Semantic composition: Kalaallisut in CCG+UC$_1$

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1. TOWARD SYN-SEM TYPOLOGY

- E. Jelinek 1984:
  W(arlpiri)-TYPE (EJ traits (62.a-f) ~ MB traits **BA**, **TO**, **L**, …):
  = {*Warlpiri* (Pama-Nyungan: Ctr. Australia), *Tohono O'odham* (Uto-Aztecan: Arizona), *Lummi* (N. Straits Salish: American NW), …}

- SYN-SEM TRAITS (MB generalization of EJ)

T1: *Argument type*: What are the nominal arg's saturating the verbal pred.?
SA: *s*yntactic *a*rgument phrases only (NP subject, NP object, …)
e.g. English, French, …

BA: morphologically *b*ound *a*rguments only (pn clitic|affix, n-root, …)
e.g. Warlpiri, Tohono O'odham, Lummi, Kalaallisut, …

LA: *l*exical *a*rgument operations only (in ctxt, 'vrb-pred' = complete s)
e.g. Japanese, Chinese, …

MA: *m*ixed *a*rguments (some combination of SA, BA, LA)
e.g. Polish (BA subject, SA object), …

T2 *Prominence type*: What is the most prominent nominal relation?
SU: *su*bject prominent (grammatically marked SUbject vs. Direct Object)
e.g. English (SU pre-V, DO post-V, VP = s\SU constituent, …), …

TO: *to*pic prominent (gramm. marked ⊤ (topic) vs. ⊥ (background))
e.g. Warlpiri (iv-tns TNS-pn$_{\top}$, tv-tns TNS-pn$_{\top}$-pn$_{\bot}$), Tohono O'odham (ASP-pn$_{\bot}$, pn$_{\bot}$-tv), Kalaallisut (-3$_{\top}$|3$_{\bot}$, -ELA$_{\top|\bot}$, -FCT$_{\top|\bot}$, …), Japanese (⊤-marker *-ga*) Chinese (⊤-position), …

T3 *Word order type*: What determines the word order?
S: *s*yntactic rules (e.g. S → NP VP, etc, ∴ 'rigid' word order)
e.g. English, French, Chinese, …

L: *l*exical operations (H-lift, pre-H lift, post-H lift, etc, ∴ 'free' order)
e.g. Warlpiri, Tohono O'odham, Kalaallisut, Polish, Japanese (no post-H lift, ∴ H-final), …

- **T1** (argument type). Bound-Argument languages

BA.i. verbal *n*-pred. requires *n* morphologically BOUND ARGUMENTS
verbal *n*-pred. + *n* mrph. BOUND ARGUMENTS constitute a sentence (s)

(1)

	Warlpiri (K. Hale data)	Kalaallisut (MB data)
s:		*Guuti-qar-pu-q.* *God*-have-DEC$_{iv}$-**3S**$_{(\top)}$ There is$_{\top}$ a God$^{\bot}$.
iv:	*Parnka-mi ka-rna.* run-NPST PRS-**1S** I am running.	*Arpag-pu-nga.* run-DEC$_{iv}$-**1S** I am running.
tv:	*Nya-nyi ka-rna-ngku* see-NPST PRS-**1S**-*2S* I see you.	*Taku-pa-a-nga.* see-DEC$_{tv}$-**3S**$_{(\top)}$-*1S* He$_{\top}$'s seen me.

BA.ii no obligatory syntactic np's: all syntactic np's ('subject', 'object', etc) are optional dependents of the verbal head. (see TO.ii below).

- **T2** (prominence type). TOpic-prominent languages

TO.i. Grammar primarily contrasts ⊤ (topic) vs. ⊥ (background).
TO.ii. Optional syntactic dependents used for *re-centering*.

(2)

	Warlpiri (KH data)	Kalaallisut (MB data)
iv^0:		*(Qanga) guuti-qar-pu-q.* (long.ago) *god*-have-DEC$_{iv}$-**3S**$_{(\top)}$ There is$_{\top}$ a God$^{\bot}$ | (Long ago$^{\top}$) there was a God$^{\bot}$.
iv^1:	*Parnka-mi ka-Ø (marlu).* run-NPST PRS-**3S** (roo) It$_{\top}$|(A|the kangaroo$^{\top}$) is running.	*(Nanuq) pangalig-pu-q.* (bear) run-DEC$_{iv}$-**3S**$_{(\top)}$ It$_{\top}$|(A|the bear$^{\top}$) is running.
tv:	*Nya-nyi ka-lu-Ø (marlu).* see-NPST PRS-**3P**-*3S* (roo) *(ngarrka-patu-rlu)* (man-PL-ERG) They$_{\top}$|(sm|the men$^{\top}$) see it$_{\bot}$|(a|the kangaroo$^{\bot}$).	*(Ole-p) (nanuq)* (Ole-ERG) (bear) *taku-pa-a-Ø.* see-DEC$_{tv}$-**3S**$_{(\top)}$.*3S*$_{(\bot)}$ He$_{\top}$|(Ole$^{\top}$) has seen . it$_{\bot}$|(a|the bear$^{\bot}$).

• **T3** (word order type). Lexically-ordered languages

L.i. *'free' order* of verbal head and dependents

(3) Warlpiri (KH data)

a. *Nya-nyi ka-rna-Ø marlu.*
see-NPST PRS-1S-3S roo

b. *Marlu ka-rna-Ø nya-nyi.*
roo PRS-1S-3S see-NPST
I see a|the kangaroo.

Kalaallisut (MB data)

Nanuq taku-pa-ra.
bear see-DEC_{tv}-1S.3S

Taku-pa-ra nanuq.
see-DEC_{tv}-1S.3S bear
I've seen a|the (polar) bear.

L.ii. *discontinuous 'constituents'*

(4) Warlpiri (KH data)

Marlu ka-rna-Ø wiri
roo PRS-1S-3S *big*
nya-nyi.
see-NPST
I see a|the big kangaroo.

Kalaallisut (MB data)

Angisuu-mik nanu-si-pu-nga
big-MOD *bear*-see-DEC_{tv}-1S
alla-mik.
other-MOD
I've seen another big bear.

L.iii. 'scrambling' ✓within | *across clause boundaries

(5) Warlpiri (KH data)

a.✓ *Karli-ki ka-rna-rla*
boomerang-DAT PRS-1S-D
warri-rni yangka-ku
seek-NPST that-DAT
kuja-npa-ju yu-ngu.
[CMP-2S-1S give-PST]
I am looking for the boomerang
you gave me.

b. * *Karli-ki ka-rna-rla*
boomerang-DAT PRS-1S-D
yu-ngu yangka-ku
give-PST that-DAT
kuja-npa-ju warri-rni
[CMP-2S-1S seek-NPST]

Kalaallisut (MB data)

a.✓ *Ole-p angisuu-mik*
Ole-ERG [big-MOD
nanu-si-ga-mi
bear-see-$FCT_{\top}$-$3S_{\top}$]
aallaa-pa-a
shoot-DEC-3S.3S
O.$^{\top}$ saw a big bear$^{\perp}$ and shot it.

b. * *Angisuu-mik Ole-p*
[big-MOD Ole-ERG
nanu-si-ga-mi
bear-see-$FCT_{\top}$-$3S_{\top}$]
aallaa-pa-a.
shoot-DEC_{tv}-3S.3S

2. CCG+UC_1 FRAGMENT OF KALAALLISUT

CCG-Rules (universal):

• application

X/Y: B_{bc} Y: A_{ab} $\Rightarrow_{>}$ X: BA

Y: A_a $X\backslash Y$: B_{ab} $\Rightarrow_{<}$ X: BA

• composition

$Y\backslash Z$: A_{ab} $X\backslash Y$: B_{bc} $\Rightarrow_{<\mathbf{B}}$ $X\backslash Z$: $\lambda u.\ B(Au)$

$Y\backslash Z\backslash Z'$: $A_{aa'b}$ $X\backslash Y$: B_{bc} $\Rightarrow_{<<\mathbf{B}}$ $X\backslash Z\backslash Z'$: $\lambda u \lambda u'.\ B(Auu')$

K1 (Kalaallisut categories)

i. s, pn, cn, are Kalaallisut categories;

ii. If X and Y are Kalaallisut categories, then so are X/Y and $X\backslash Y$

Abbreviations: s^+ = s/s, iv = s\pn, tv = iv\pn, rn = cn\pn, x\y\z = (x\y)\z

K2 (Kalaallisut category-to-type rule)

i. **tp**(s) = [], **tp**(pn) = D, **tp**(cn) = [D]

ii. $\mathbf{tp}(X/Y) = \mathbf{tp}(X\backslash Y) = \mathbf{tp}(Y)\mathbf{tp}(X)$

Abbreviation: $[] = (st)st$, $[]^2 = [][]$, D = se, $abc = a(bc)$, $[a_1 \ldots a_n] = a_1 \ldots a_n[]$

Table 1

Kalaallisut item (gloss)	Category	UC_1 type a	Notes
run, die-, capsize, …	iv	[D]	$\underline{x}, \underline{y}, \underline{z} \in {}^{\perp}Var_{D}$
see, kill-, forestall-…	tv	[DD]	
bear-, Ole, that-, big, other-…	cn	[D]	
enemy-, …	rn	[DD]	
-see, -use	iv\cn	[D][D]	$\underline{P} \in {}^{\perp}Var_{[D]}$
-have	iv\rn	[DD][D]	$\underline{R} \in {}^{\perp}Var_{[DD]}$
-antip	iv\tv	[DD][D]	
-with	cn\rn	[DD][D]	
-cn\iv (-tuq)	cn\iv	[D][D]	
-rn\tv (-taq)	rn\tv	[DD][DD]	
-rn\cn (-Ø)	rn\cn	[D][DD]	
-DEC, …	s\pn\iv	[D](D[])	$K \in {}^{\perp}Var_{[]}$
$-FCT_{\top}$, $-FCT_{\perp}$, $-ELA_{\top}$, $-ELA_{\perp}$, …	s^+\pn\iv	$[D](D[]^2)$	
$-^{\top}$, $-ERG^{\top}$, $-^{\perp}$, $-ERG^{\perp}$, -MOD	s^+\cn	$[D][]^2$	
-1S, -2S, $-3S_{(\top)}$, $-3S_{(\perp)}$, …	x\(x\pn)	(D…)…	x ∈ {s, s^+, cn, …}
$-^{y}(\cdot)$ (⊥-accommodation)	x\x	[D][D]	x ∈ {iv, cn}
$-^{\backslash}(\cdot)$ (head x lift)	x\\s^+\x	$[D][]^2[D]$	x ∈ {iv, cn}
$-^{\backslash\backslash}(\cdot)$ (pre-head lift)	$s^+\backslash s^+\backslash s^+$	$[]^2[]^2[]^2$	$\underline{J} \in {}^{\perp}Var_{[]2}$
$-^{\backslash\backslash\backslash}(\cdot)$ (post-head lift)	$s\backslash(s\backslash s^+)\backslash s^+$	$[]^2[[]^2][]$	$\underline{H} \in {}^{\perp}Var_{[[]2]}$

KALAALLISUT LEXICON (sample):

• roots & derivational suffixes

run-	iv: $\lambda\underline{x}[run\langle\underline{x}\rangle]$		*pangalig-*
see-	tv: $\lambda\underline{y}\lambda\underline{x}[see\langle\underline{x}, \underline{y}\rangle]$		*taku-*
bear-	cn: $\lambda\underline{x}[bear\langle\underline{x}\rangle]$		*nanu(q)-*
Ole-	cn: $\lambda\underline{x}[\underline{x} =_i ole]$		*Ole-*
that-	cn: $\lambda\underline{x}[\underline{x} =_i ?_n]$		*taa(ss)-*
big-	cn: $\lambda\underline{x}[big\{\underline{x}, ?_n\|\|\}]$		*angisuu(q)-*
other-	cn: $\lambda\underline{x}[?_n \in \underline{x}\|\|]; [\underline{x} \neq_i ?_n]$		*alla-*
enemy-	rn: $\lambda\underline{z}\lambda\underline{x}[enm^{of}\langle\underline{x}, \underline{z}\rangle]$		*akira(q)-*
-see	iv\cn: $\lambda\underline{P}\lambda\underline{x}.\ \underline{P} \perp {}^{\perp}; [see\langle\underline{x}, \perp\rangle]$		*-si*
-use	iv\cn: $\lambda\underline{P}\lambda\underline{x}.\ \underline{P} \perp {}^{\perp}; [use\langle\underline{x}, \perp\rangle]$		*-tur*
-have	iv\rn: $\lambda\underline{R}\lambda\underline{x}.\ \underline{R}\ \underline{x} \perp$		*-qar*
-antip	iv\tv: $\lambda\underline{R}\lambda\underline{x}.\ \underline{R} \perp \underline{x}$		*-si|(ss)i|llir|nnig*
-with	cn\rn: $\lambda\underline{R}\lambda\underline{x}.\ \underline{R}\ \underline{x} \perp$		*-lik*
-cn\iv	cn\iv: $\lambda\underline{P}\lambda\underline{x}.\ {}^{\downarrow}\underline{P}\ f?_n; [\underline{x} = f?_n]$	$f \in \{\lambda x.x, pos\}$	*-tuq*
-rn\tv	rn\tv: $\lambda\underline{R}\lambda\underline{z}\lambda\underline{x}.\ {}^{\downarrow}(\underline{R}\ \underline{z})\ f?_n; [\underline{x} = f?_n]$	$f \in \{\lambda x.x, pos\}$	*-taq*
$-_{=}$	cn\cn: $\lambda\underline{P}\lambda\underline{x}.\ {}^{\downarrow}\underline{P}\ f?_n; [\underline{x} = f?_n]$	$f \in \{\lambda x.x, pos\}$	*-Ø*
$-_{f}$	rn\cn: $\lambda\underline{P}\lambda\underline{z}\lambda\underline{x}.[\underline{z} = f\underline{x}]; \underline{P}\ \underline{x}$	$f \in \{pos, loc, \ldots\}$	*-Ø*

• inflectional suffixes

(-DEP $\in$ {-FCT, -ELA}, ${}^{\downarrow}\underline{P} = \lambda\underline{x}(\downarrow\underline{P}\ \underline{x})$, x $\in$ {s, s^{+}} for SUB-pn, x = cn for POS-pn)

-DEC	s\pn\iv: $\lambda\underline{P}\lambda\underline{x}.\ \underline{P}\ \underline{x}$		*-pu|pa|la*
$\text{-DEP}_{\top}$	s^{+}\pn\iv: $\lambda\underline{P}\lambda\underline{x}\lambda K.\ (\underline{P}\ \underline{x}; K)$		*-ga|llu*
	s^{+}\pn\iv: $\lambda\underline{P}\lambda\underline{x}\lambda K.\ ([\mathbf{x}\| \mathbf{x} = ?_n]^{\top}; \underline{P}\ \underline{x})^{\top}; K$		
$\text{-DEP}_{\perp}$	s^{+}\pn\iv: $\lambda\underline{P}\lambda\underline{x}\lambda K.\ (\underline{P}\ \underline{x}; K)$		*-mm|tu*
	s^{+}\pn\iv: $\lambda\underline{P}\lambda\underline{x}\lambda K.\ ([y\| y = ?_n]^{\perp}; \underline{P}\ \underline{x})^{\perp}; K$		
$\text{-(ERG)}^{\top}$	s^{+}\cn: $\lambda\underline{P}\lambda K.\ ([\mathbf{x}]^{\top}; \underline{P} \top)^{\top}; K$		*-Ø|p|uma|…(-3*$_{\top}$*)*
$\text{-(ERG)}^{\perp}$	s^{+}\cn: $\lambda\underline{P}\lambda K.\ ([y]^{\perp}; \underline{P} \perp)^{\perp}; K$		*-Ø|p|uma|…(-3*$_{\perp}$*)*
-MOD	s^{+}\cn: $\lambda\underline{P}\lambda K.\ K^{\perp}; {}^{\downarrow}\underline{P} \perp$		*-mik*
$\text{-3S}_{(\top)}$	x\(x\pn): $\lambda\underline{F}.\ \underline{F} \top$	$\underline{F} \in {}^{\perp}Var_{\mathbf{typ}(x\backslash pn)}$	*-q|a|ni|mi…*
	x\(x\pn): $\lambda\underline{F}\lambda\ldots([\mathbf{x}\| \mathbf{x} = ?_n]^{\top}; \underline{F} \top\ldots)$		*-ni|mi…*
$\text{-3S}_{(\perp)}$	x\(x\pn): $\lambda\underline{F}.\ \underline{F} \perp$		*-Ø|at|gu|…*
	x\(x\pn): $\lambda\underline{F}\lambda\ldots([y\| y = ?_n]^{\top}; \underline{F} \perp\ldots)$		*-at|gu…*

• lexical operators (x $\in$ {iv, cn})

${}^{y}(\cdot)$-	x/x: $\lambda\underline{P}\lambda\underline{x}.\ [y]^{\perp}; \underline{P}\ \underline{x}$	⊥-accommodation
$-^{\backslash}(\cdot)$	x\\$s^{+}$\x: $\lambda\underline{P}\lambda\underline{J}\lambda\underline{x}.\ \underline{J}(\underline{P}\ \underline{x})$	head lift
$-^{\backslash\backslash}(\cdot)$	s^{+}\\$s^{+}$\\$s^{+}$: $\lambda\underline{J}'\lambda\underline{J}\lambda K.\ \underline{J}(\underline{J}'K)$	pre-head lift
$-^{\backslash\backslash\backslash}(\cdot)$	s\(s\\$s^{+}$)\\$s^{+}$: $\lambda\underline{J}\lambda\underline{H}.\ \underline{H}\ \underline{J}$	post-head lift

3. KALAALLISUT BA.TO.L-TRAITS EXPLAINED

• **T1** (argument type). BOUND-ARGUMENT LANGUAGE

BA.i. verbal *n*-pred. requires *n* morphologically BOUND ARGUMENTS
verbal *n*-pred. + *n* mrph. BOUND ARGUMENTS constitute a sentence (s)

BA.ii no obligatory syntactic np's: all syntactic np's ('subject', 'object', etc) are optional dependents of the verbal head. (see TO.ii below).

(1) (Look, a bear$^{\top}$!)

iv: *Pangalig-pu-**q**.*
run$_{(4\ legs)}$-DEC$_{iv}$-3S
It$_{\top}$ is running$_{(4\ legs)}$.

run-	-DEC$_{iv}$	**-3S**$_{(\top)}$
iv: $\lambda\underline{x}[run\langle\underline{x}\rangle]$	s\pn\iv: $\lambda\underline{P}\lambda\underline{x}.\ \underline{P}\ \underline{x}$	s\(s\pn): $\lambda\underline{P}.\ \underline{P} \top$

——————— <

s\pn: $\lambda\underline{x}[run\langle\underline{x}\rangle]$

——————————— <

s: $[run\langle\top\rangle]$

(Q: Has Ole$^{\top}$ seen it$^{\perp}$?
A: Yes, …)

tv: *taku-pa-**a**.*
see-DEC$_{tv}$-3S.3S
he$_{\top}$'s seen it$_{\perp}$.

see-	-DEC$_{tv}$	**-3S**$_{(\top)}$	**-3S**$_{(\perp)}$
tv (= iv\pn) $\lambda\underline{y}\lambda\underline{x}[see\langle\underline{x}, \underline{y}\rangle]$	s\pn\iv: $\lambda\underline{P}\lambda\underline{x}.\ \underline{P}\ \underline{x}$	s\(s\pn): $\lambda\underline{P}.\ \underline{P} \top$	s\(s\pn): $\lambda\underline{P}.\ \underline{P} \perp$

——————— <**B**

s\pn\pn: $\lambda\underline{y}\lambda\underline{x}[see\langle\underline{x}, \underline{y}\rangle]$

————————— <**B**

s\pn: $\lambda\underline{y}[see\langle\top, \underline{y}\rangle]$

——————————— <

s: $[see\langle\top, \perp\rangle]$

• **T2** (prominence type). TOPIC-PROMINENT LANGUAGE

TO.i. Grammatically marked $\top$ (topic) vs. $\bot$ (background).
TO.ii. Optional syntactic dependents used for *re-centering*.

($1^\top$) iv (Look!) — *Nanuq pangalig-pu-q.* — bear$^\top$ run-DEC$_{iv}$-3S — There is *a* bear running.

(Yesterday I saw a hunter and a bear$^\bot$.) — *Nanuq pangalig-pu-q.* — bear$^\top$ run-DEC$_{iv}$-3S — *The* bear was running.

- non-anaphoric topic:

bear-	-$^\top$
cn:	s$^+$\cn:
$\lambda \underline{x}[bear\langle \underline{x}\rangle]$	$\lambda \underline{P}\lambda K.\ ([\mathbf{x}]^\top; \underline{P}\ \top)^\top; K$

$<$
s$^+$: $\lambda K.\ ([\mathbf{x}]^\top; [bear\langle\top\rangle])^\top; K$
s$^+$: $\lambda K.\ [\mathbf{x}|\ bear\langle \mathbf{x}\rangle]^\top; K$

- anaphoric topic:

bear-	-$_=$	-$^\top$
cn:	cn\cn	s$^+$\cn:
$\lambda \underline{x}[bear\langle \underline{x}\rangle]$	$\lambda \underline{P}\lambda \underline{x}.\ {}^\downarrow\underline{P}\ \bot; [\underline{x} =_i \bot]$	$\lambda \underline{P}\lambda K.\ ([\mathbf{x}]^\top; \underline{P}\ \top)^\top; K$

$<$
cn: $\lambda \underline{x}.\ [bear\langle\bot\rangle]; [\underline{x} =_i \bot]$
cn: $\lambda \underline{x}.\ [bear\langle\bot\rangle, \underline{x} =_i \bot]$
$<$
s$^+$: $\lambda K.\ [\mathbf{x}|\ bear\langle\mathbf{x}\rangle, \mathbf{x} =_i \bot]^\top; K$

- licensing verbal head:

run-	-$^\backslash(\cdot)$	-DEC$_{iv}$	-3S$_{(\top)}$
iv (= s\pn)	iv\s$^+$\iv:	s\pn\iv:	s\(s\pn):
$\lambda \underline{x}[run\langle \underline{x}\rangle]$	$\lambda \underline{P}\lambda \underline{J}\lambda \underline{x}.\ \underline{J}(\underline{P}\ \underline{x})$	$\lambda \underline{P}\lambda \underline{x}.\ \underline{P}\ \underline{x}$	$\lambda \underline{P}.\ \underline{P}\ \top$

$<$
iv\s$^+$: $\lambda \underline{J}\lambda \underline{x}.\ \underline{J}[run\langle \underline{x}\rangle]$
$<$**B**
iv\s$^+$: $\lambda \underline{J}\lambda \underline{x}.\ \underline{J}[run\langle \underline{x}\rangle]$
$<$**B**
s\s$^+$: $\lambda \underline{J}.\ \underline{J}[run\langle\top\rangle]$

- (Look!) (3a) There is *a* bear running.

bear-$^\top$	$^\backslash$**(run-)**-DEC$_{iv}$-3S$_{(\top)}$
s$^+$:	s\s$^+$:
$\lambda K([\mathbf{x}|\ bear\langle\mathbf{x}\rangle]^\top; K)$	$\lambda \underline{J}.\ \underline{J}[run\langle\top\rangle]$

$<$
s: $\lambda \underline{J}.\ \underline{J}[run\langle\top\rangle]\ \lambda K([\mathbf{x}|\ bear\langle\mathbf{x}\rangle]^\top; K)$
s: $[\mathbf{x}|\ bear\langle\mathbf{x}\rangle]; [run\langle\top\rangle]$

- (Yesterday I saw a hunter and a bear$^\bot$.) (3b) *The* bear was running.

bear-$_=$-$^\top$	$^\backslash$**(run-)**-DEC$_{iv}$-3S$_{(\top)}$
s$^+$:	s\s$^+$:
$\lambda K.\ [\mathbf{x}|\ bear\langle\mathbf{x}\rangle, \mathbf{x} =_i \bot]^\top; K$	$\lambda \underline{J}.\ \underline{J}[run\langle\top\rangle]$

$<$
s: $\lambda \underline{J}.\ \underline{J}[run\langle\top\rangle]\ \lambda K.\ [\mathbf{x}|\ bear\langle\mathbf{x}\rangle, \mathbf{x} =_i \bot]^\top; K$
s: $[\mathbf{x}|\ bear\langle\mathbf{x}\rangle, \mathbf{x} =_i \bot]; [run\langle\top\rangle]$

• **T3** (word order type). LEXICALLY-ORDERED LANGUAGE

L.i. *'free' order* of verbal head and dependents

(2,3) (Any news today?)

SOV *Ole-p nanuq taku-pa-a.* — Ole-ERG bear see-DEC$_{tv}$-3S.3S — 'Ole saw a bear.'

SVO *Ole-p taku-pa-a. nanuq.* — Ole-ERG see-DEC$_{tv}$-3S.3S bear — 'Ole saw a bear.'

(Who has seen a bear or a walrus?)

OSV *Nanuq Ole-p taku-pa-a.* — bear Ole-ERG see-DEC$_{tv}$-3S.3S — 'Ole has seen a bear.'

- non-anaphoric topic (dependent)

Ole-	-ERG$^\top$
cn:	s$^+$\cn:
$\lambda \underline{x}[\underline{x} =_i ole]$	$\lambda \underline{P}\lambda K.\ ([\mathbf{x}]^\top; \underline{P}\ \top)^\top; K$

$<$
s$^+$: $\lambda K.\ [\mathbf{x}|\ \mathbf{x} =_i ole]^\top; K$

- non-anaphoric background (dependent)

bear-	-$^\bot$
cn:	s$^+$\cn:
$\lambda \underline{x}[bear\langle \underline{x}\rangle]$	$\lambda \underline{P}\lambda K.\ ([y]^\bot; \underline{P}\ \bot)^\bot; K$

$<$
s$^+$: $\lambda K.\ [y|\ bear\langle y\rangle]^\bot; K$

- licensing verbal head

see-	-$^{\backslash}(\cdot)$	-DEC$_{tv}$	-3S$_{(\top)}$	-3S$_{(\bot)}$
tv (= iv\pn) $\lambda \underline{y}\lambda \underline{x}[see\langle \underline{x}, \underline{y}\rangle]$	iv\s^{+}\iv: $\lambda \underline{P}\lambda \underline{J}\lambda \underline{x}.\ \underline{J}(\underline{P}\ \underline{x})$	s\pn\iv: $\lambda \underline{P}\lambda \underline{x}.\ \underline{P}\ \underline{x}$	s\(s\pn): $\lambda \underline{P}.\ \underline{P}\ \top$	x\(x\pn): $\lambda \underline{P}.\ \underline{P}\ \bot$

———— <**B**

iv\s^{+}\pn: $\lambda \underline{y}\lambda \underline{J}\lambda \underline{x}.\ \underline{J}[see\langle \underline{x}, \underline{y}\rangle]$

———— <<**B**

iv\s^{+}\pn: $\lambda \underline{y}\lambda \underline{J}\lambda \underline{x}.\ \underline{J}[see\langle \underline{x}, \underline{y}\rangle]$

———— <<**B**

s\s^{+}\pn: $\lambda \underline{y}\lambda \underline{J}.\ \underline{J}[see\langle \top, \underline{y}\rangle]$

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s\s^{+}: $\lambda \underline{J}.\ \underline{J}[see\langle \top, \bot\rangle]$

SOV

Ole-ERG$^{\top}$	$^{\backslash\backslash}$(bear-$^{\bot}$)	$^{\backslash}$(see-)-DEC$_{tv}$-3S$_{(\top)}$-3S$_{(\bot)}$
s^{+}: $\lambda K([\mathbf{x}\mid \mathbf{x} =_i ole]^{\top}; K)$	s^{+}\s^{+}: $\lambda \underline{J}\lambda K.\ \underline{J}([y\mid bear\langle y\rangle]^{\bot}; K)$	s\s^{+}: $\lambda \underline{J}.\ \underline{J}[see\langle \top, \bot\rangle]$

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s^{+}: $\lambda K([\mathbf{x}\mid \mathbf{x} =_i ole]^{\top}; ([y\mid bear\langle y\rangle]^{\bot}; K))$

———— <

s: $\lambda \underline{J}.\ \underline{J}[see\langle \top, \bot\rangle]\ \lambda K([\mathbf{x}\mid \mathbf{x} =_i ole]^{\top}; ([y\mid bear\langle y\rangle]^{\bot}; K))$

s: $[\mathbf{x}\mid \mathbf{x} =_i ole]; [y\mid bear\langle y\rangle]; [see\langle \top, \bot\rangle]$

SVO

$^{\backslash\backslash}$(Ole-ERG$^{\top}$)	$^{\backslash}$(see-)-DEC$_{tv}$-3S$_{(\top)}$-3S$_{(\bot)}$	$^{\backslash\backslash\backslash}$(bear-$^{\bot}$)
s^{+}\s^{+}: $\lambda \underline{J}\lambda K.\ \underline{J}([\mathbf{x}\mid \mathbf{x} =_i ole]^{\top}; K)$	s\s^{+}: $\lambda \underline{J}.\ \underline{J}[see\langle \top, \bot\rangle]$	s\(s\s^{+}): $\lambda \underline{H}.\ \underline{H}\ \lambda K([y\mid bear\langle y\rangle]^{\bot}; K)$

———— <**B**

s\s^{+}: $\lambda \underline{J}.\ \lambda \underline{J}'.\ \underline{J}'[see\langle \top, \bot\rangle]\ \lambda K.\ \underline{J}([\mathbf{x}\mid \mathbf{x} =_i ole]^{\top}; K)$

s\s^{+}: $\lambda \underline{J}.\ \underline{J}([\mathbf{x}\mid \mathbf{x} =_i ole]; [see\langle \top, \bot\rangle])$

———— <

s: $\lambda \underline{H}.\ \underline{H}\ \lambda K([y\mid bear\langle y\rangle]^{\bot}; K)\ \lambda \underline{J}.\ \underline{J}([\mathbf{x}\mid \mathbf{x} =_i ole]; [see\langle \top, \bot\rangle])$

s: $[y\mid bear\langle y\rangle]; [\mathbf{x}\mid \mathbf{x} =_i ole]; [see\langle \top, \bot\rangle]$

OSV

bear-$^{\bot}$	$^{\backslash\backslash}$(Ole-ERG$^{\top}$)	$^{\backslash}$(see-)-DEC$_{tv}$-3S$_{(\top)}$-3S$_{(\bot)}$
s^{+}: $\lambda K([y\mid bear\langle y\rangle]^{\bot}; K)$	s^{+}\s^{+}: $\lambda \underline{J}\lambda K.\ \underline{J}([\mathbf{x}\mid \mathbf{x} =_i ole]^{\top}; K)$	s\s^{+}: $\lambda \underline{J}.\ \underline{J}[see\langle \top, \bot\rangle]$

———— <

s^{+}: $\lambda K([y\mid bear\langle y\rangle]^{\bot}; ([\mathbf{x}\mid \mathbf{x} =_i ole]^{\top}; K))$

———— <

s: $\lambda \underline{J}.\ \underline{J}[see\langle \top, \bot\rangle]\ \lambda K([y\mid bear\langle y\rangle]^{\bot}; ([\mathbf{x}\mid \mathbf{x} =_i ole]^{\top}; K))$

s: $[y\mid bear\langle y\rangle]; [\mathbf{x}\mid \mathbf{x} =_i ole]; [see\langle \top, \bot\rangle]$

LII. *discontinuous 'constituents'*

(4a) (Yesterday I saw a bear$^{\bot}$ near the village. Today…)
Ole alla-mik nanu-si-pu-q angisuu-mik.
Ole other-MOD bear-see-DEC$_{tv}$-3S big-MOD
Ole saw another bear, a big one.

(4b) (Yesterday I saw a big bear$^{\bot}$ near the village. And today…)
Ole angisuu-mik nanu-si-pu-q alla-mik.
Ole big-MOD bear-see-DEC$_{tv}$-3S other-MOD
Ole saw another big bear.

- *$\underline{J}$-topic saw a $\underline{J}'$-bear*

$^{y}(\cdot)$-	bear-	-$^{\backslash}(\cdot)$
cn/cn: $\lambda \underline{P}\lambda \underline{x}([y]^{\bot}; \underline{P}\ \underline{x})$	cn: $\lambda \underline{x}[bear\langle \underline{x}\rangle]$	cn\s^{+}\cn: $\lambda \underline{P}\lambda \underline{J}'\lambda \underline{x}.\ \underline{J}'(\underline{P}\ \underline{x})$

———— >

cn: $\lambda \underline{x}([y]^{\bot}; [bear\langle \underline{x}\rangle])$

———— <

cn\s^{+}: $\lambda \underline{J}'\lambda \underline{x}.\ \underline{J}'([y]^{\bot}; [bear\langle \underline{x}\rangle])$

-see	-$^{\backslash}(\cdot)$	-DEC$_{iv}$	-3S$_{(\top)}$
iv\cn: $\lambda \underline{P}\lambda \underline{x}(\underline{P}\ \bot\ ^{\bot}; [see\langle \underline{x}, \bot\rangle])$	iv\s^{+}\iv: $\lambda \underline{P}\lambda \underline{J}\lambda \underline{x}.\ \underline{J}(\underline{P}\ \underline{x})$	s\pn\iv: $\lambda \underline{P}\lambda \underline{x}.\ \underline{P}\ \underline{x}$	s\(s\pn): $\lambda \underline{P}.\ \underline{P}\ \top$

———— <**B**

iv\s^{+}: $\lambda \underline{J}'\lambda \underline{x}(\underline{J}'([y]^{\bot}; [bear\langle \bot\rangle])^{\bot}; [see\langle \underline{x}, \bot\rangle])$

iv\s^{+}: $\lambda \underline{J}'\lambda \underline{x}(\underline{J}'[y\mid bear\langle y\rangle]^{\bot}; [see\langle \underline{x}, \bot\rangle])$

———— <**B**

iv\s^{+}\s^{+}: $\lambda \underline{J}'\lambda \underline{J}\lambda \underline{x}.\ \underline{J}(\underline{J}'[y\mid bear\langle y\rangle]^{\bot}; [see\langle \underline{x}, \bot\rangle])$

———— <<**B**

s\pn\s^{+}\s^{+}: $\lambda \underline{J}'\lambda \underline{J}\lambda \underline{x}.\ \underline{J}(\underline{J}'[y\mid bear\langle y\rangle]^{\bot}; [see\langle \underline{x}, \bot\rangle])$

———— <<**B**

s\s^{+}\s^{+}: $\lambda \underline{J}'\lambda \underline{J}.\ \underline{J}(\underline{J}'[y\mid bear\langle y\rangle]^{\bot}; [see\langle \top, \bot\rangle])$

(4a) *J-topic saw a J′-other bear*

$^{\backslash\backslash}$(other-MOD) | $^{\backslash}$($^{\backslash}$($^{\flat}$bear-)-see-)-DEC$_{iv}$-3S$_{(\top)}$

$s^+\backslash s^+$: $\lambda \underline{J}'\lambda K.\ \underline{J}'(K^{\perp}; [\perp_2 \in \perp||]; [\perp \neq_i \perp_2])$ | $s\backslash s^+\backslash s^+$: $\lambda \underline{J}''\lambda \underline{J}.\ \underline{J}(\underline{J}''[y|\ bear\langle y\rangle]^{\perp}; [see\langle\top, \perp\rangle])$

<B

$s\backslash s^+\backslash s^+$: $\lambda \underline{J}'.\ \lambda \underline{J}''\lambda \underline{J}.\ \underline{J}(\underline{J}''[y|\ bear\langle y\rangle]^{\perp}; [see\langle\top, \perp\rangle])\ \lambda K.\ \underline{J}'(K^{\perp}; [\perp_2 \in \perp||]; [\perp \neq_i \perp_2])$

$s\backslash s^+\backslash s^+$: $\lambda \underline{J}'.\ \lambda \underline{J}.\ \underline{J}(\underline{J}'([y|\ bear\langle y\rangle]; [\perp_2 \in \perp||]; [\perp \neq_i \perp_2])^{\perp}; [see\langle\top, \perp\rangle])$

(Yesterday I saw a bear$^{\perp}$ near the village. Today…)

(4a) Ole$^{\top}$ saw another bear$^{\perp}$, a big one.

Ole-$^{\top}$ | $^{\backslash\backslash}$(other-MOD) $^{\backslash}$($^{\backslash}$($^{\flat}$bear-)-see-)-DEC$_{iv}$-3S$_{(\top)}$ | $^{\backslash\backslash\backslash}$(big-MOD)

s^+: $\lambda K([\mathbf{x}|\ \mathbf{x} =_i ole]^{\top}; K)$ | $s\backslash s^+\backslash s^+$: $\lambda \underline{J}'.\ \lambda \underline{J}.\ \underline{J}(\underline{J}'([y|\ bear\langle y\rangle]; \ldots\ldots)^{\perp}; [see\langle\top, \perp\rangle])$ | $s\backslash(s\backslash s^+)$: $\lambda \underline{H}.\ \underline{H}\ \lambda K(K^{\perp}; [big\{\perp, \perp||\}])$

<B

$s\backslash s^+$: $\lambda \underline{J}.\ \underline{J}((([y|\ bear\langle y\rangle]; \ldots)^{\perp}; [big\{\perp, \perp||\}])^{\perp}; [see\langle\top, \perp\rangle])$

<

s: $\lambda \underline{J}.\ \underline{J}((([y|\ bear\langle y\rangle]; \ldots)^{\perp}; [big\{\perp, \perp||\}])^{\perp}; [see\langle\top, \perp\rangle])\ \lambda K([\mathbf{x}|\ \mathbf{x} =_i ole]^{\top}; K)$

s: $[\mathbf{x}|\ \mathbf{x} =_i ole]; [y|\ bear\langle y\rangle]; [\perp_2 \in \perp||]; [\perp \neq_i \perp_2]; [big\{\perp, \perp||\}]; [see\langle\top, \perp\rangle]$

(4b) *J-topic saw a J′-big bear*

$^{\backslash\backslash}$(big-MOD) | $^{\backslash}$($^{\backslash}$($^{\flat}$bear-)-see-)-DEC$_{iv}$-3S$_{(\top)}$

$s^+\backslash s^+$: $\lambda \underline{J}'\lambda K.\ \underline{J}'(K^{\perp}; [big\{\perp, \perp||\}])$ | $s\backslash s^+\backslash s^+$: $\lambda \underline{J}''\lambda \underline{J}.\ \underline{J}(\underline{J}''[y|\ bear\langle y\rangle]^{\perp}; [see\langle\top, \perp\rangle])$

<B

$s\backslash s^+\backslash s^+$: $\lambda \underline{J}'.\ \lambda \underline{J}''\lambda \underline{J}.\ \underline{J}(\underline{J}''[y|\ bear\langle y\rangle]^{\perp}; [see\langle\top, \perp\rangle])\ \lambda K.\ \underline{J}'(K^{\perp}; [big\{\perp, \perp||\}])$

$s\backslash s^+\backslash s^+$: $\lambda \underline{J}'.\ \lambda \underline{J}.\ \underline{J}(\underline{J}'([y|\ bear\langle y\rangle]; [big\{\perp, \perp||\}])^{\perp}; [see\langle\top, \perp\rangle])$

(Yesterday I saw a big bear$^{\perp}$ near the village. And today…)

(4b) Ole$^{\top}$ saw another big bear$^{\perp}$.

Ole-$^{\top}$ | $^{\backslash\backslash}$(big-MOD) $^{\backslash}$($^{\backslash}$($^{\flat}$bear-)-see-)-DEC$_{iv}$-3S$_{(\top)}$ | $^{\backslash\backslash\backslash}$(other-MOD)

s^+: $\lambda K([\mathbf{x}|\ \mathbf{x} =_i ole]^{\top}; K)$ | $s\backslash s^+\backslash s^+$: $\lambda \underline{J}'.\ \lambda \underline{J}.\ \underline{J}(\underline{J}'([y|\ bear\langle y\rangle]; \ldots; \ldots)^{\perp}; [see\langle\top, \perp\rangle])$ | $s\backslash(s\backslash s^+)$: $\lambda \underline{H}.\ \underline{H}\ \lambda K(K^{\perp}; [\perp_2 \in \perp||]; [\perp \neq_i \perp_2]))$

<B

$s\backslash s^+$: $\lambda \underline{J}.\ \underline{J}((([y|\ \ldots)^{\perp}; [\perp_2 \in \perp||]; [\perp \neq_i \perp_2])^{\perp}; [see\langle\top, \perp\rangle])$

<

s: $\lambda \underline{J}.\ \underline{J}((([y|\ \ldots)^{\perp}; [\perp_2 \in \perp||]; [\perp \neq_i \perp_2])^{\perp}; [see\langle\top, \perp\rangle])\ \lambda K([\mathbf{x}|\ \mathbf{x} =_i ole]^{\top}; K)$

s: $[\mathbf{x}|\ \mathbf{x} =_i ole]; [y|\ bear\langle y\rangle]; [big\{\perp, \perp||\}]; [\perp_2 \in \perp||]; [\perp \neq_i \perp_2]; [see\langle\top, \perp\rangle]$

Liii. *'scrambling' ✓within | *across clause boundaries*

(5a)✓ *Ole-p angisuu-**mik** **nanu**-si-ga-mi aallaa-pa-a.*
Ole-ERG [big-MOD bear-see-FCT$_{\top}$-3S$_{\top}$] shoot-DEC$_{tv}$-3S.3S
Ole saw a big bear and shot it.

1, 2 non-anaphoric ERG$^{\top}$ (dependent of tv) | non-anaphoric MOD (dependent of 'bear-')

Ole- | -ERG$^{\top}$ | big- | -MOD

cn: $\lambda \underline{x}[\underline{x} =_i ole]$ | $s^+\backslash$cn: $\lambda \underline{P}\lambda K.\ ([\mathbf{x}]^{\top}; \underline{P}\ \top)^{\top}; K$ | cn: $\lambda \underline{x}[big\{\underline{x}, \perp||\}]$ | $s^+\backslash$cn: $\lambda \underline{P}\lambda K(K^{\perp}; \underline{P}\ \perp)$

< <

s^+: $\lambda K.\ [\mathbf{x}|\ \mathbf{x} =_i ole]^{\top}; K$ | s^+: $\lambda K(K^{\perp}; [big\{\perp, \perp||\}])$

3 licensing head for MOD: $\top$ *having seen a J-bear*

$^{\backslash}$($^{\flat}$bear-)

<

cn$\backslash s^+$: $\lambda \underline{J}'\lambda \underline{x}.\ \underline{J}'([y]^{\perp}; [bear\langle \underline{x}\rangle])$

-see | -FCT$_{\top}$ | -3S$_{\top}$

iv$\backslash$cn: $\lambda \underline{P}\lambda \underline{x}(\underline{P}\ \perp^{\perp}; [see\langle \underline{x}, \perp\rangle])$ | $s^+\backslash$pn$\backslash$iv: $\lambda \underline{P}\lambda \underline{x}\lambda K(\underline{P}\ \underline{x}; K)$ | $s^+\backslash(s^+\backslash$pn): $\lambda \underline{F}.\ \underline{F}\ \top$

<B

iv$\backslash s^+$: $\lambda \underline{J}\lambda \underline{x}(\underline{J}[y|\ bear\langle y\rangle]^{\perp}; [see\langle \underline{x}, \perp\rangle])$

<B

$s^+\backslash$pn$\backslash s^+$: $\lambda \underline{J}\lambda \underline{x}\lambda K((\underline{J}[y|\ bear\langle y\rangle]^{\perp}; [see\langle \underline{x}, \perp\rangle]); K)$

<B

$s^+\backslash s^+$: $\lambda \underline{J}\lambda K((\underline{J}[y|\ bear\langle y\rangle]^{\perp}; [see\langle\top, \perp\rangle]); K)$

4 dependent clause: *J-topic having seen a big bear*$^{\perp}$

big-MOD | $^{\backslash}$($^{\flat}$bear-)-see-FCT$_{\top}$-3S$_{\top}$ | -$^{\backslash\backslash}$(·)

s^+: $\lambda K(K^{\perp}; [big\{\perp, \perp||\}])$ | $s^+\backslash s^+$: $\lambda \underline{J}\lambda K'((\underline{J}[y|\ bear\langle y\rangle]^{\perp}; [see\langle\top, \perp\rangle]); K')$ | $s^+\backslash s^+\backslash s^+$: $\lambda \underline{J}'\lambda \underline{J}\lambda K.\ \underline{J}(\underline{J}'K)$

<

s^+: $\lambda K([y|\ bear\langle y\rangle]; [big\{\perp, \perp||\}]; [see\langle\top, \perp\rangle]\ ; K)$

<

$s^+\backslash s^+$: $\lambda \underline{J}\lambda K.\ \underline{J}([y|\ bear\langle y\rangle]; [big\{\perp, \perp||\}]; [see\langle\top, \perp\rangle]\ ; K)$

5 dependent cluster: *Ole*$^{\top}$ *having seen a big bear*$^{\perp}$

Ole-ERG$^{\top}$ | big-MOD $^{\backslash\backslash}$($^{\backslash}$($^{\flat}$bear-)-see-FCT$_{\top}$-3S$_{\top}$)

< <

s^+: s^+: $\lambda K([\mathbf{x}|\ \mathbf{x} =_i ole]^{\top}; K)$ | $s^+\backslash s^+$: $\lambda \underline{J}\lambda K.\ \underline{J}([y|\ bear\langle y\rangle]; [big\{\perp, \perp||\}]; [see\langle\top, \perp\rangle]\ ; K)$

<

s^+: $\lambda K([\mathbf{x}|\ \mathbf{x} =_i ole]^{\top}; ([y|\ bear\langle y\rangle]; [big\{\perp, \perp||\}]; [see\langle\top, \perp\rangle]\ ; K))$

6 licensing head: $\underline{J}$(*he*$_⊤$ *shot it*$_⊥$)

$^\backslash$(shoot-)	-DEC$_{tv}$	-3S$_{(⊤)}$	-3S$_{(⊥)}$
——— <**B**	———	———	———
iv\s$^+$\pn	s\pn\iv:	s\(s\pn):	x\(x\pn):
$\lambda \underline{y}\lambda \underline{J}\lambda \underline{x}.\ \underline{J}[shoot\langle \underline{x}, \underline{y}\rangle]$	$\lambda \underline{P}\lambda \underline{x}.\ \underline{P}\ \underline{x}$	$\lambda \underline{P}.\ \underline{P}\ ⊤$	$\lambda \underline{P}.\ \underline{P}\ ⊥$

——————————————— <<**B**

iv\s$^+$\pn: $\lambda \underline{y}\lambda \underline{J}\lambda \underline{x}.\ \underline{J}[shoot\langle \underline{x}, \underline{y}\rangle]$

——————————————— <<**B**

s\s$^+$\pn: $\lambda \underline{y}\lambda \underline{J}.\ \underline{J}[shoot\langle ⊤, \underline{y}\rangle]$

——————————————— <

s\s$^+$: $\lambda \underline{J}.\ \underline{J}[shoot\langle ⊤, ⊥\rangle]$

7 (6a) = dependent cluster (*Ole*$^⊤$ *having seen a big bear*$^⊥$) + licensing head ($\underline{J}$(he$_⊤$ shot it$_⊥$)

Ole-ERG$^⊤$ [big-MOD $^{\backslash\backslash}$($^\backslash$(^{y}bear-)-see-FCT$_⊤$-3S$_⊤$)] $\qquad$ $^\backslash$(see-)-DEC$_{tv}$-3S-3S

——————————————— < $\qquad$ ——— <

s$^+$: $\qquad$ s\s$^+$:

$\lambda K([\mathbf{x}|\ \mathbf{x} =_i ole]^{⊤}; ([y|\ bear\langle y\rangle]; [big\{⊥, ⊥||\}]; [see\langle ⊤, ⊥\rangle]\ ; K))$ $\qquad$ $\lambda \underline{J}.\ \underline{J}[shoot\langle ⊤, ⊥\rangle]$

——————————————— <

s: $[\mathbf{x}|\ \mathbf{x} =_i ole]^{⊤}; ([y|\ bear\langle y\rangle]; [big\{⊥, ⊥||\}]; [see\langle ⊤, ⊥\rangle]\ ; [shoot\langle ⊤, ⊥\rangle])$

s: $[\mathbf{x}|\ \mathbf{x} =_i ole]; [y|\ bear\langle y\rangle]; [big\{⊥, ⊥||\}]; [see\langle ⊤, ⊥\rangle]\ ; [shoot\langle ⊤, ⊥\rangle]$

(5b)* *Nanu-si-ga-mi* *Ole-p* *angisuu-mik* *aallaa-pa-a.*

bear-see-FCT$_⊤$-3S$_⊤$ Ole-ERG big-MOD shoot-DEC$_{tv}$-3S.3S

⋮

3 licensing head for MOD: ⊤ *having seen a* $\underline{J}$*-bear*

$^\backslash$(^{y}bear-)-see-FCT$_⊤$-3S$_⊤$

——————————————— <**B**

s$^+$\s$^+$: $\lambda \underline{J}\lambda K((\underline{J}[y|\ bear\langle y\rangle]^{⊥}; [see\langle ⊤, ⊥\rangle]); K)$

4 dep. cluster (*having seen a* $\underline{J}'$*-bear*$^⊥$ *Ole*-ERG$^⊤$ *big*-MOD) + licensing head ($\underline{J}$(he$_⊤$ shot it$_⊥$)

$^\backslash$(^{y}bear-)-see-FCT$_⊤$-3S$_⊤$	$^{\backslash\backslash}$(Ole-ERG$^⊤$)	$^{\backslash\backslash}$(big-MOD)
——— <**B**	——— <	——— <
s$^+$\s$^+$:	s$^+$\s$^+$:	s$^+$\s$^+$:
$\lambda \underline{J}'\lambda K((\underline{J}'[y|\ldots]\ldots); K)$	$\lambda \underline{J}\lambda K.\ \underline{J}([\mathbf{x}|\ \mathbf{x} =_i ole]^{⊤}; K)$	$\lambda \underline{J}\lambda K.\ \underline{J}(K^{⊥}; [big\{⊥, ⊥||\}])$

——————————————— <**B**

s$^+$\s$^+$: $\lambda \underline{J}'\lambda K((\underline{J}'[y|\ bear\langle y\rangle]^{⊥}; [see\langle ⊤, ⊥\rangle]); ([\mathbf{x}|\ \mathbf{x} =_i ole]^{⊤}; K))$

——————————————— <**B**

s$^+$\s$^+$: $\lambda \underline{J}'\lambda K((\underline{J}'[y|\ bear\langle y\rangle]^{⊥}; [see\langle ⊤, ⊥\rangle]); ([\mathbf{x}|\ \mathbf{x} =_i ole]^{⊤}; (K^{⊥}; [big\{⊥, ⊥||\}])))$

$^\backslash$(shoot-)-DEC$_{tv}$-3S$_{(⊤)}$-3S$_{(⊥)}$

——— <

s\s$^+$: $\lambda \underline{J}.\ \underline{J}[shoot\langle ⊤, ⊥\rangle]$

——————————————— <**B**

<u>s\s$^+$</u>: $\lambda \underline{J}'((\underline{J}'[y|\ bear\langle y\rangle]^{⊥}; [see\langle ⊤, ⊥\rangle]); ([\mathbf{x}|\ \mathbf{x} =_i ole]^{⊤};$
$\quad$ $([\underline{shoot\langle ⊤, ⊥\rangle]^{⊥}; [big\{⊥, ⊥||\}}]))$

- type (is: s\s$^+$, should be: s)
- bck-ela seq. ($[\![\underline{\ldots^{⊥}; \ldots}]\!]^g = \varnothing$)

Appendix 1: Definition of UC$_1$

DEFINITION 1 (Lists & infotention states) Let D be a non-empty set.

- $\langle D\rangle^{n,m} = D^n \times D^m$ is the set of ⊤⊥*-lists* of n topical D-objects (the ⊤*-list*) and m background D-objects (the ⊥*-list*).
- For any ⊤⊥-list $\mathsf{i} = \langle \mathsf{i}_1, \mathsf{i}_2\rangle \in \langle D\rangle^{n,m}$, $⊤\mathsf{i} = \mathsf{i}_1$ and $⊥\mathsf{i} = \mathsf{i}_2$. Thus, $\mathsf{i} = \langle ⊤\mathsf{i}, ⊥\mathsf{i}\rangle$.
- An *n,m-infotention state* is any subset of $\langle D\rangle^{n,m}$. ∅ is the *absurd state.*

DEFINITION 2 (UC$_1$ types) The set of UC$_1$ *types* is the smallest set Θ such that (i) $\{t, e\} \subseteq \Theta$, (ii) if $a, b \in \Theta$, then $(ab) \in \Theta$, and (iii) $s \in \Theta$.

DEFINITION 3 (UC$_1$ frames) A UC$_1$ *frame* is a set $\{D_a|\ a \in \Theta\}$ of non-empty pairwise disjoint sets D_a s.t. (i) $D_t = \{1, 0\}$, (ii) $D_{ab} = \{f|\ \varnothing \subset \mathrm{Dom}\ f \subseteq D_a \wedge \mathrm{Ran}\ f \subseteq D_b\}$, and (iii) $D_s = \cup_{n,\, m\, \geq\, 0} \langle D_e\rangle^{n,m}$.

DEFINITION 4 (UC$_1$ syntax) Define for all $a \in \Theta$ the set of a-terms as follows

i. $Con_a \cup {}^{⊤}Var_a \cup {}^{⊥}Var_a \subseteq Term_a$
ii. $\lambda u_a(B) \in Term_{ab}$, if $u_a \in {}^{⊤}Var_a \cup {}^{⊥}Var_a$ and $B \in Term_b$
iii. $BA \in Term_b$, if $B \in Term_{ab}$ and $A \in Term_a$
iv. $\neg A, (A \rightarrow B), (A \wedge B), (A \vee B) \in Term_t$, if $A, B \in Term_t$
v. $\forall u_a B, \exists u_a B \in Term_t$, if $u_a \in {}^{⊤}Var_a \cup {}^{⊥}Var_a$ and $B \in Term_t$
vi. $(A = B) \in Term_t$, if $A, B \in Term_a$
vii. $(u \cdot B) \in Term_s$, if $u \in {}^{⊤}Var_e \cup {}^{⊥}Var_e$ and $B \in Term_s$
viii. $⊤_n, ⊥_n \in Term_{se}$, if $n \geq 1$.
ix. $A\{B\} \in Term_{et}$, if $A \in Term_{se}$ and $B \in Term_{st}$
x. $\downarrow A, (A; B), (A^{⊤}; B), (A^{⊥}; B) \in Term_{(st)st}$, if $A, B \in Term_{(st)st}$

REMARK:

$A\{B\}$	is the *global value* of anaphor A_{se} in state B_{st}
$\downarrow A$	is the *static closure* of drs A
$(A^{⊤}; B)$	is a *topic-comment sequence* of drs's A and B
$(A^{⊥}; B)$	is a *background-elaboration sequence* of drs's A and B

DEFINITION 5 (UC$_1$ models) A UC$_1$ model is a pair $M = \langle \{D_a|\ a \in \Theta\}, [\![\cdot]\!]\rangle$, where $\{D_a|\ a \in \Theta\}$ is a UC$_1$ frame, and $[\![\cdot]\!]$ assigns to each $A \in Con_a$ a value $[\![A]\!] \in D_a$.

ABBREVIATIONS 1 (Projections & dot-extensions). For any non-empty set D,

- $(\mathsf{x})_n$ = the nth coordinate, x_n $\qquad$ for $\mathsf{x} \in D^{n+m}$
- $(\mathsf{d} \cdot \mathsf{x}) = \langle \mathsf{d}, \mathsf{x}_1, \ldots, \mathsf{x}_n\rangle$ $\qquad$ for $\mathsf{d} \in D$, $\mathsf{x} \in D^n$
- $\mathsf{y} \cdot\!> \mathsf{x}$ iff $\mathsf{y} = (\mathsf{y}_1 \cdot \ldots(\mathsf{y}_m \cdot \mathsf{x}))$ $\qquad$ for $\mathsf{y} \in D^{m+n}$, $\mathsf{x} \in D^n$

ABBREVIATIONS 2 For $f \in D_{a_1 \ldots a_n t}$, $\langle \mathsf{a}_1, \ldots, \mathsf{a}_n \rangle \in D_{a_1} \times \ldots D_{a_n}$, $A \subseteq D_{a_1} \times \ldots D_{a_n}$:

- $f(\mathsf{a}_1, \ldots, \mathsf{a}_n) := f(\mathsf{a}_1)\ldots(\mathsf{a}_n)$,
- ${}^{\{\}}f := \{\langle \mathsf{a}_1, \ldots, \mathsf{a}_n \rangle \mid f(\mathsf{a}_1, \ldots, \mathsf{a}_n) = 1\}$ (*set characterized* by f)
- ${}^{\chi}A = \iota f \in D_{a_1 \ldots a_n t}.(A = {}^{\{\}}f)$ (*characteristic function* of A)

DEFINITION 6 (UC$_1$ semantics). The value $\llbracket A \rrbracket^g$ of a term A given $\llbracket \cdot \rrbracket$ and an assignment g is defined as follows (we write (i) '$X \doteq Y$' for 'X is Y, if Y is defined, else X is undefined', (ii) '$\mathsf{c}\llbracket X \rrbracket$' for '$\llbracket X \rrbracket(\mathsf{c})$', for any $\mathsf{c} \in D_{st}$ (iii) '$X[Y/Z]$' for the result of replacing every occurrence of Y in X with Z, and (iv) use the Von Neumann definition, so $0 = \varnothing$ and $1 = \{\varnothing\}$):

i.	$\llbracket u \rrbracket^g = g(u)$			for any $u \in {}^{\top}Var_a \cup {}^{\bot}Var_a$
	$\llbracket A \rrbracket^g = \llbracket A \rrbracket$			for any $A \in Con_a$
ii.	$\llbracket \lambda u_a(B) \rrbracket^g(\mathsf{d}) \doteq \llbracket B \rrbracket^{g[u/\mathsf{d}]}$			for any $\mathsf{d} \in D_a$
iii.	$\llbracket BA \rrbracket^g$	$\doteq$	$\llbracket B \rrbracket^g(\llbracket A \rrbracket^g)$	
iv.	$\llbracket \neg A \rrbracket^g$	$\doteq$	$1 \backslash \llbracket A \rrbracket^g$	
	$\llbracket A \to B \rrbracket^g$	$\doteq$	$1 \backslash (\llbracket A \rrbracket^g \backslash \llbracket B \rrbracket^g)$	
	$\llbracket A \wedge B \rrbracket^g$	$\doteq$	$\llbracket A \rrbracket^g \cap \llbracket B \rrbracket^g$	
	$\llbracket A \vee B \rrbracket^g$	$\doteq$	$\llbracket A \rrbracket^g \cup \llbracket B \rrbracket^g$	
v.	$\llbracket \forall u_a A \rrbracket^g$	$\doteq$	$\bigcap_{\mathsf{d} \in D_a} \llbracket A \rrbracket^{g[u/\mathsf{d}]}$	
	$\llbracket \exists u_a A \rrbracket^g$	$\doteq$	$\bigcup_{\mathsf{d} \in D_a} \llbracket A \rrbracket^{g[u/\mathsf{d}]}$	
vi.	$\llbracket A = B \rrbracket^g$	$=$	$\lvert \{\langle \mathsf{d}, \mathsf{d}' \rangle \in D_a{}^2 \mid \mathsf{d} = \llbracket A \rrbracket^g \wedge \mathsf{d}' = \llbracket B \rrbracket^g \wedge \mathsf{d} = \mathsf{d}'\} \rvert$	
vii.	$\llbracket u \cdot B_s \rrbracket^g$	$\doteq$	$\langle (g(u) \cdot \top\llbracket B \rrbracket^g), \bot\llbracket B \rrbracket^g \rangle$	for any $u \in {}^{\top}Var_e$
		$\doteq$	$\langle \top\llbracket B \rrbracket^g, (g(u) \cdot \bot\llbracket B \rrbracket^g) \rangle$	for any $u \in {}^{\bot}Var_e$
viii.	$\llbracket \top_n \rrbracket^g(\mathsf{i})$	$\doteq$	$(\top\mathsf{i})_n$	for any $\mathsf{i} \in D_s$
	$\llbracket \bot_n \rrbracket^g(\mathsf{i})$	$\doteq$	$(\bot\mathsf{i})_n$	
ix.	$\llbracket A\{B\} \rrbracket^g$	$\doteq$	${}^{\chi}\{\llbracket A \rrbracket^g(\mathsf{i}) \mid \mathsf{i} \in {}^{\{\}}\llbracket B \rrbracket^g\}$	
x.	$\mathsf{c}\llbracket {\downarrow} A \rrbracket^g$	$\doteq$	${}^{\chi}\{\mathsf{i} \in {}^{\{\}}\mathsf{c} \mid \exists \mathsf{j}: \top\mathsf{j} \cdot\!\geq \top\mathsf{i} \wedge \bot\mathsf{j} \cdot\!\geq \bot\mathsf{i} \wedge \mathsf{j} \in {}^{\{\}}(\mathsf{c}\llbracket A \rrbracket^g)\}$	
	$\mathsf{c}\llbracket A; B \rrbracket^g$	$\doteq$	$\mathsf{c}\llbracket A \rrbracket^g \llbracket B \rrbracket^g$	
	$\mathsf{c}\llbracket A^{\top}; B \rrbracket^g$	$\doteq$	$\{\mathsf{l} \in \mathsf{c}\llbracket A; B \rrbracket^g \mid \forall \mathsf{k} \in \mathsf{c}\llbracket A; B \rrbracket^g \exists \mathsf{j} \in \mathsf{c}\llbracket A \rrbracket^g \exists \mathsf{i} \in \mathsf{c} \exists \mathsf{d} \in D_e$: $\top\mathsf{k} \cdot\!\geq \top\mathsf{j} \cdot\!> \top\mathsf{i} \wedge (\top\mathsf{j})_1 = \mathsf{d} \wedge \llbracket B \rrbracket^g \neq \llbracket B[\top_1/\bot_1] \rrbracket^g \wedge (\top\mathsf{j})_1 = \mathsf{d}\}$	
	$\mathsf{c}\llbracket A^{\bot}; B \rrbracket^g$	$\doteq$	$\{\mathsf{l} \in \mathsf{c}\llbracket A; B \rrbracket^g \mid \forall \mathsf{k} \in \mathsf{c}\llbracket A; B \rrbracket^g \exists \mathsf{j} \in \mathsf{c}\llbracket A \rrbracket^g \exists \mathsf{i} \in \mathsf{c} \exists \mathsf{d} \in D_e$: $\bot\mathsf{k} \cdot\!\geq \bot\mathsf{j} \cdot\!> \bot\mathsf{i} \wedge (\bot\mathsf{j})_1 = \mathsf{d} \wedge \llbracket B \rrbracket^g \neq \llbracket B[\bot_1/\top_1] \rrbracket^g \wedge (\bot\mathsf{j})_1 = \mathsf{d}\}$	

DEFINITION 7 (UC$_1$ defaults). $\mathsf{c}_0 = {}^{\chi}\{\langle \langle\, \rangle, \langle\, \rangle \rangle\}$ is the default state.

DEFINITION 8 (Truth) An $(st)st$ term K is *true* in M iff $\forall g$: $\mathsf{c}_0\llbracket K \rrbracket^g \neq \varnothing$

Appendix 2: Abbreviations

Table 1 (UC$_1$ types & variables)

	$a \in \Theta$	Abbrev.	${}^{\top}Var_a$	${}^{\bot}Var_a$	Name of objects
i.	e		$\mathbf{x}, \mathbf{y}$	x, y, z	individuals
	s			i, j	$\top\bot$-lists
	st			I, J	infotention states
	$(st)st$	$=: []$		K	updates
ii.	aa	$=: a^2$			
	abc	$=: a(bc)$			
iii.	se	$=: \mathrm{D}$		$\underline{x}, \underline{y}, \underline{z}$	individual-projections
	$[]^2$			$\underline{J}$	s$^+$-dependent meaning
	$[]^2[]$			$\underline{H}$	s$^+$-licensing head meaning

Table 2 (drt-notation)

	Abbrev.	for	UC term	Example
i.	Static relations			
	$A_a \neq B_a$	for	$\neg(A = B)$	$\top_1 i \neq x$
	$A_a \in B_{at}$	for	BA	$\bot_2 j \in \bot_1\{I\}$
ii.	Local projections ($\mathbf{R} \in \{=, \neq\}$)			
	$\top, \bot$	for	$\top_1, \bot_1$	$\top, \bot$
	$A_e{}^{\circ}$	for	$\lambda i.\ A$	$\mathbf{x}^{\circ}, x^{\circ}$
	$A_{se}{}^{\circ}$	for	$\lambda i.\ Ai$	$\top^{\circ}, \bot^{\circ}$
	$A\, \mathbf{R}_i\, B$	for	$\lambda i.\ A^{\circ}i\ \mathbf{R}\ B^{\circ}i$	$(\top \neq_i x)$
	$B\langle A_1, \ldots A_n \rangle$	for	$\lambda i.\ B\ A_1{}^{\circ}i\ \ldots\ A_n{}^{\circ}i$	$enm^{of}\langle y, \top \rangle$
	(C_1, C_2)	for	$\lambda i.\ C_1 i \wedge C_2 i$	
iii.	Local drt-boxes			
	$[u]$	for	$\lambda Ij.\ \exists u \exists i (j = (u \cdot i) \wedge Ii)$	$[\mathbf{x}]$
	$[C]$	for	$\lambda Ij.\ Ij \wedge Cj$	$[man\ \bot]$
	$[u \mid C]$	for	$\lambda Ij.\ \exists u \exists i (j = (u \cdot i) \wedge Ii \wedge Ci)$	$[y \mid enm^{of}\langle y, \top \rangle]$
iv.	Global drt-boxes			
	$[A_{se} \in B_{se} \|\|]$	for	$\lambda Ij.\ Ij \wedge Aj \in B\{I\}$	$[\bot_2 \in \bot \|\|]$
	$[{\sim} D_{[]}]$	for	$\lambda Ij.\ Ij \wedge j \notin {\downarrow} DI$	$[{\sim}[y \mid man\langle y \rangle]]$