

# Introduction to Glue Semantics

## Class 3: Event semantics

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# Exercise 1: Event semantics (1/3)

## 1 *Buffy did not die.*

	<b>[Buffy]</b>	<b>[die]</b>	
	<b>buffy :</b>	$\lambda x. \lambda f. \exists e. \text{die}(e) \wedge \text{theme}(e, x) \wedge f(e) :$	
	$E(b)$	$E(b) \multimap [[V(d) \multimap T(d)] \multimap T(d)]$	
	<hr/>		<b>[root]</b>
		$\lambda f. \exists e. \text{die}(e) \wedge \text{theme}(e, \text{buffy}) \wedge f(e) :$	$\lambda e. T :$
		$[V(d) \multimap T(d)] \multimap T(d)$	$V(d) \multimap T(d)$
	<hr/>		
<b>[not]</b>		$\exists e. \text{die}(e) \wedge \text{theme}(e, \text{buffy}) :$	
$\lambda p. \neg p :$		$T(d)$	
$T(d) \multimap T(d)$			
	<hr/>		
	$\neg[\exists e. \text{die}(e) \wedge \text{theme}(e, \text{buffy})] :$		
	$T(d)$		

# Exercise 1: Event semantics (2/3)

## 2 *Giles read every book thoroughly.*

<b>[Giles]</b>	<b>[read]</b>	
<b>giles :</b>	$\lambda x. \lambda f. \lambda y. \exists e. \text{read}(e) \wedge \text{agent}(e, x) \wedge \text{theme}(e, y) \wedge f(e) :$	
<b>E(g)</b>	$E(g) \multimap [[V(r) \multimap T(r)] \multimap [E(b) \multimap T(r)]]$	
$\frac{\lambda f. \lambda y. \exists e. \text{read}(e) \wedge \text{agent}(e, \text{giles}) \wedge \text{theme}(e, y) \wedge f(e) : \quad \left[ \begin{array}{c} f : \\ V(r) \multimap T(r) \end{array} \right]^1}{[V(r) \multimap T(r)] \multimap [E(b) \multimap T(r)]}$		
	$\lambda y. \exists e. \text{read}(e) \wedge \text{agent}(e, \text{giles}) \wedge \text{theme}(e, y) \wedge f(e) :$	<b>[every book]</b>
	$E(b) \multimap T(r)$	$\lambda Q. \forall x. \text{book}(x) \rightarrow Q(x) :$
		$[E(b) \multimap T(r)] \multimap T(r)$
	$\forall x. \text{book}(x) \rightarrow \exists e. \text{read}(e) \wedge \text{agent}(e, \text{giles}) \wedge \text{theme}(e, x) \wedge f(e) :$	
	$T(r)$	
<b>[thoroughly]</b>		
$\lambda V. \lambda g. \forall (\lambda e. \text{thorough}(e) \wedge g(e)) :$	$\lambda f. \forall x. \text{book}(x) \rightarrow \exists e. \text{read}(e) \wedge \text{agent}(e, \text{giles}) \wedge \text{theme}(e, x) \wedge f(e) :$	
$[[[V(r) \multimap T(r)] \multimap T(r)] \multimap [[V(r) \multimap T(r)] \multimap T(r)]]$	$[V(r) \multimap T(r)] \multimap T(r)$	
$\lambda g. \forall x. \text{book}(x) \rightarrow \exists e. \text{read}(e) \wedge \text{agent}(e, \text{giles}) \wedge \text{theme}(e, x) \wedge \text{thorough}(e) \wedge g(e) :$		<b>[root]</b>
$[V(r) \multimap T(r)] \multimap T(r)$		$\lambda e. T :$
		$V(r) \multimap T(r)$
$\forall x. \text{book}(x) \rightarrow \exists e. \text{read}(e) \wedge \text{agent}(e, \text{giles}) \wedge \text{theme}(e, x) \wedge \text{thorough}(e) :$		
$[V(r) \multimap T(r)] \multimap T(r)$		

# Exercise 1: Event semantics (3/3)

## 3 Andrew slept in a van yesterday.

$$\begin{array}{c}
 \text{[in]} \\
 \frac{\lambda \mathcal{V}. \lambda g. \lambda x. \mathcal{V}(\lambda e. \text{location}(e, x) \wedge g(e)) : \left[ \frac{[[V(s) \multimap T(s)] \multimap T(s)] \multimap [[V(s) \multimap T(s)] \multimap [E(v) \multimap T(s)]]}{\lambda g. \lambda x. \mathcal{V}(\lambda e. \text{location}(e, x) \wedge g(e)) : [V(s) \multimap T(s)] \multimap [E(v) \multimap T(s)]} \left[ \frac{\mathcal{V} : [V(s) \multimap T(s)] \multimap T(s)}{[V(s) \multimap T(s)] \multimap T(s)} \right]^1}{\left[ \frac{\lambda g. \lambda x. \mathcal{V}(\lambda e. \text{location}(e, x) \wedge g(e)) : [V(s) \multimap T(s)] \multimap [E(v) \multimap T(s)]}{\lambda x. \mathcal{V}(\lambda e. \text{location}(e, x) \wedge g(e)) : E(v) \multimap T(s)} \left[ \frac{g : V(s) \multimap T(s)}{V(s) \multimap T(s)} \right]^2 \right]}{[a \text{ van}] \quad \lambda Q. \exists x. \text{van}(x) \wedge Q(x) : [E(v) \multimap T(s)] \multimap T(s)} \\
 \frac{\lambda x. \mathcal{V}(\lambda e. \text{location}(e, x) \wedge g(e)) : E(v) \multimap T(s)}{\exists x. \text{van}(x) \wedge \mathcal{V}(\lambda e. \text{location}(e, x) \wedge g(e)) : T(s)} \\
 \frac{\text{[Andrew]} \quad \text{[slept]} \quad \text{andrew : } \lambda x. \lambda f. \exists e. \text{sleep}(e) \wedge \text{theme}(e, x) \wedge f(e) : E(a) \multimap [[V(s) \multimap T(s)] \multimap T(s)]}{\lambda f. \exists e. \text{sleep}(e) \wedge \text{theme}(e, \text{andrew}) \wedge f(e) : [V(s) \multimap T(s)] \multimap T(s)} \\
 \frac{\lambda g. \exists x. \text{van}(x) \wedge \mathcal{V}(\lambda e. \text{location}(e, x) \wedge g(e)) : [V(s) \multimap T(s)] \multimap T(s)}{\lambda \mathcal{V}. \lambda g. \exists x. \text{van}(x) \wedge \mathcal{V}(\lambda e. \text{location}(e, x) \wedge g(e)) : [[V(s) \multimap T(s)] \multimap T(s)]} \multimap_{T,2} \\
 \frac{\lambda \mathcal{V}. \lambda g. \exists x. \text{van}(x) \wedge \mathcal{V}(\lambda e. \text{location}(e, x) \wedge g(e)) : [[V(s) \multimap T(s)] \multimap T(s)]}{\lambda \mathcal{V}. \lambda g. \exists x. \text{van}(x) \wedge \mathcal{V}(\lambda e. \text{location}(e, x) \wedge g(e)) : [[V(s) \multimap T(s)] \multimap T(s)]} \multimap_{T,1} \\
 \frac{\lambda g. \exists x. \text{van}(x) \wedge \exists e. \text{sleep}(e) \wedge \text{theme}(e, \text{andrew}) \wedge \text{location}(e, x) \wedge g(e) : [V(s) \multimap T(s)] \multimap T(s)}{\lambda g. \exists x. \text{van}(x) \wedge \exists e. \text{sleep}(e) \wedge \text{theme}(e, \text{andrew}) \wedge \text{location}(e, x) \wedge \text{time}(e, \text{yesterday}) \wedge g(e) : [V(s) \multimap T(s)] \multimap T(s)} \text{[yesterday]} \\
 \frac{\lambda g. \exists x. \text{van}(x) \wedge \exists e. \text{sleep}(e) \wedge \text{theme}(e, \text{andrew}) \wedge \text{location}(e, x) \wedge \text{time}(e, \text{yesterday}) \wedge g(e) : [V(s) \multimap T(s)] \multimap T(s)}{\lambda g. \exists x. \text{van}(x) \wedge \exists e. \text{sleep}(e) \wedge \text{theme}(e, \text{andrew}) \wedge \text{location}(e, x) \wedge \text{time}(e, \text{yesterday}) : T(s)} \text{[root]}
 \end{array}$$