Scope in English: Analysis in CCG+UC

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Scope prediction

- **SA** (syntactic argument):
  The scope of SA may be ambiguous

- **BA** (morphologically bound argument):
  The scope of BA and any modifiers is unambiguous

**Plan**

- Introduction:
  - scope prediction: SA vs BA
  - sample data: English (SA, BA) & Kalaallisut (BA)
- Analysis of English data (**today**)
- Analysis of Kalaallisut data (**next time**)

**Scope prediction**

- **English SA**
  - (Last month Ole ordered three books.)
  - Transitive **DO** (direct object): ambiguous
    - He hasn’t received *one book* yet.
    - hasn’t received any
  - Passive **SU** (subject): wide only
    - One book hasn’t been received yet.
    - one book still missing
English SA & BA

- (Ole\textsuperscript{T} has invited his students\textsuperscript{2} to come and see him individually. But…)
- Passive TV-CTR (‘implicit agent’): narrow only
  \( H_e \) hasn’t been approached yet.
  \( \neg \exists \). none have come yet
- Passive BY QP (‘by phrase’): ambiguous
  \( H_e \) hasn’t been approached by one student yet.
  \( \neg \exists \). none have come yet
  \( \exists \neg \). one hasn’t come yet

Kalaallisut BA: Wide scope -pn

- (Last month Ole\textsuperscript{T} ordered three books\textsuperscript{4}.)
- Transitive \( s^\ldots pn \); wide only
  Suli atuagaq ataasiq tigu-ngi(l)-la-a-∅.
  still \( ^tbook \_ one \_ receive-\text{not-DEC-3}_{S(T)} \_3_{S(\lambda)} \)
  \( \exists \neg \). one book still missing
- Passive \( s^\ldots pn \); wide only
  Suli atuagaq ataasiq tigu-nilq(q)-ngi(l)-la-q. still
  \( ^tbook \_ one \_ receive-pssv-\text{not-DEC-3}_{S(T)} \)
  \( \exists \neg \). one book still missing

Kalaallisut BA: Narrow scope -antip \( \text{cn-} \)

- (Last month Ole\textsuperscript{T} ordered three books\textsuperscript{4}.)
- Antipassive \( s^\ldots \text{antip} \); narrow only
  Suli atuakka-mik ataatsi-mik tigu-si-ngi(l)-la-q.
  still \( ^\text{book-MOD} \_ one-MOD \_ \text{receive-\text{antip-\text{not-DEC-3}}}_{S(T)} \)
  \( \neg \exists \). hasn’t received any
- ‘Incorporated’ noun \( ^s \ldots \text{cn-} \); narrow only
  Suli ataatsimik atuagar-si-ngi(l)-la-q.
  still \( \text{one-MOD} \_ \text{book-rcv-\text{not-DEC-3}}_{S(T)} \)
  \( \neg \exists \). hasn’t received any

Kalaallisut BA: \([+s \ldots \text{cn-} \ldots ]^s \) only

- (Yesterday I saw a bear near the village. And today…)
  Ole alla-mik nanu-si-pu-q angisuu-mik.
  Ole other-MOD\(_\lambda\) bear-see-DEC-3\(_{S(T)}\) big-MOD\(_\lambda\)
  big > other. Ole saw another bear, a big one.
- (Yesterday I saw a big bear near the village. And today…)
  Ole angisuu-mik nanu-si-pu-q alla-mik.
  Ole big-MOD\(_\lambda\) bear-see-DEC-3\(_{S(T)}\) other-MOD\(_\lambda\)
  other > big. Ole (too) saw a big bear, another one.
English SA & BA: Lexicon

- **lexical categories** (TV = x_i/PN' where tp(x_i) = [I])
  - receive-
    - IV/IV_p: λK.K
  - have-
    - IV/IV_p: λK.K
  - be-
    - IV/IV_p: λK(K⁺; [∀ e ⊆ L, CTR e = BCK L.e])
  - book
    - CN: λx. bx
  - one
    - N/P-CN: λPλx(P(x); [∈ ∈ ?B])

- **grammatical categories** (VP = s/VN, QP = s/VP, QP' = x_i(x_i/PN'))
  - I, HE
    - QP': λPλx(CTR(Tx), λP P ?δ)
      - (?δ ∈ (Tδ, δ, Tδ))
  - ME, SLF
    - PN': CTR(Tx), CTR(Tx)
  - HIM
    - QP': λPλx(CTR(Tx), λP P ?δ)
      - (?δ ∈ (Tδ, δ, Tδ))
  - T-
    - QP'/NP: λPλx(TRY; δ; P) ?δ)
      - (?δ ∈ (Tδ, δ, Tδ))
  - PS
    - QP'/NP: λPλx(TRY; δ; P) ?δ)
      - (?δ ∈ (Tδ, δ, Tδ))
  - BY
    - PP/QP': λPλx(TRY; δ; P) ?δ)
      - (?δ ∈ (Tδ, δ, Tδ))
  - -PS
    - IV_p: IV_p: λPλx(TRY; δ; P) ?δ)
  - -PP
    - IV_p: IV_p: λPλx(TRY; δ; P) ?δ)

- **-TNS**
  - VP/VN: λKλx(K⁺; [CTR L.e = g])
  - =T
    - VP/VN: λPλx((P; ?ι)

English SA & BA: have-TNS=n't

- have-
  - -TNS
  - =n'T
    - IV_p: IV_p: λKλx(K⁺; [CTR L.e = g])
    - λPλx(TRY; δ; P) ?δ)

English SA & BA: Passive copula

- been-
  - -PF
  - IV/IV_p:
    - λK(K⁺; [∀ e ⊆ L, CTR e = BCK L.e])
  - IV_p: IV_p: λK.K

- receive-
  - -PF
  - IV/IV_p:
    - λK(K⁺; [∀ e ⊆ L, CTR e = BCK L.e])
  - IV_p: IV_p: λK.K

English SA & BA: Passive vs. Perfect

- receive-
  - -PS
  - IV/IV_p:
    - λK(K⁺; [∀ e ⊆ L, CTR e = BCK L.e])
  - IV_p: IV_p: λK.K

- receive-
  - -PF
  - IV/IV_p:
    - λK(K⁺; [∀ e ⊆ L, CTR e = BCK L.e])
  - IV_p: IV_p: λK.K

- receive-
  - -PS
  - IV/IV_p:
    - λK(K⁺; [∀ e ⊆ L, CTR e = BCK L.e])
  - IV_p: IV_p: λK.K

- receive-
  - -PF
  - IV/IV_p:
    - λK(K⁺; [∀ e ⊆ L, CTR e = BCK L.e])
  - IV_p: IV_p: λK.K
Ambiguous object $\text{QP}^1$: English data

- (Last month Ole ordered three books.)

- He hasn't received one book yet.
  
  - He hasn't received a book yet.
  
  - He hasn't received any book yet.
  
  - He hasn't received one book yet.

- He hasn't received one book yet.

- He hasn't received one book yet.

- He hasn't received one book yet.


Ambiguous object $\text{QP}^1$: Narrow scope (part 1)

- He hasn't received one book yet.

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- He hasn't received one book yet.

- He hasn't received one book yet.

- He hasn't received one book yet.


Ambiguous object $\text{QP}^1$: Narrow scope (part 2)

- ... receive-PF `one book (yet).

- receive-PF

- receive-PF

- receive-PF

- receive-PF

- receive-PF

- receive-PF

- receive-PF

- receive-PF


Ambiguous object $\text{QP}^1$: Narrow scope (conclusion)

- He hasn't received one book (yet).

- He haven't-tns=N'T

- He haven't-tns=N'T

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- He haven't-tns=N'T

- He haven't-tns=N'T

- He haven't-tns=N'T


Ambiguous object QP:\textsuperscript{1}: Wide scope (part 1)

- HE hasn't receive-PF...

<table>
<thead>
<tr>
<th>HE have-TNS=\textsuperscript{1T}</th>
<th>receive-PF</th>
</tr>
</thead>
<tbody>
<tr>
<td>QP\textsuperscript{T} (= s/NP):</td>
<td>\lambda P. P \in \delta</td>
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<tr>
<td>\lambda P' P \in \delta</td>
<td>\lambda (K \vdash \text{[CTR } \perp \ell = \Delta])</td>
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<tr>
<td>\lambda P' P \in \delta</td>
<td>\lambda (e \vdash \text{[rcv(\ell, CTR } \perp \ell, \Delta])</td>
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Ambiguous object QP:\textsuperscript{1}: Wide scope (part 2)

- \textasciitilde \textasciitilde one book (yet).

<table>
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<td>QP\textsuperscript{1}/NP:</td>
<td>\lambda P' P'((y): \lambda e \vdash \text{[rcv(\ell, CTR } \perp \ell, \Delta])</td>
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<td>NP/CN:</td>
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<td>CN:</td>
<td>\lambda x. bk x</td>
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Ambiguous object QP:\textsuperscript{1}: Wide scope (conclusion)

- [he hasn't receive-PF] \textasciitilde \textasciitilde one book (yet).

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Subject QP\textsuperscript{T}: Wide scope only (part 1)

- (Last month \textasciitilde \textasciitilde \textasciitilde \textasciitilde ordered \textasciitilde \textasciitilde \textasciitilde \textasciitilde \textasciitilde three books.)

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Subject QPT: Wide scope only (part 2)

- He hasn’t been received.

\[
\begin{align*}
\text{have-N} & \rightarrow \text{be-PF} \\
\text{VP/IV}_{\text{pt}}: & \quad \text{VP/IV}_{\text{pt}}: \quad & \lambda K \lambda \varphi \{ (K \vdash [\text{CTR } e \equiv \exists \Box]) \} \\
\text{VP/IV}_{\text{pt}}: & \quad \text{VP/IV}_{\text{pt}}: \quad & \lambda K (K \vdash [e \in e \subseteq \exists \Box, \text{CTR } e \equiv \text{BCK } e \equiv]) \\
\text{receive-PF} & \quad \rightarrow B \\
\text{IV}_{\text{pt}}: & \quad \text{IV}_{\text{pt}}: \quad & \{ e \text{ rev}(e, \text{CTR } e, \text{BCK } e) \} \\
\text{VP}: & \quad \text{VP}: \quad & \lambda \varphi \{ [[e \text{ rev}(e, \text{CTR } e, \text{BCK } e)] \}
\end{align*}
\]

Passive BA-CTR: Narrow scope only (data)

- (Ole has invited his students to come and see him individually. But…)
  - He hasn’t [been approached] yet.

Subject QPT: Wide scope only (conclusion)

- One book ...
  - One book

\[
Q^T (\equiv \text{s/VP}): \lambda \varphi \{ (x); [\Box ([\exists \Box])]; [\Box (\exists \Box)] \} \rightarrow \text{be-PF receive-PS}
\]

- … hasn’t been received.

\[
\begin{align*}
\text{have-N} & \rightarrow \text{be-PF receive-PS} \\
\text{VP}: & \quad \lambda \varphi \{ [[e \text{ rev}(e, \text{CTR } e, \text{BCK } e)] \}
\end{align*}
\]

Passive BA-CTR: Narrow scope only (analysis)

- He hasn’t ...
  - have-N=\text{s/}

\[
\begin{align*}
\text{Q}^T (\equiv \text{s/VP}) & \quad \text{VP/IV}_{\text{pt}}: \quad \lambda K \lambda \varphi \{ (K \vdash [\text{CTR } e \equiv \exists \Box]) \} \\
\text{VP/IV}_{\text{pt}}: & \quad \text{VP/IV}_{\text{pt}}: \quad & \lambda K (K \vdash [e \in e \subseteq \exists \Box, \text{CTR } e \equiv \text{BCK } e \equiv]) \\
\text{receive-PF} & \quad \rightarrow B \\
\text{IV}_{\text{pt}}: & \quad \text{IV}_{\text{pt}}: \quad & \{ e \text{ rev}(e, \text{CTR } e, \text{BCK } e) \} \\
\text{IV}_{\text{pt}}: & \quad \text{IV}_{\text{pt}}: \quad & \{ [] \text{approach}(e, \text{CTR } e, \text{BCK } e) \} \\
\text{IV}_{\text{pt}}: & \quad \text{IV}_{\text{pt}}: \quad & \{ e \text{ approach}(e, \text{CTR } e, \text{BCK } e) \} \\
\text{IV}_{\text{pt}}: & \quad \text{IV}_{\text{pt}}: \quad & \{ e \text{ approach}(e, \text{CTR } e, \text{BCK } e) \}
\end{align*}
\]

- … been approached

\[
\begin{align*}
\text{be-PF} & \quad \text{approach-PS} \\
\text{IV}_{\text{pt}}: & \quad \text{IV}_{\text{pt}}: \quad & \{ e \text{ approach}(e, \text{CTR } e, \text{BCK } e) \} \\
\text{IV}_{\text{pt}}: & \quad \text{IV}_{\text{pt}}: \quad & \{ e \text{ approach}(e, \text{CTR } e, \text{BCK } e) \}
\end{align*}
\]

- … has/havn’t been received.

\[
\begin{align*}
\text{have-N} & \rightarrow \text{be-PF receive-PS} \\
\text{VP}: & \quad \lambda \varphi \{ [[e \text{ rev}(e, \text{CTR } e, \text{BCK } e)] \}
\end{align*}
\]
Ambiguous BY-phrase: Data

- (Ole has invited his students to come and see him individually. But...)
- He hasn’t been approached by one student yet.
  - no student has approached him yet
  - one student still hasn’t approached him

Ambiguous BY-phrase: Narrow scope (conclusion)

- ... approached by one student (yet).
  - [a approach(e, CTR e, BCK e)]
  - one student

Ambiguous BY-phrase: Wide scope (part 1)

- He hasn’t been approached ...
  - SP
    - have-NS ≈ be-FF
      - B
  - approach-PS
    - [IV e: el approach(e, CTR e, BCK e)]
  - one student

Ambiguous BY-phrase: Narrow scope (part 1)

- He hasn’t been...
  - HE
    - have-NS ≈ be-FF
      - B
  - QP (= s/vp):
    - VP/IV e:
      - λKλε(ε ≈ (K ≈ [eε ≈ e], CTR e ≈ e, BCK e, CTR e ≈ e)]
    - B
  - s/IV e: λK(ε ≈ (K ≈ [eε ≈ e], CTR e ≈ e, BCK e, CTR e ≈ e)]

Ambiguous BY-phrase: Narrow scope (conclusion)

- [e el approach(e, CTR e, BCK e)]

Ambiguous BY-phrase: Wide scope (part 1)

- [e el approach(e, CTR e, BCK e)]
  - one student

Ambiguous BY-phrase: Wide scope (part 1)

- [e el approach(e, CTR e, BCK e)]
  - one student

Ambiguous BY-phrase: Wide scope (part 1)

- [e el approach(e, CTR e, BCK e)]
  - one student

Ambiguous BY-phrase: Wide scope (part 1)

- [e el approach(e, CTR e, BCK e)]
  - one student

Ambiguous BY-phrase: Wide scope (part 1)

- [e el approach(e, CTR e, BCK e)]
  - one student
Ambiguous **BY-phrase**: Wide scope (conclusion)

- **HE hasn’t been approached** ...
  
  s: \([-e \cdot e \text{ approach}(e, CTR e, T\delta), e' \subseteq e, CTR e' = T\delta]\]

- **… BY one student** (yet).
  
  QP: \(\lambda K((y); \{ \text{std}(\perp \Delta); [\perp \Delta \in \perp \delta] \}) \vdash P \perp \delta\) 

- **Oops!** The antecedent \(e\) for \(\perp e\) is trapped inside the scope of negation (-). So this background-elaboration sequence \(A \vdash B\) denotes the absurd state--i.e. wide scope BY QP is wrongly ruled out. (See handout for the outline of a possible *solution*).