (z) \]

Here’s the computation (evaluating at \(w_7\)):  

\[ [\lambda p_{<,>} . p(w_9)] \]

1
In the world of Sherlock Holmes, a famous detective lives at 221B Baker St\[w^7\]
= \[\text{in the world of Sherlock Holmes}\]^{w^7} (\text{intension of S})
= \[\text{in the world of Sherlock Holmes}\]^{w^7} (\lambda w'. \text{a famous detective lives at 221B Baker St. in } w')
= [\lambda p_{<s,t>} . p(w_9)] (\lambda w'. \text{a famous detective lives at 221B Baker St. in } w'(w_9))
= (\text{true iff}) \text{a famous detective lives at 221B Baker St. in } w_9

[From von Fintel & Heim] Exercise 1.3 (page 11)
Keep in mind that we’re using the simple version of the intensional semantics, as above.

First, let’s give the extension and intension of the two conjuncts:

- **Extensions:**
  - \(\llbracket \text{Holmes is quick} \rrbracket^w = 1 \iff \text{Holmes is quick in } w\)
  - \(\llbracket \text{Watson is slow} \rrbracket^w = 1 \iff \text{Watson is slow in } w\)

- **Intensions:**
  - Intension of \textit{Holmes is quick}: 
    \(\llbracket \lambda w' . \llbracket \text{Holmes is quick} \rrbracket^{w'} \rrbracket\)
  - \(= [\lambda w'. \text{Holmes is quick in } w']\)
  - Intension of \textit{Watson is slow}: 
    \(\llbracket \lambda w' . \llbracket \text{Watson is slow} \rrbracket^{w'} \rrbracket\)
  - \(= [\lambda w'. \text{Watson is slow in } w']\)

Now let’s go on to the computation. The first part is the same in both cases:

\(\llbracket \text{In the world of Sherlock Holmes, Holmes is quick and Watson is slow} \rrbracket^w\)
\(= \llbracket \text{in the world of Sherlock Holmes} \rrbracket^w (\lambda w'. \llbracket \text{Holmes is quick and Watson is slow} \rrbracket^{w'})\)
\(= [\lambda p_{<s,t>} . p(w_9)] (\lambda w'. \llbracket \text{Holmes is quick and Watson is slow} \rrbracket^{w'}(w_9))\)
\(= [\lambda w'. \llbracket \text{Holmes is quick and Watson is slow} \rrbracket^{w'}(w_9)]\)
\(= \llbracket \text{Holmes is quick and Watson is slow} \rrbracket^{w_9}\)

At this point, we have to do the two computations separately:

- **With extensional \textit{and}:**
  \(\llbracket \text{and} \rrbracket^w = [\lambda u_t . [\lambda v_t . u = v = 1]]\)
  \(\llbracket \text{Holmes is quick and Watson is slow} \rrbracket^{w_9} = \llbracket \text{and} \rrbracket^{w_9} (\llbracket \text{Watson is slow} \rrbracket^{w_9}) \)
  \(= [\lambda u_t . [\lambda v_t . u = v = 1]] (\llbracket \text{Watson is slow} \rrbracket^{w_9}) (\llbracket \text{Holmes is quick} \rrbracket^{w_9})\)
  \(= [\lambda v_t . \llbracket \text{Watson is slow} \rrbracket^{w_9} = v = 1] (\llbracket \text{Holmes is quick} \rrbracket^{w_9})\)
= (true iff) \[\text{[Watson is slow]}^w_9 = \text{[Holmes is quick]}^w_9 = 1\]
= (true iff) Watson is slow in w_9 and Holmes is quick in w_9

➢ With intensional and:

\[\text{[and]}^w = [λp_{<s,t>} \cdot [λq_{<s,t>} \cdot p(w) = q(w) = 1]}\]
\[\text{[Holmes is quick and Watson is slow]}^w_9 = \text{[and]}^w_9 ( [λw'. [\text{Watson is slow]}^w]\) ( [λw'. [\text{Holmes is quick]}^w]\)\]
= \[ [λp_{<s,t>} \cdot [λq_{<s,t>} \cdot p(w_9) = q(w_9) = 1]}\] ( [λw'. [\text{Watson is slow]}^w]\) ( [λw'. [\text{Holmes is quick]}^w]\)\]
= \[ [λq_{<s,t>} \cdot [λw' \cdot \text{[Watson is slow]}^w]\] (w_9) = q(w_9) = 1]\]
= (true iff) \[\text{[Watson is slow]}^w_9 = [λw'. [\text{Holmes is quick]}^w]\] (w_9) = 1]
= (true iff) Watson is slow in w_9 and Holmes is quick in w_9

➢ [From von Fintel & Heim] Exercise 2.1 (page 19)
[Discussed in class – see handout from 2/24/09, pp. 3-4]