

**Lecture 11**

TEMPORAL ANAPHORA: DREFS FOR TIMES, EVENTS AND STATES

1. Nominal and temporal anaphora

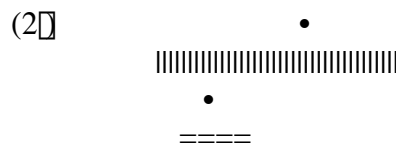
• ENGLISH

(1E) Today I *saw* a cat.



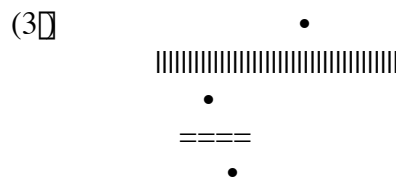
$e_0$ : speech event  
 $t_0$ : day of  $e_0$   
 $e_1$ :  $e_0$ -speaker  $x_1$  sees cat  $x_2$

(2E) It *was* hungry.



$e_0$ : speech event  
 $t_0$ : day of  $e_0$   
 $e_1$ :  $e_0$ -speaker  $x_1$  sees cat  $x_2$   
 $s_1$ :  $x_2$  is hungry

(3E) I *gave* it some food.



$e_0$ : speech event  
 $t_0$ : day of  $e_0$   
 $e_1$ :  $e_0$ -speaker  $x_1$  sees cat  $x_2$   
 $s_1$ : cat  $x_2$  is hungry  
 $e_2$ :  $e_0$ -spkr  $x_1$  gives cat  $x_2$  food  $x_3$

• KALAALLISUT

(1K) *Ullu-mi qitsus-si-vu-nga.*  
 day-LOC cat-see-IND.IV-1S

(Today I saw a cat.)



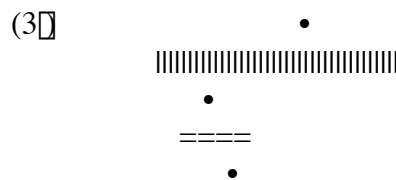
$e_0$ : speech event  
 $t_0$ : day of  $e_0$   
 $e_1$ :  $e_0$ -speaker  $x_1$  sees cat  $x_2$

(2-3) *Pirililir-su-q taku-ga-kku...*  
 hungry-ELA-3S see-FCT-1S.3S...

(I saw it was hungry, ...

*...nirisassa-nik tuni-va-ra.*  
 ...food-MOD give-IND.TV-1S.3S

...so I gave it some food.)



$e_0$ : speech event  
 $t_0$ : day of  $e_0$   
 $e_1$ :  $e_0$ -speaker  $x_1$  sees cat  $x_2$   
 $s_1$ : cat  $x_2$  is hungry  
 $e_2$ :  $e_0$ -spkr  $x_1$  gives cat  $x_2$  food  $x_3$

## II. Notation to be used

- For *entities* (type  $\square$ )

$[x  ]$	add an entity to $\top$	
$[y  ]$	add an entity to $\square$	
$1_{\top}$	topical entity	(1st entity on $\top$ )
$1_{\square}$	background entity	(1st entity on $\square$ )

- For *time periods* (type  $\square$ )

$[t  ]$	add a time period to $\top$	
$[t  \square]$	add a time period to $\square$	
$\square_{\top}$	topic time	(1st time period on $\top$ )
$\square_{\square}$	background time	(1st time period on $\square$ )
$t < t[\square]$	$t$ is before $t[\square]$	
$t \square t[\square]$	$t$ is a subperiod of $t[\square]$	
$\square_r$	$w_i$ -time of	

- For *events* (type  $\square$ )

$[e  ]$	add an event to $\top$	
$[e  \square]$	add an event to $\square$	
$\square_{\top}$	topical event	(1st event on $\top$ )
$\square_{\square}$	background event	(1st event on $\square$ )
$e \square_r t$	$\square_r e \square t$	(in $w_i$ , $e$ within $t$ )
$AG e =_r x$	in $w_i$ , the agent of $e$ is $x$	
$RS e =_r s$	in $w_i$ , the result state of $e$ is $s$	
$t =_r \square RS e$	in $w_i$ , $t$ is the time of the result state of $e$	
$(e: (AG e) speak_{up,r})$	in $w_i$ , $e$ is the beginning of a speech event	
$(e: 1_{\top} see_r y)$	in $w_i$ , $e$ is an event in which $1_{\top}$ sees $y$	

- For *states* (type  $\square$ )

$[s  ]$	add a state to $\top$	
$[s  \square]$	add a state to $\square$	
$\square_{\top}$	topical state	(1st state on $\top$ )
$\square_{\square}$	background state	(1st state on $\square$ )
$t \square_r s$	$t \square \square_r s$	(in $w_i$ , $s$ holds at $t$ )
$EX s =_r x$	in $w_i$ , the experiences of $s$ is $x$	
$BC s =_r e$	in $w_i$ , the onset ('becoming') of $s$ is $e$	
$t =_r \square s$	in $w_i$ , $t$ is the time of state $s$	
$(s: (EX s) believe_r p)$	in $w_i$ , $s$ is a belief state whose experiencer believes proposition $p$	
$(s: busy_r 1_{\top})$	in $w_i$ , $s$ is a state in which $1_{\top}$ (experiencer of $s$ ) is busy	

- For *kinds of entities* (type  $\square\square\square$  or  $\square\square$ , where  $\square$  is the type of *worlds*)

$[k  ]$	add a kind (function) to $\top$	
$[k  \square]$	add a kind (function) to $\square$	
$\square_{\top}$	topical kind	(1st kind on $\top$ )
$\square_{\square}$	background kind	(1st kind on $\square$ )
$busy k$	for any world $w$ where $k$ is instantiated & state $s$ where $k$ is instantiated in $w$ , the instantiating entity, $kws$ , is busy in $s$ in $w$ .	



• ENGLISH: *State* verb (intransitive)

(5E) My GEN mother  
 [y| y =<sub>r</sub> AG □<sub>r</sub>]; [x| x ≠ 1<sub>□</sub>]; [l 1<sub>τ</sub> ma.of 1<sub>□</sub>];

was: ...*pst* be- -*tns* happy  
 [l □<sub>r</sub> <<sub>r</sub> □<sub>r</sub>]; [s kl 1<sub>τ</sub> = krs]; [l □<sub>r</sub> □<sub>r</sub> □<sub>□</sub>]; [t| t =<sub>r</sub> □□□]; [l happy □<sub>□</sub>]  
 ✓ (4a)



will: ...*will* be- -*tns* happy  
 [l □<sub>r</sub> <<sub>r</sub> □<sub>r</sub>]; [s kl 1<sub>τ</sub> = krs]; [l □<sub>r</sub> □<sub>r</sub> □<sub>□</sub>]; [t| t =<sub>r</sub> □□□]; [l happy □<sub>□</sub>]  
 ✓ (4b)



is: ...*prs* be- -*tns* happy  
 [l □<sub>r</sub> □<sub>r</sub> □<sub>r</sub>]; [s kl 1<sub>τ</sub> = krs]; [l □<sub>r</sub> □<sub>r</sub> □<sub>□</sub>]; [t| t =<sub>r</sub> □□□]; [l happy □<sub>□</sub>]



IV. Revised basic meaningsENGLISH. **Lex 3:** Without drefs for *times*, *events*, *states*, or *kinds* (as on **Quiz 3**)

<b>rf.</b>	he <sub>□</sub> / him <sub>□</sub>	↔ [  msc <sub>r</sub> □]	<i>referential noun</i>
	she <sub>□</sub> / her <sub>□</sub>	↔ [  fem <sub>r</sub> □]	
	John <sub>□</sub>	↔ [  john <sub>e</sub> □ □]	
<b>n.</b>	man <sub>□</sub>	↔ [  man <sub>r</sub> □]	<i>common noun</i>
	enemy <sub>□□</sub>	↔ [  enemy <sub>r</sub> □□□]	
<b>d.</b>	the <sub>□</sub>	↔ [  □ ≠ 1 <sub>T</sub> ]	<i>determiner</i>
	a(n)	↔ [y ]	
		↔ [ ]	
<b>K.</b>	NOM <sub>□</sub>	↔ [x  x □ □], if □ ≠ 1 <sub>T</sub> [  □ □ □], otherwise	<i>case</i>
	ACC <sub>□</sub>	↔ [  1 <sub>□</sub> □ □]	
	GEN <sub>□</sub>	↔ [y  y ≠ □]	
	GEN <sub>□□</sub>	↔ [  □□ ≠ □]	
<b>P.</b>	to <sub>□</sub> / [ ] <sub>□</sub>	↔ [  2 <sub>□</sub> □ □]	<i>prepositional case</i>
	by <sub>□</sub>	↔ [  2 <sub>□</sub> □ □]	
<b>iv.</b>	return <sub>□</sub>	↔ [  return <sub>r</sub> 1 <sub>T</sub> ]	<i>intransitive verb</i>
<b>tv.</b>	see	↔ [  see <sub>r</sub> 1 <sub>□</sub> 1 <sub>T</sub> ]	<i>transitive verb</i>
		↔ [y  see <sub>r</sub> y 1 <sub>T</sub> ]	
<b>tv'.</b>	give <sub>□</sub>	↔ [y ]; [y  give.to <sub>r</sub> y 1 <sub>□</sub> 1 <sub>T</sub> ]	<i>ditransitive verb</i>
	introduce	↔ [y  ]; [y  intr.to <sub>r</sub> 1 <sub>□</sub> y 1 <sub>T</sub> ]	
<b>be.</b>	was	↔ [y  y ≠ 1 <sub>T</sub> ]	<i>passive 'be'</i>
<b>pp.</b>	see-n	↔ [  see <sub>r</sub> 1 <sub>T</sub> 1 <sub>□</sub> ]	<i>passive participle</i>
	give <sub>□</sub> -en	↔ [y  give.to <sub>r</sub> 1 <sub>T</sub> y 1 <sub>□</sub> ]	

ENGLISH. **Lex 4: *With*** drefs for *times, events, states, and kinds*

<b>in.</b>	I / me	↔ [y  y = <sub>r</sub> AG □ <sub>T</sub> ]	<i>indexical noun</i>
	today	↔ [tl day <sub>r</sub> t, □ <sub>r</sub> □ <sub>r</sub> t]; [tl t □ □ <sub>□</sub> ]	
<b>rn.</b>	he <sub>□</sub> / him <sub>□</sub>	↔ [l 3SM □]	<i>referential noun (3rd person)</i>
	she <sub>□</sub> / her <sub>□</sub>	↔ [l 3SF □]	
	it <sub>□</sub>	↔ [l 3SN □]	
	John <sub>□</sub>	↔ [l john <sub>e</sub> = □]	
<b>D.</b>	the <sub>□</sub>	↔ [l □ ≠ 1 <sub>T</sub> ]	<i>determiner</i>
	a(n)/some	↔ [y ]	
		↔ [y  y = □ <sub>□</sub> r □ <sub>□</sub> ]	
		↔ [l]	
<b>cn.</b>	man <sub>□</sub>	↔ [l man □]	<i>common noun</i>
	father <sub>□□</sub>	↔ [l □ fa.of <sub>r</sub> □□]	
<b>K.</b>	NOM <sub>□</sub>	↔ [xl x = □], if □ ≠ 1 <sub>T</sub> [l □ = □], otherwise	<i>case</i>
	ACC <sub>□</sub>	↔ [l 1 <sub>□</sub> = □]	
	GEN <sub>□</sub>	↔ [xl x ≠ □] ↔ [y  y ≠ □]	
<b>T1.</b>	<b><i>pst</i></b>	↔ [l □ <sub>r</sub> < <sub>r</sub> □ <sub>r</sub> ]	<i>temporal presupposition</i>
	<b><i>fut</i></b>	↔ [l □ <sub>r</sub> < <sub>r</sub> □ <sub>r</sub> ]	
	<b><i>prs</i></b>	↔ [l □ <sub>r</sub> □ <sub>r</sub> □ <sub>r</sub> ]	
<b>iv.</b>	return	↔ [el e: 1 <sub>T</sub> return <sub>r</sub> ]	<i>intransitive verb</i>
	stink	↔ [sl s: 1 <sub>T</sub> stink <sub>r</sub> ]	
<b>tv.</b>	like	↔ [sl s: 1 <sub>T</sub> like <sub>r</sub> 1 <sub>□</sub> ] ↔ [s y  e: 1 <sub>T</sub> like <sub>r</sub> y]	<i>transitive verb</i>
	see	↔ [el e: 1 <sub>T</sub> see <sub>r</sub> 1 <sub>□</sub> ] ↔ [e y  e: 1 <sub>T</sub> see <sub>r</sub> y]	
	give <sup>k</sup>	↔ [e kl e: 1 <sub>T</sub> give <sub>r</sub> k]; [l DA □ <sub>□</sub> = <sub>r</sub> 1 <sub>□</sub> ] ↔ [e kl e: 1 <sub>T</sub> give <sub>r</sub> k]; [y  DA □ <sub>□</sub> = <sub>r</sub> y]	e.g. <b>give</b> him a book
<b>be.</b>	be	↔ [s kl 1 <sub>T</sub> = krs]	e.g., <b>be</b> smart / a man / like-d
	be <sub>pp</sub>	↔ [e kl 1 <sub>T</sub> = <sub>r</sub> kre];	e.g., <b>be</b> see-n (□-verb)
<b>T2.</b>	<b><i>-tns</i></b>	↔ [l □ <sub>□</sub> □ <sub>r</sub> □ <sub>r</sub> ]; [tl t = <sub>r</sub> □RS □ <sub>□</sub> ] [l □ <sub>r</sub> □ <sub>r</sub> □ <sub>□</sub> ]; [tl t = <sub>r</sub> □□ <sub>□</sub> ]	<i>tmp. location &amp; update</i>
<b>a.</b>	see-n	↔ [l □ <sub>□</sub> : AG □ <sub>□</sub> see <sub>r</sub> □ <sub>□</sub> ]	<i>adjective / adj. participle</i>
	like-d	↔ [l □ <sub>□</sub> : EX □ <sub>□</sub> like <sub>r</sub> □ <sub>□</sub> ]	
	give <sup>k</sup> -n	↔ [kl □ <sub>□</sub> : AG □ <sub>□</sub> give <sub>r</sub> k]; [l DA □ <sub>□</sub> = <sub>r</sub> □ <sub>□</sub> ]	e.g. he was <b>given</b> a book
	happy	↔ [l happy □ <sub>□</sub> ]	
<b>P.</b>	to / □	↔ [y  DA □ <sub>□</sub> □ y]	<i>preposition</i>
	by	↔ [y  AG □ <sub>□</sub> □ y]	

**Homework 8**

(8 pts)

$e_0$ -speaker in  $w_i = S$ ,  $w_i$ -cat =  $C$ ,  $w_i$ -food =  $F$ ,  $unknown_1 = ?$ ,  $unknown_2 = ??$

Input state:  $[w_i, \square, \square, \square]$

- START-UP UPDATE (all languages)

(0)  $[el\ e: (AG\ e)\ speak.up_r]; [tl\ t =_r\ \square\square_r]$   
 out:  $[w_i, \square_0, \square, \square]$   $[w_i, \square_0, e_0, \square, \square]$

(0)  $w_i:$   $\bullet$   $\uparrow e_0$ : speech event  
 |  $\uparrow t_0$ :  $e_0$ -now

- ENGLISH:

(1E) Today ...  
 $[tl\ day_r\ t, \square_r\ \square_r\ t]; [tl\ t\ \square\ \square_r]; \dots$   
 out:  $[w_i, \square_0, e_0, \square_1, \square]$   $[w_i, \square_2, t_0, e_0, \square_1, \square]$

(a)  $w_i:$   $\bullet$   $\uparrow e_0$ : speech event  
 |  $t_0$ :  $e_0$ -now  
 |||||  $t_1$ : day of  $e_0$   
 |||||  $\uparrow t_2$ : subperiod of  $t_1$

(b)  $w_i:$   $\bullet$   $\uparrow e_0$ : speech event  
 |  $t_0$ :  $e_0$ -now  
 |||||  $t_1$ : day of  $e_0$   
 |||||  $\uparrow t_2$ : subperiod of  $t_1$

(c)  $w_i:$   $\bullet$   $\uparrow e_0$ : speech event  
 |  $t_0$ :  $e_0$ -now  
 |||||  $t_1$ : day of  $e_0$   
 |||||  $\uparrow t_2$ : subperiod of  $t_1$

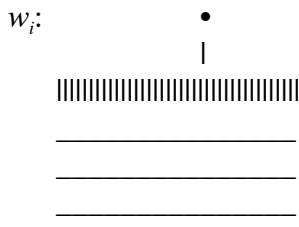
...I NOM  
 $[y| y =_r\ AG\ \square_r]; [x| x = 1_\square];$   
 \_\_\_\_\_ ; \_\_\_\_\_

- ...*pst* see- -*tns*  
 $[| \square_r <_r \square_r]; [e\ y| e: 1_\uparrow\ see_r\ y]; [|\ \square_r \square_r \square_r]; [tl\ t =_r \square_{RS} \square_r];$   
 \_\_\_\_\_  
 \_\_\_\_\_

$w_i:$   $\bullet$   $\uparrow e_0$ : speech event  
 |  $t_0$ :  $e_0$ -now  
 |||||  $t_1$ : day of  $e_0$   
 \_\_\_\_\_  $t_2$ : subperiod of  $t_1$   
 \_\_\_\_\_  $e_1$ :  $e_0$ -speaker  $\uparrow S$  sees ?  
 \_\_\_\_\_  $\uparrow t_3$ : time of result state of  $e_1$

- ...a cat ACC  
[l ]; [l cat<sub>r</sub> 1<sub>□</sub>]; [l 1<sub>□</sub> = 1<sub>□</sub>]

out: \_\_\_\_\_  
\_\_\_\_\_



<sup>⊤</sup>e<sub>0</sub>: speech event  
t<sub>0</sub>: e<sub>0</sub>-now  
t<sub>1</sub>: day of e<sub>0</sub>  
t<sub>2</sub>: subperiod of t<sub>1</sub>  
e<sub>1</sub>: e<sub>0</sub>-speaker <sup>⊤</sup>S sees cat C  
<sup>⊤</sup>t<sub>3</sub>: time of result state of e<sub>1</sub>

- (2E) It NOM ...  
[l 3SN 1<sub>□</sub>]; [x| x = 1<sub>□</sub>]; ...

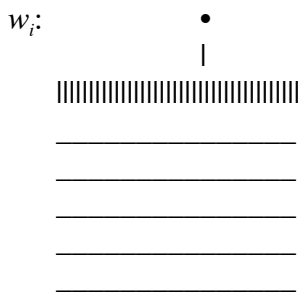
out: \_\_\_\_\_

- ...*pst* be- -*tns*  
[l □<sub>r</sub> <<sub>r</sub> □<sub>r</sub>]; [s kl 1<sub>⊤</sub> = krs]; [l □<sub>r</sub> □<sub>r</sub> □<sub>□</sub>]; [tl t =<sub>r</sub> □□□<sub>□</sub>];

out: \_\_\_\_\_  
\_\_\_\_\_

hungry.  
[l hungry □<sub>□</sub>];

out: \_\_\_\_\_  
\_\_\_\_\_



<sup>⊤</sup>e<sub>0</sub>: speech event  
t<sub>0</sub>: e<sub>0</sub>-now  
t<sub>1</sub>: day of e<sub>0</sub>  
t<sub>2</sub>: subperiod of t<sub>1</sub>  
e<sub>1</sub>: e<sub>0</sub>-speaker S sees cat C  
t<sub>3</sub>: time of result state of e<sub>1</sub>  
s<sub>0</sub>: cat <sup>⊤</sup>C is k<sub>0</sub>-hungry  
<sup>⊤</sup>t<sub>4</sub>: time of s<sub>0</sub>

(3E) ...I NOM  
 [yl y =<sub>r</sub> AG □<sub>r</sub>]; [xl x = 1□];

out: \_\_\_\_\_  
 \_\_\_\_\_

• ...*pst* *give*<sup>k</sup> *-tns*  
 [l □<sub>r</sub> <<sub>r</sub> □<sub>r</sub>]; [e kl e: 1<sub>τ</sub> give<sub>r</sub> k]; [yl DA □<sub>h</sub> = y]; [l □<sub>h</sub> □<sub>r</sub> □<sub>r</sub>]; [tl t =<sub>r</sub> □RS □<sub>h</sub>];

out: \_\_\_\_\_  
 \_\_\_\_\_

• ...it ACC  
 [l 3SN 2<sub>τ</sub>]; [l 1□ = 2<sub>τ</sub>];

out: \_\_\_\_\_  
 \_\_\_\_\_

• ... some food  
 [yl y = □<sub>r</sub>r□<sub>h</sub>]; [l food □<sub>h</sub>]

out: \_\_\_\_\_  
 \_\_\_\_\_

w<sub>i</sub>: •  
 |  
 |||||  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

<sup>τ</sup>e<sub>0</sub>: speech event  
 t<sub>0</sub>: e<sub>0</sub>-now  
 t<sub>1</sub>: day of e<sub>0</sub>  
 t<sub>2</sub>: subperiod of t<sub>1</sub>  
 e<sub>1</sub>: e<sub>0</sub>-speaker S sees cat C  
 t<sub>3</sub>: time of result state of e<sub>1</sub>  
 s<sub>0</sub>: cat C is k<sub>0</sub>-hungry  
 t<sub>4</sub>: time of s<sub>0</sub>  
 e<sub>2</sub>: <sup>τ</sup>S gives C sm k<sub>1</sub>-food F  
<sup>τ</sup>t<sub>5</sub>: time of result state of e<sub>2</sub>





(3E) ...I NOM  
 [yl y =<sub>r</sub> AG □<sub>r</sub>]; [xl x = 1□];

out: □<sub>w<sub>i</sub></sub>, □<sub>t<sub>4</sub></sub>, C, t<sub>3</sub>, S, t<sub>2</sub>, t<sub>0</sub>, e<sub>0</sub>□ □<sub>w<sub>i</sub></sub>, □<sub>t<sub>4</sub></sub>, C, t<sub>3</sub>, S, t<sub>2</sub>, t<sub>0</sub>, e<sub>0</sub>□  
 □<sub>S</sub>, s<sub>0</sub>, k<sub>0</sub>, e<sub>1</sub>, C, S, t<sub>1</sub>□□ □<sub>S</sub>, s<sub>0</sub>, k<sub>0</sub>, e<sub>1</sub>, C, S, t<sub>1</sub>□□

• ...*pst* give<sup>k</sup>-  
 [l □<sub>r</sub> <<sub>r</sub> □<sub>r</sub>]; [e kl e: 1<sub>τ</sub> give<sub>r</sub> k]; [yl DA □<sub>h</sub> = y];

out: □<sub>w<sub>i</sub></sub>, □<sub>t<sub>4</sub></sub>, C, t<sub>3</sub>, S, t<sub>2</sub>, t<sub>0</sub>, e<sub>0</sub>□ □<sub>w<sub>i</sub></sub>, □<sub>t<sub>4</sub></sub>, C, t<sub>3</sub>, S, t<sub>2</sub>, t<sub>0</sub>, e<sub>0</sub>□□  
 □<sub>e<sub>2</sub></sub>, k<sub>1</sub>, S, s<sub>0</sub>, k<sub>0</sub>, e<sub>1</sub>, C, S, t<sub>1</sub>□□ □<sub>e<sub>2</sub></sub>, k<sub>1</sub>, S, s<sub>0</sub>, k<sub>0</sub>, e<sub>1</sub>, C, S, t<sub>1</sub>□□

-*tns*

[l □<sub>h</sub> □<sub>r</sub> □<sub>r</sub>]; [tl t =<sub>r</sub> □RS □<sub>h</sub>];

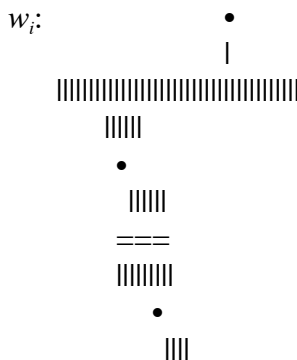
□<sub>w<sub>i</sub></sub>, □<sub>t<sub>5</sub></sub>, S, t<sub>4</sub>, C, t<sub>3</sub>, S, t<sub>2</sub>, t<sub>0</sub>, e<sub>0</sub>□□  
 □<sub>e<sub>2</sub></sub>, k<sub>1</sub>, S, s<sub>0</sub>, k<sub>0</sub>, e<sub>1</sub>, C, S, t<sub>1</sub>□□

• ...it ACC  
 [l 3SN 2<sub>τ</sub>]; [l 1□ = 2<sub>τ</sub>];

out: □<sub>w<sub>i</sub></sub>, □<sub>t<sub>5</sub></sub>, S, t<sub>4</sub>, C, t<sub>3</sub>, S, t<sub>2</sub>, t<sub>0</sub>, e<sub>0</sub>□□  
 □<sub>C</sub>, e<sub>2</sub>, k<sub>1</sub>, S, s<sub>0</sub>, k<sub>0</sub>, e<sub>1</sub>, C, S, t<sub>1</sub>□□

• ... some food  
 [yl y = □<sub>r</sub>r□<sub>h</sub>]; [l food □<sub>h</sub>]

out: □<sub>w<sub>i</sub></sub>, □<sub>t<sub>5</sub></sub>, S, t<sub>4</sub>, C, t<sub>3</sub>, S, t<sub>2</sub>, t<sub>0</sub>, e<sub>0</sub>□□  
 □<sub>F</sub>, C, e<sub>2</sub>, k<sub>1</sub>, S, s<sub>0</sub>, k<sub>0</sub>, e<sub>1</sub>, C, S, t<sub>1</sub>□□



- τ e<sub>0</sub>: speech event
- t<sub>0</sub>: e<sub>0</sub>-now
- t<sub>1</sub>: day of e<sub>0</sub>
- t<sub>2</sub>: subperiod of t<sub>1</sub>
- e<sub>1</sub>: e<sub>0</sub>-speaker S sees cat C
- t<sub>3</sub>: time of result state of e<sub>1</sub>
- s<sub>0</sub>: cat C is k<sub>0</sub>-hungry
- t<sub>4</sub>: time of s<sub>0</sub>
- e<sub>2</sub>: τ S gives C sm k<sub>1</sub>-food F
- τ t<sub>5</sub>: time of result state of e<sub>2</sub>

**Lecture 12**

TEMPORAL ANAPHORA IN A TENSELESS LANGUAGE

I. Temporal anaphora in *Kalaallisut*: Mood instead of tense

(4K) Today ...  
*Ullu-* *-mi* ...  
 day- -LOC ...  
 $[t \text{ day}_r t]$ ;  $[t \text{ t } \square \square_h]$ ;  $[ \square_r \square_r \square_h ]$  ...

(a)  $w_i$ : •  $\text{}^\top e_0$ : speech event  
 |  $t_0$ :  $e_0$ -now  
 |||  $t_1$ : day of  $e_0$   
 |||  $\text{}^\top t_2$ : subinterval of  $t_1$

...my father returned.

*ataata-* *-ga* *tikip-* *-pu* *-q.*  
 father- -1S.S come.back- -IND.IV -3S  
 $[f \text{ fa.of } \square]$ ;  $[x \text{ x} = \square \square_h(\text{AG}_r \square_r)]^1$ ;  $[e \text{ e: } 1_\top \text{ return}_r]$ ;  $^p[ \square \square_h <_r \square_r ]$ ;  $[ \square \square_r \square_r ]$ ;  $^p[ \text{3S } 1_\top ]$

$w_i$ : •  $\text{}^\top e_0$ : speech event  
 |  $t_0$ :  $e_0$ -now  
 |||  $t_1$ : day of  $e_0$   
 |||  $\text{}^\top t_2$ : subinterval of  $t_1$   
 •  $e_1$ :  $e_0$ -spkr's fa  $\text{}^\top x_1$  returns

(5K) When he came home, ...  
*Angirla-* *-mm* *-at* ...  
 come.home- -FCT $\square$  -3S $\square$  ...  
 $[ \square \square_h : 1_\top \text{ come.home}_r ]$ ;  $^A[ y \text{ AG } \square \square_h = y ]$ ;  $[ \square \square_r \square_r ]$ ;  $[ t \text{ t} = \square \text{RS } \square_h ]$ ;  $^p[ \text{3S } 1_\square ]$ ;  $[ x \text{ x} \neq 1_\square ]$  ...

$w_i$ : •  $\text{}^\top e_0$ : speech event  
 |  $t_0$ :  $e_0$ -now  
 |||  $t_1$ : day of  $e_0$   
 |||  $t_2$ : subinterval of  $t_1$   
 •  $e_1$ :  $e_0$ -spkr's fa  $\square x_1$  returns  
 |||  $\text{}^\top t_3$ : time of res. state of  $e_1$

<sup>1</sup>  $\square$  is the type of *entities* (instead of 'e', now used as a variable over events), and 'f', a variable over  $\square$ -functions.  
 $f \text{ fa.of } \square := \square i. \square y \square \text{ Dom } f: f y \text{ fa.of}_r y.$  (i.e., *f* maps any entity *y* in its domain to *y*'s father)



(6K) She *had* cooked his favorite food.

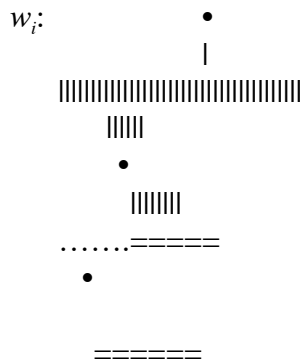
*Illinnarisa-* -*a* -*nik*  
 favorite.food- -3S<sub>□</sub> -MOD

[*kl k favorite.food.of* 1<sub>□</sub>]; <sup>P</sup>[*l 3S* 1<sub>□</sub>]; [*l 1<sub>□</sub> ≠ 1<sub>τ</sub>*]; [*l*];

*nirisas-* -*siu* -*us* -*sima*  
 food- -make -for -PRF

[*l* □<sub>□</sub> *food*]; [*el e: 1<sub>τ</sub> make* □<sub>□</sub>]; [*l* □<sub>□</sub> *for<sub>r</sub>* 1<sub>□</sub>]; [*sl s =<sub>r</sub> RS* □<sub>□</sub>];

-*va* -*a*  
 -IND.TV -3S.3S  
 [*l* □<sub>τ</sub> □<sub>r</sub> □<sub>□</sub>]; [*l 3S 1<sub>τ</sub>*]; [*l 3S 1<sub>□</sub>, 1<sub>□</sub> ≠ 1<sub>τ</sub>*]



- <sup>τ</sup>*e*<sub>0</sub>: speech event
- t*<sub>0</sub>: *e*<sub>0</sub>-now
- t*<sub>1</sub>: day of *e*<sub>0</sub>
- t*<sub>2</sub>: subinterval of *t*<sub>1</sub>
- e*<sub>1</sub>: *e*<sub>0</sub>-spkr's fa □<sub>x</sub><sub>1</sub> returns
- <sup>τ</sup>*t*<sub>3</sub>: time of res. state of *e*<sub>1</sub>
- s*<sub>1</sub>: *e*<sub>0</sub>-spkr's ma <sup>τ</sup>*x*<sub>2</sub> is happy
- e*<sub>2</sub>: *e*<sub>0</sub>-spkr's ma <sup>τ</sup>*x*<sub>2</sub> makes □<sub>x</sub><sub>1</sub>'s favorite *k*<sub>0</sub>-food for □<sub>x</sub><sub>1</sub>
- s*<sub>2</sub>: result state of *e*<sub>2</sub>-cooking

**Homework 9**  
(Extra credit: 4 pts max)

$e_0$ -speaker in  $w_i = S$ ,  $w_i$ -cat =  $C$ ,  $w_i$ -food =  $F$ ,  $unknown_1 = ?$ ,  $unknown_2 = ??$

Input state:  $\langle w_i, \square \square \square \square \rangle$

- START-UP UPDATE (all languages)

(0)  $[el\ e: (AG\ e)\ speak.up_r]; [tl\ t =_r \square \square \square_r]$

out:  $\langle w_i, \langle e_0 \rangle \square \square \square \rangle \quad \langle w_i, \langle t_0, e_0 \rangle \square \square \square \rangle$

(0)  $w_i:$  •  
|  $\top e_0$ : speech event  
 $\top t_0$ :  $e_0$ -now

- KALAALLISUT:

(1K) Today  
Ullu- -mi ...  
day- -LOC ...  
 $[tl\ day_r\ t]; [tl\ t \square \square_1]; [\square \square_r \square_r \square_1]; \dots$

out:  $\langle w_i, \langle t_0, e_0 \rangle \langle t_1 \rangle \rangle \quad \langle w_i, \langle t_2, t_0, e_0 \rangle \langle t_1 \rangle \rangle$

$w_i:$  •  
|  
|||||  
|||||  $\top e_0$ : speech event  
 $t_0$ :  $e_0$ -now  
 $t_1$ : day of  $e_0$   
 $\top t_2$ : subinterval of  $t_1$

...I saw a cat.

...qitsus- -si  
...cat- -see  
... $[kl\ k\ cat]; [el\ e: (EX\ e)\ see_r\ k];$   
... $\langle w_i, \langle t_2, t_0, e_0 \rangle \langle k_0, t_1 \rangle \rangle \quad \langle w_i, \langle t_2, t_0, e_0 \rangle \langle e_1, k_0, t_1 \rangle \rangle$

-vu -nga.  
-IND.IV -1S  
 $P[\square \square_1 <_r \square_r]; [\square \square_1 \square_r \square_r]; P[\square \square_1\ 1S\ (EX\ \square_1)]; [xl\ x = (EX\ \square_1)]$   
 $\langle w_i, \langle S, t_2, t_0, e_0 \rangle \langle e_1, k_0, t_1 \rangle \rangle$

$w_i:$  •  
|  
|||||  
|||||  
•  $\top e_0$ : speech event  
 $t_0$ :  $e_0$ -now  
 $t_1$ : day of  $e_0$   
 $\top t_2$ : subinterval of  $t_1$   
 $e_1$ :  $e_0$ -spkr  $\top S$  sees a  $k_0$ -cat

(2K) I saw it was hungry, and so...  
*Pirililir-*  
 hungry-  
 [sl s: (EX s) hungry<sub>r</sub>];

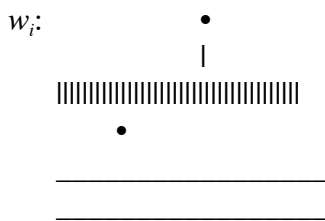
out: \_\_\_\_\_  
 \_\_\_\_\_

-su  
 -ELA<sub>□</sub>  
 [l (EX<sub>r</sub> □<sub>□</sub>) = □<sub>□</sub>r□<sub>□</sub>]; [l □<sub>r</sub> □<sub>r</sub> □<sub>□</sub>]; [tl t =<sub>r</sub> □□□];

out: \_\_\_\_\_  
 \_\_\_\_\_

-q ...  
 -3S<sub>□</sub> ...  
 [l 3S (EX □<sub>□</sub>), EX □<sub>□</sub> ≠<sub>r</sub> 1<sub>□</sub>]; [yl y =<sub>r</sub> EX □<sub>□</sub>]; ...

out: \_\_\_\_\_  
 \_\_\_\_\_



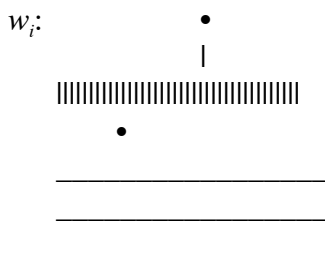
<sup>□</sup>e<sub>0</sub>: speech event  
 t<sub>0</sub>: e<sub>0</sub>-now  
 t<sub>1</sub>: day of e<sub>0</sub>  
 e<sub>1</sub>: e<sub>0</sub>-spkr <sup>□</sup>S sees a k<sub>0</sub>-cat  
 s<sub>0</sub>: k<sub>0</sub>-cat <sup>□</sup>C seen in e<sub>1</sub> is hungry  
<sup>□</sup>t<sub>2</sub>: time of s<sub>0</sub>-hungry state

...taku-  
 ...see-  
 [l □<sub>□</sub>: 1<sub>□</sub> see<sub>r</sub> 1<sub>□</sub>];

-ga  
 -FCT<sub>□</sub>  
 [l (EX<sub>r</sub> □<sub>□</sub>) = 1<sub>□</sub>]; [l □<sub>□</sub> □<sub>r</sub> □<sub>□</sub>]; [tl t =<sub>r</sub> □RS □<sub>□</sub>];

-kku ...  
 -1S.3S<sub>□</sub> ...  
 [l 1S 1<sub>□</sub>]; [l 3S 1<sub>□</sub>, 1<sub>□</sub> ≠ 1<sub>□</sub>];...

out: \_\_\_\_\_  
 \_\_\_\_\_



<sup>□</sup>e<sub>0</sub>: speech event  
 t<sub>0</sub>: e<sub>0</sub>-now  
 t<sub>1</sub>: day of e<sub>0</sub>  
 e<sub>1</sub>: e<sub>0</sub>-spkr <sup>□</sup>S sees a k<sub>0</sub>-cat C  
 s<sub>0</sub>: k<sub>0</sub>-cat <sup>□</sup>C is hungry  
 t<sub>2</sub>: time of s<sub>0</sub>-hungry state of <sup>□</sup>C  
<sup>□</sup>t<sub>3</sub>: time of the result state of e<sub>1</sub>

...I gave it some food.

...nirisassa-

...food-

[kl k food];

-nik

-MOD

[];

out: \_\_\_\_\_  
 \_\_\_\_\_

...tuni-

...give-

[el e: 1<sub>τ</sub> give □<sub>□</sub>]; [l (EX □<sub>□</sub>) =<sub>r</sub> 1<sub>□</sub>];

out: \_\_\_\_\_  
 \_\_\_\_\_

-va

-IND.TV

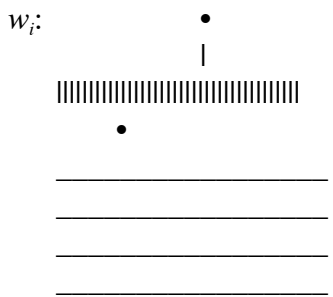
[l □<sub>□</sub> <<sub>r</sub> □<sub>τ</sub>]; [l □<sub>□</sub> □<sub>r</sub> □<sub>τ</sub>];

-ra.

-1s.3s

[l 1s 1<sub>τ</sub>]; [l 3s 1<sub>□</sub>, 1<sub>□</sub> ≠ 1<sub>τ</sub>]

out: \_\_\_\_\_  
 \_\_\_\_\_



<sup>τ</sup>e<sub>0</sub>: speech event

t<sub>0</sub>: e<sub>0</sub>-now

t<sub>1</sub>: day of e<sub>0</sub>

e<sub>1</sub>: e<sub>0</sub>-spkr <sup>τ</sup>S sees a k<sub>0</sub>-cat C

s<sub>0</sub>: k<sub>0</sub>-cat □C is hungry

t<sub>2</sub>: time of s<sub>0</sub>-hungry state of □C

<sup>τ</sup>t<sub>3</sub>: time of the result state of e<sub>1</sub>

e<sub>2</sub>: e<sub>0</sub>-spkr <sup>τ</sup>S gives k<sub>0</sub>-cat □C some k<sub>1</sub>-food

**Solution to Homework 9**  
(Extra credit: 4 pts max)

$e_0$ -speaker in  $w_i = S$ ,  $w_i$ -cat =  $C$ ,  $w_i$ -food =  $F$ ,  $unknown_1 = ?$ ,  $unknown_2 = ??$

Input state:  $\langle w_i, \square \square \square \square \rangle$

- START-UP UPDATE (all languages)

(0)  $[el\ e: (AG\ e)\ speak.up_r]; [tl\ t =_r \square \square \square_r]$

out:  $\langle w_i, \langle \phi_0 \rangle \square \square \square \rangle \quad \langle w_i, \langle t_0, e_0 \rangle \square \square \square \rangle$

(0)  $w_i:$  •  
|  $\top e_0$ : speech event  
 $\top t_0$ :  $e_0$ -now

- KALAALLISUT:

(1K) Today  
Ullu- -mi ...  
day- -LOC ...  
 $[tl\ day_r\ t]; [tl\ t \square \square_1]; [\square \square_r \square_r \square_1]; \dots$

out:  $\langle w_i, \langle t_0, e_0 \rangle \langle t_1 \rangle \rangle \quad \langle w_i, \langle t_2, t_0, e_0 \rangle \langle t_1 \rangle \rangle$

$w_i:$  •  
|  
|||||  
|||||  $\top e_0$ : speech event  
 $t_0$ :  $e_0$ -now  
 $t_1$ : day of  $e_0$   
 $\top t_2$ : subinterval of  $t_1$

∩ ...I saw a cat.

...qitsus- -si  
...cat- -see  
... $[kl\ k\ cat]; [el\ e: (EX\ e)\ see_r\ k];$   
... $\langle w_i, \langle t_2, t_0, e_0 \rangle \langle k_0, t_1 \rangle \rangle \quad \langle w_i, \langle t_2, t_0, e_0 \rangle \langle \phi_1, k_0, t_1 \rangle \rangle$

-vu -nga.  
-IND.IV -1S  
 $P[\square \square_1 <_r \square_r]; [\square \square_1 \square_r \square_r]; P[\square \square_1\ 1S\ (EX\ \square_1)]; [xl\ x = (EX\ \square_1)]$   
 $\langle w_i, \langle \phi_1, t_2, t_0, e_0 \rangle \langle \phi_1, k_0, t_1 \rangle \rangle$

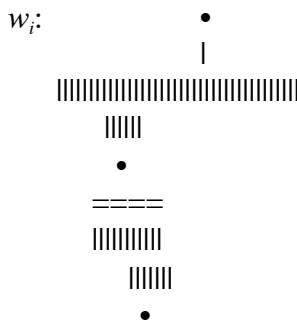
$w_i:$  •  
|  
|||||  
|||||  
•  $\top e_0$ : speech event  
 $t_0$ :  $e_0$ -now  
 $t_1$ : day of  $e_0$   
 $\top t_2$ : subinterval of  $t_1$   
 $e_1$ :  $e_0$ -spkr  $\top S$  sees a  $k_0$ -cat



...I gave it some food.  
 ...nirisassa- -nik  
 ...food- -MOD  
 [kl k food]; [];  
 out:  $\langle v_i, \langle d_4, t_3, S, t_2, t_0, e_0 \rangle$   
 $\langle k_1, C, s_0, e_1, k_0, t_1 \rangle$

...tuni-  
 ...give-  
 [el e: 1<sub>T</sub> give  $\langle \rangle$ ]; [l (EX  $\langle \rangle$ ) =<sub>r</sub> 1 <sub>$\langle \rangle$</sub> ];  
 out:  $\langle v_i, \langle d_4, t_3, S, t_2, t_0, e_0 \rangle$   
 $\langle e_2, k_1, C, s_0, e_1, k_0, t_1 \rangle$

-va -ra.  
 -IND.TV -1S.3S  
 [l  $\langle \rangle$  <<sub>r</sub>  $\langle \rangle$ ]; [l  $\langle \rangle$   $\langle \rangle$  <<sub>r</sub>  $\langle \rangle$ ]; [l 1S 1<sub>T</sub>]; [l 3S 1 <sub>$\langle \rangle$</sub> , 1 <sub>$\langle \rangle$</sub>  ≠ 1<sub>T</sub>]  
 out:  $\langle v_i, \langle d_4, t_3, S, t_2, t_0, e_0 \rangle$   
 $\langle e_2, k_1, C, s_0, e_1, k_0, t_1 \rangle$



- $\top e_0$ : speech event
- $t_0$ :  $e_0$ -now
- $t_1$ : day of  $e_0$
- $t_2$ : subinterval of  $t_1$
- $e_1$ :  $e_0$ -spkr  $\top S$  sees a  $k_0$ -cat
- $s_0$ :  $k_0$ -cat  $\langle C$  seen in  $e_1$  is hungry
- $t_3$ : time of  $s_0$ -hungry state of cat  $\langle C$
- $\top t_4$ : time of the result state of  $e_1$
- $e_2$ :  $e_0$ -spkr  $\top S$  gives  $k_0$ -cat  $\langle C$  some  $k_1$ -food