How does composition work in de Groote's dynamic continuation semantics? Let us compute the meaning of "John admires Mary. He smiles at her." We have the following meanings:

$$\begin{aligned}
[\![\text{John admires Mary}]\!] &= \lambda i \lambda k'.\mathsf{Admire}(j, m) \wedge k'(m :: j :: i) \\
[\![\text{He smiles at her}]\!] &= \lambda i \lambda k'.\mathsf{Smile}(\mathtt{sel}_{\mathsf{He}}(i), \mathtt{sel}_{\mathsf{Her}}(i)) \wedge k'(i)
\end{aligned}$$

In other words, "John admires Mary" asserts that $\mathsf{Admire}(j, m)$, and also pushes $j$ and $m$ onto the left context $i$. "He smiles at her" selects an entity for $\mathsf{He}$ and an entity for $\mathsf{Her}$ from the left context, and asserts that a $\mathsf{Smile}$ relation holds between them.

In addition, we define the following rule:

$$[\![S_1.S_2]\!] = \lambda i \lambda k.[\![S_1]\!](i)(\lambda i'.[\![S_2]\!](i')(k))$$

Given a left context $i$, we first apply $[\![S_1]\!]$ to $i$. For simplicity, we will assume that "John admires Mary" is the first sentence of our discourse, and therefore let $i$ be the empty list $[]$. Then $(m :: j :: i)$ is just the list $[m, j]$:

$$\begin{aligned}
[\![S_1]\!]([]) &= (\lambda i \lambda k'.\mathsf{Admire}(j, m) \wedge k'(m :: j :: i))([]) \\
&= \lambda k'.\mathsf{Admire}(j, m) \wedge k'([m, j])
\end{aligned}$$

The right context of $S_1$ is $(\lambda i'.[\![S_2]\!](i')(k))$, and therefore we apply the above expression to it. This successively plugs in $(\lambda i'.[\![S_2]\!](i')(k))$ for $k'$, and then $[m, j]$ for $i'$:

$$\begin{aligned}
[\![S_1]\!]([])(\lambda i'.[\![S_2]\!](i')(k)) &= (\lambda k'.\mathsf{Admire}(j, m) \wedge k'([m, j]))(\lambda i'.[\![S_2]\!](i')(k)) \\
&= \mathsf{Admire}(j, m) \wedge (\lambda i'.[\![S_2]\!](i')(k))([m, j]) \\
&= \mathsf{Admire}(j, m) \wedge [\![S_2]\!]([m, j])(k)
\end{aligned}$$

Then we can evaluate $[\![S_2]\!]([m, j])(k)$. We plug in $[m, j]$ for $i$ and $k$ for $k'$:

$$\begin{aligned}
[\![S_2]\!]([m, j])(k) &= (\lambda i \lambda k'.\mathsf{Smile}(\mathtt{sel}_{\mathsf{He}}(i), \mathtt{sel}_{\mathsf{Her}}(i)) \wedge k'(i))([m, j])(k) \\
&= (\lambda k'.\mathsf{Smile}(\mathtt{sel}_{\mathsf{He}}([m, j]), \mathtt{sel}_{\mathsf{Her}}([m, j])) \wedge k'([m, j]))(k) \\
&= \mathsf{Smile}(\mathtt{sel}_{\mathsf{He}}([m, j]), \mathtt{sel}_{\mathsf{Her}}([m, j])) \wedge k([m, j])
\end{aligned}$$

Then, assuming $\mathtt{sel}_{\mathsf{He}}$ selects $j$ from $[m, j]$, and $\mathtt{sel}_{\mathsf{Her}}$ selects $m$, we get:

$$[\![S_2]\!]([m, j])(k) = \mathsf{Smile}(j, m) \wedge k([m, j])$$

In this way, we can see that the right context is the rest of the discourse!

Putting it all together, we get:

$$[\![S_1]\!]([])(\lambda i'.[\![S_2]\!](i')(k)) = \mathsf{Admire}(j, m) \wedge \mathsf{Smile}(j, m) \wedge k([m, j])$$

All of this is in a $\lambda k$-expression, so finally we get:

$$[\![S_1.S_2]\!]([]) = \lambda k.\mathsf{Admire}(j, m) \wedge \mathsf{Smile}(j, m) \wedge k([m, j])$$

To get a truth value, we must give it a right context $k$, which is the right context for the whole discourse. What is $k$? See HW4 for details.