# Notes on Karttunen & Peters 1979
# Two-Dimensional Semantics for Extensional Presupposition Triggers

## 1. OVERVIEW

In this handout we consider an extensional fragment of Karttunen & Peters 1979 (hereafter K&P '79), where we abstract away from worlds and times. We also eliminate meaning postulates and the heritage function, by revising the basic meanings and the compositional rules, respectively (see APPENDIX).

The resulting extensional fragment of K&P 79 can deal with extensional presupposition triggers such as those underlined in (1)–(5) (see detailed derivations in SECTIONS 2–4).

(1) *Presuppositional nouns & verbs*
John likes Mary.
**P:** John is male, he is acquainted with Mary, and Mary is female.
**A:** John likes Mary.

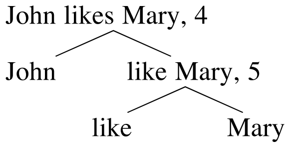
(2) *Definites*
The unicorn is pregnant.
**P:** There is a unique unicorn and it is female.
**A:** The unicorn is pregnant.

(3) *Quantifiers*
Sue has caught every unicorn.
**P:** There are unicorns.
**A:** Sue has caught every unicorn.

(4) *Iterative adverbs*
The unicorn is pregnant, too.
= TOO RULE$_7$(the unicorn, he$_7$ is pregnant)
**P:** There is a unique unicorn, it is female and some entity other than that unicorn is pregnant.
**A:** The unicorn is pregnant.

(5) *It-Clefts*
It is John that Mary dates.
= CLEFT RULE$_5$(John, Mary dates him$_5$)
**P:** John is male, Mary is female and Mary dates somebody.
**A:** Mary dates John.

## 2. PRESUPPOSITIONAL NOUNS AND VERBS




<u>Basic meanings</u>

Denotation of 'John' is $\langle$**A**(John), **P**(John)$\rangle$, where

**A**(John) = $\lambda P_{et}\, P(john)$ [contribution to assertion]

**P**(John) = $\lambda P_{et}\, male(john)$ [contribution to presupposition]

Denotation of 'Mary' is $\langle$**A**(Mary), **P**(Mary)$\rangle$, where

**A**(Mary) = $\lambda P_{et}\, P(mary)$

**P**(Mary) = $\lambda P_{et}\, female(mary)$

Denotation of 'like' is $\langle$**A**(like), **P**(like)$\rangle$, where

**A**(like) = $\lambda Q_{(et)t}\, \lambda x_e\, Q(\lambda y_e\, like(x, y))$

**P**(like) = $\lambda Q_{(et)t}\, \lambda x_e\, Q(\lambda y_e\, acquainted\_with(x, y))$

<u>Semantic composition</u>

By RULE 5 (TV + T), 'like Mary' denotes $\langle$**A**(like Mary), **P**(like Mary)$\rangle$, where

**A**(like Mary) = **A**(like)(**A**(Mary))
= $[\lambda Q_{(et)t}\, \lambda x_e\, Q(\lambda y_e\, like(x, y))](\lambda P_{et}\, P(mary))$
= $\lambda x_e\, like(x, mary)$

**P**(like Mary) = $\lambda x_e[$**P**(like)(**A**(Mary))$(x)$
$\wedge\ \exists P_{et}$ **P**(Mary)$(P)]$
= $\lambda x_e[[\lambda Q_{(et)t}\, \lambda x_e\, Q(\lambda y_e\, acquainted\_with(x, y))](\lambda P_{et}\, P(mary))$
$\wedge\ \exists P_{et}\, [\lambda P'_{et}\, female(mary)](P)]$
= $\lambda x_e[acquainted\_with(x, mary)$
$\wedge\ female(mary)]$

By RULE 4 (T + IV), 'John likes Mary' denotes $\langle$**A**(John likes Mary), **P**(John likes Mary)$\rangle$, where

**A**(John likes Mary) = **A**(John)(**A**(likes Mary))
= $[\lambda P_{et}\, P(john)](\lambda x_e\, like(x, mary))$
= $like(john, mary)$

**P**(John likes Mary) = **P**(John)(**A**(like Mary))
$\wedge$ **A**(John)(**P**(like Mary))
= $[\lambda P_{et}\, male(john)](\lambda x_e\, like(x, mary))$
$\wedge\ [\lambda P_{et}\, P(john)](\lambda x_e[acquainted\_with(x, mary) \wedge female(mary)])$
= $male(john)$
$\wedge\ acquainted\_with(john, mary) \wedge female(mary)$

## 3. DEFINITE DESCRIPTIONS

the unicorn is pregnant, 4

the unicorn, 2 be_pregnant

unicorn

<u>Basic meanings</u>

Denotation of 'unicorn' is $\langle \mathbf{A}(\text{unicorn}), \mathbf{P}(\text{unicorn})\rangle$, where

$\mathbf{A}(\text{unicorn}) = \lambda y_e\ \mathit{unicorn}(y)$

$\mathbf{P}(\text{unicorn}) = \lambda y_e\ y = y$

Denotation of 'be_pregnant' is $\langle \mathbf{A}(\text{be\_pregnant}), \mathbf{P}(\text{be\_pregnant})\rangle$, where

$\mathbf{A}(\text{be\_pregnant}) = \lambda y_e\ \mathit{pregnant}(y)$

$\mathbf{P}(\text{be\_pregnant}) = \lambda y_e\ \mathit{female}(y)$

<u>Semantic composition</u>

By RULE 2 (D + CN), 'the unicorn' denotes $\langle \mathbf{A}(\text{the unicorn}), \mathbf{P}(\text{the unicorn})\rangle$, where

$$\begin{aligned}
\mathbf{A}(\text{the unicorn}) &= \lambda P_{et}\ \exists y_e[\mathbf{A}(\text{unicorn})(y) \wedge \forall z_e(\mathbf{A}(\text{unicorn})(z) \rightarrow z = y) \\
&\qquad \wedge P(y)] \\
&= \lambda P_{et}\ \exists y_e[\mathit{unicorn}(y) \wedge \forall z_e(\mathit{unicorn}(z) \rightarrow z = y) \\
&\qquad \wedge P(y)]
\end{aligned}$$

$$\begin{aligned}
\mathbf{P}(\text{the unicorn}) &= \lambda P_{et}\ \exists y_e[\mathbf{A}(\text{unicorn})(y) \wedge \forall z_e(\mathbf{A}(\text{unicorn})(z) \rightarrow z = y) \\
&\qquad \wedge \mathbf{P}(\text{unicorn})(y)] \\
&= \lambda P_{et}\ \exists y_e[\mathit{unicorn}(y) \wedge \forall z_e(\mathit{unicorn}(z) \rightarrow z = y) \\
&\qquad \wedge y = y] \\
&= \lambda P_{et}\ \exists y_e[\mathit{unicorn}(y) \wedge \forall z_e(\mathit{unicorn}(z) \rightarrow z = y)]
\end{aligned}$$

By RULE 4 (T + IV), 'the unicorn is pregnant' denotes $\langle \mathbf{A}(\text{the unicorn is pregnant}), \mathbf{P}(\text{the unicorn is pregnant})\rangle$, where

$$\begin{aligned}
\mathbf{A}(\text{the unicorn is pregnant}) &= \mathbf{A}(\text{the unicorn})(\mathbf{A}(\text{be_pregnant})) \\
&= \lambda P_{et}\ \exists y_e[\mathit{unicorn}(y) \wedge \forall z_e(\mathit{unicorn}(z) \rightarrow z = y) \\
&\qquad \wedge P(y)](\lambda x_e\ \mathit{pregnant}(x)) \\
&= \exists y_e[\mathit{unicorn}(y) \wedge \forall z_e(\mathit{unicorn}(z) \rightarrow z = y) \\
&\qquad \wedge \mathit{pregnant}(y)]
\end{aligned}$$

$$\begin{aligned}
\mathbf{P}(\text{the unicorn is pregnant}) &= \mathbf{P}(\text{the unicorn})(\mathbf{A}(\text{be_pregnant})) \\
&\qquad \wedge \mathbf{A}(\text{the unicorn})(\mathbf{P}(\text{be_pregnant})) \\
&= [\lambda P_{et}\ \exists y_e[\mathit{unicorn}(y) \wedge \forall z_e(\mathit{unicorn}(z) \rightarrow z = y)]](\lambda x_e\ \mathit{pregnant}(x)) \\
&\qquad \wedge [\lambda P_{et}\ \exists y_e[\mathit{unicorn}(y) \wedge \forall z_e(\mathit{unicorn}(z) \rightarrow z = y) \wedge P(y)]](\lambda x_e\ \mathit{female}(x)) \\
&= \quad \exists y_e[\mathit{unicorn}(y) \wedge \forall z_e(\mathit{unicorn}(z) \rightarrow z = y)] \\
&\qquad \wedge \exists y_e[\mathit{unicorn}(y) \wedge \forall z_e(\mathit{unicorn}(z) \rightarrow z = y) \wedge \mathit{female}(y)] \\
&= \exists y_e[\mathit{unicorn}(y) \wedge \forall z_e(\mathit{unicorn}(z) \rightarrow z = y) \wedge \mathit{female}(y)]
\end{aligned}$$

John likes the unicorn, 4

John — like the unicorn, 5

like — the unicorn, 2

unicorn

Basic meanings

Denotation of 'John' is $\langle \mathbf{A}(\text{John}), \mathbf{P}(\text{John})\rangle$, where

$\mathbf{A}(\text{John}) = \lambda P_{et}\, P(john)$

$\mathbf{P}(\text{John}) = \lambda P_{et}\, male(john)$

Denotation of 'unicorn' is $\langle \mathbf{A}(\text{unicorn}), \mathbf{P}(\text{unicorn})\rangle$, where

$\mathbf{A}(\text{unicorn}) = \lambda y_e\, unicorn(y)$

$\mathbf{P}(\text{unicorn}) = \lambda y_e\, y = y$

Denotation of 'like' is $\langle \mathbf{A}(\text{like}), \mathbf{P}(\text{like})\rangle$, where

$\mathbf{A}(\text{like}) = \lambda Q_{(et)t}\, \lambda x_e\, Q(\lambda y_e\, like(x, y))$

$\mathbf{P}(\text{like}) = \lambda Q_{(et)t}\, \lambda x_e\, Q(\lambda y_e\, acquainted\_with(x, y))$

Semantic composition

By RULE 2 (D + CN), 'the unicorn' denotes $\langle \mathbf{A}(\text{the unicorn}), \mathbf{P}(\text{the unicorn})\rangle$, where

$$\begin{aligned}
\mathbf{A}(\text{the unicorn}) &= \lambda P_{et}\, \exists y_e[\mathbf{A}(\text{unicorn})(y) \wedge \forall z_e(\mathbf{A}(\text{unicorn})(z) \rightarrow z = y) \\
&\qquad \wedge P(y)] \\
&= \lambda P_{et}\, \exists y_e[unicorn(y) \wedge \forall z_e(unicorn(z) \rightarrow z = y) \\
&\qquad \wedge P(y)]
\end{aligned}$$

$$\begin{aligned}
\mathbf{P}(\text{the unicorn}) &= \lambda P_{et}\, \exists y_e[\mathbf{A}(\text{unicorn})(y) \wedge \forall z_e(\mathbf{A}(\text{unicorn})(z) \rightarrow z = y) \\
&\qquad \wedge \mathbf{P}(\text{unicorn})(y)] \\
&= \lambda P_{et}\, \exists y_e[unicorn(y) \wedge \forall z_e(unicorn(z) \rightarrow z = y)]
\end{aligned}$$

By RULE 5 (TV + T), 'like the unicorn' denotes $\langle \mathbf{A}(\text{like the unicorn}), \mathbf{P}(\text{like the unicorn})\rangle$, where

$$\begin{aligned}
\mathbf{A}(\text{like the unicorn}) &= \mathbf{A}(\text{like})(\mathbf{A}(\text{the unicorn})) \\
&= [\lambda Q_{(et)t}\, \lambda x_e Q(\lambda y_e\, like(x, y))](\lambda P_{et}\, \exists y_e[unicorn(y) \wedge \forall z_e(unicorn(z) \rightarrow z = y) \wedge P(y)]) \\
&= \lambda x_e\, \exists y_e[unicorn(y) \wedge \forall z_e(unicorn(z) \rightarrow z = y) \wedge like(x, y)]
\end{aligned}$$

$$\begin{aligned}
\mathbf{P}(\text{like the unicorn}) &= \lambda x_e[\mathbf{P}(\text{like})(\mathbf{A}(\text{the unicorn}))(x) \\
&\qquad \wedge \exists P_{et}\, \mathbf{P}(\text{the unicorn})(P)] \\
&= \lambda x_e[[\lambda Q_{(et)t}\, \lambda x_e Q(\lambda y_e\, acquainted_with(x, y))] \\
&\qquad (\lambda P_{et}\, \exists y_e[unicorn(y) \wedge \forall z_e(unicorn(z) \rightarrow z = y) \wedge P(y)]) \\
&\qquad \wedge \exists P_{et}\, [\lambda P_{et}\, \exists y_e[unicorn(y) \wedge \forall z_e(unicorn(z) \rightarrow z = y)](P)] \\
&= \lambda x_e\, \exists y_e[unicorn(y) \wedge \forall z_e(unicorn(z) \rightarrow z = y) \wedge acquainted_with(x, y) \\
&\qquad \wedge \exists y_e[unicorn(y) \wedge \forall z_e(unicorn(z) \rightarrow z = y)]] \\
&= \lambda x_e\, \exists y_e[unicorn(y) \wedge \forall z_e(unicorn(z) \rightarrow z = y) \wedge acquainted_with(x, y)]
\end{aligned}$$

By RULE 4 (T + IV), 'John likes the unicorn' denotes $\langle \mathbf{A}(\text{J. likes the uni.}), \mathbf{P}(\text{J. likes the uni.})\rangle$, where

$$\begin{aligned}
\mathbf{A}(\text{J. likes the uni.}) &= \mathbf{A}(\text{John})(\mathbf{A}(\text{likes the unicorn})) \\
&= [\lambda P_{et}\, P(john)](\lambda x_e\, \exists y_e[unicorn(y) \wedge \forall z_e(unicorn(z) \rightarrow z = y) \wedge like(x, y)]) \\
&= \exists y_e[unicorn(y) \wedge \forall z_e(unicorn(z) \rightarrow z = y) \wedge like(john, y)
\end{aligned}$$

$$\begin{aligned}
\mathbf{P}(\text{J. likes the uni.}) &= \mathbf{P}(\text{John})(\mathbf{A}(\text{like the unicorn})) \\
&\qquad \wedge \mathbf{A}(\text{John})(\mathbf{P}(\text{like the unicorn})) \\
&= [\lambda P_{et}\, male(john)](\lambda x_e\, \exists y_e[unicorn(y) \wedge \forall z_e(unicorn(z) \rightarrow z = y) \wedge like(x, y)]) \\
&\qquad \wedge [\lambda P_{et}\, P(john)] \\
&\qquad\qquad (\lambda x_e\, \exists y_e[unicorn(y) \wedge \forall z_e(unicorn(z) \rightarrow z = y) \wedge acquainted_with(x, y)]) \\
&= male(john) \\
&\qquad \wedge \exists y_e[unicorn(y) \wedge \forall z_e(unicorn(z) \rightarrow z = y) \wedge acquainted_with(john, y)]
\end{aligned}$$

4. ITERATIVE ADVERBS

the unicorn is pregnant too, $\text{TOO}_7$

the unicorn, 2    $\text{he}_7$ is pregnant, 4

unicorn    $\text{he}_7$    be_pregnant

Basic meanings

Denotation of 'unicorn' is $\langle \mathbf{A}(\text{unicorn}), \mathbf{P}(\text{unicorn})\rangle$, where

$\mathbf{A}(\text{unicorn}) = \lambda y_e\ \mathit{unicorn}(y)$

$\mathbf{P}(\text{unicorn}) = \lambda y_e\ y = y$

Denotation of 'be_pregnant' is $\langle \mathbf{A}(\text{be\_pregnant}), \mathbf{P}(\text{be\_pregnant})\rangle$, where

$\mathbf{A}(\text{be\_pregnant}) = \lambda y_e\ \mathit{pregnant}(y)$

$\mathbf{P}(\text{be\_pregnant}) = \lambda y_e\ \mathit{female}(y)$

Denotation of '$\text{he}_7$' is $\langle \mathbf{A}(\text{he}_7), \mathbf{P}(\text{he}_7)\rangle$, where

$\mathbf{A}(\text{he}_7) = \lambda P_{et}\ P(x_7)$

$\mathbf{P}(\text{he}) = \lambda P_{et}\ x_7 = x_7$

Semantic composition

By RULE 2 (D + CN), 'the unicorn' denotes $\langle \mathbf{A}(\text{the unicorn}), \mathbf{P}(\text{the unicorn})\rangle$, where

$$\begin{aligned}\mathbf{A}(\text{the unicorn}) &= \lambda P_{et}\ \exists y_e[\mathbf{A}(\text{unicorn})(y) \wedge \forall z_e(\mathbf{A}(\text{unicorn})(z) \rightarrow z = y) \\ &\qquad \wedge P(y)] \\ &= \lambda P_{et}\ \exists y_e[\mathit{unicorn}(y) \wedge \forall z_e(\mathit{unicorn}(z) \rightarrow z = y) \\ &\qquad \wedge P(y)]\end{aligned}$$

$$\begin{aligned}\mathbf{P}(\text{the unicorn}) &= \lambda P_{et}\ \exists y_e[\mathbf{A}(\text{unicorn})(y) \wedge \forall z_e(\mathbf{A}(\text{unicorn})(z) \rightarrow z = y) \\ &\qquad \wedge \mathbf{P}(\text{unicorn})(y)] \\ &= \lambda P_{et}\ \exists y_e[\mathit{unicorn}(y) \wedge \forall z_e(\mathit{unicorn}(z) \rightarrow z = y)]\end{aligned}$$

By RULE 4 (T + IV), '$\text{he}_7$ is pregnant denotes $\langle \mathbf{A}(\text{he}_7 \text{ is pregnant}), \mathbf{P}(\text{he}_7 \text{ is pregnant})\rangle$, where

$$\begin{aligned}\mathbf{A}(\text{he}_7 \text{ is pregnant}) &= \mathbf{A}(\text{he}_7)(\mathbf{A}(\text{be\_pregnant})) \\ &= \mathit{pregnant}(x_7)\end{aligned}$$

$$\begin{aligned}\mathbf{P}(\text{he}_7 \text{ is pregnant}) &= \mathbf{P}(\text{he}_7)(\mathbf{A}(\text{be\_pregnant})) \\ &\qquad \wedge \mathbf{A}(\text{he}_7)(\mathbf{P}(\text{be\_pregnant})) \\ &= x_7 = x_7 \\ &\qquad \wedge \mathit{female}(x_7) \\ &= \mathit{female}(x_7)\end{aligned}$$

By TOO $\text{RULE}_7$ (analogous to the EVEN RULE on p. 52 of K&P 79), 'the unicorn is pregnant too' denotes $\langle \mathbf{A}(\text{the unicorn is pregnant too}), \mathbf{P}(\text{the unicorn is pregnant too})\rangle$, where

$$\begin{aligned}\mathbf{A}(\text{the unicorn is pregnant too}) &= \mathbf{A}(\text{the unicorn})(\lambda x_7\ \mathbf{A}(\text{he}_7 \text{ is pregnant})) \\ &= \lambda P_{et}\ \exists y_e[\mathit{unicorn}(y) \wedge \forall z_e(\mathit{unicorn}(z) \rightarrow z = y) \\ &\qquad \wedge P(y)](\lambda x_e\ \mathit{pregnant}(x)) \\ &= \exists y_e[\mathit{unicorn}(y) \wedge \forall z_e(\mathit{unicorn}(z) \rightarrow z = y) \\ &\qquad \wedge \mathit{pregnant}(y)]\end{aligned}$$

$$\begin{aligned}\mathbf{P}(\text{the unicorn is pregnant too}) &= \mathbf{P}(\text{the unicorn})(\lambda x_7\ \mathbf{A}(\text{he}_7 \text{ is pregnant})) \\ &\qquad \wedge \mathbf{A}(\text{the unicorn})(\lambda x_7\ \mathbf{P}(\text{he}_7 \text{ is pregnant})) \\ &\qquad \wedge \mathbf{A}(\text{the unicorn})(\lambda y_e\ \exists z_e(\neg[z = y] \wedge [\lambda x_7\ \mathbf{A}(\text{he}_7 \text{ is pregnant})](z))) \\ &= \exists y_e[\mathit{unicorn}(y) \wedge \forall z_e(\mathit{unicorn}(z) \rightarrow z = y)] \\ &\qquad \wedge \exists y_e[\mathit{unicorn}(y) \wedge \forall z_e(\mathit{unicorn}(z) \rightarrow z = y) \wedge \mathit{female}(y)] \\ &\qquad \wedge \exists y_e[\mathit{unicorn}(y) \wedge \forall z_e(\mathit{unicorn}(z) \rightarrow z = y) \wedge \exists z_e(\neg[z = y] \wedge \mathit{pregnant}(z))] \\ &= \exists y_e[\mathit{unicorn}(y) \wedge \forall z_e(\mathit{unicorn}(z) \rightarrow z = y) \wedge \mathit{female}(y) \\ &\qquad \wedge \exists x_e(\neg[x = y] \wedge \mathit{pregnant}(x))]\end{aligned}$$

APPENDIX: EXTENSIONAL FRAGMENT OF KARTTUNEN & PETERS 1979

Revise the *basic translations* as in the above sample derivations and, in each of the following *compositional rules*, leave the syntax unchanged while revising the translation as follows:

RULE 2 for $[\text{every } \zeta_{CN}]_T$, $[\text{a } \zeta_{CN}]_T$, $[\text{the } \zeta_{CN}]_T$:

$$\mathbf{A}(\text{every } \zeta) = \lambda P_{et}\, \forall x_e[\mathbf{A}(\zeta)(x) \to P(x)]$$
$$\mathbf{P}(\text{every } \zeta) = \lambda P_{et}\, \exists x_e[\mathbf{A}(\zeta)(x) \wedge \mathbf{P}(\zeta)(x)]$$

$$\mathbf{A}(\text{a } \zeta) = \lambda P_{et}\, \exists x_e[\mathbf{A}(\zeta)(x) \wedge P(x)]$$
$$\mathbf{P}(\text{a } \zeta) = \lambda P_{et}\, \exists x_e\, \mathbf{P}(\zeta)(x)$$

$$\mathbf{A}(\text{the } \zeta) = \lambda P_{et}\, \exists x_e[\mathbf{A}(\zeta)(x) \wedge \forall z_e(\mathbf{A}(\zeta)(x) \to z = x) \wedge P(x)]$$
$$\mathbf{P}(\text{the } \zeta) = \lambda P_{et}\, \exists x_e[\mathbf{A}(\zeta)(x) \wedge \forall z_e(\mathbf{A}(\zeta)(x) \to z = x) \wedge \mathbf{P}(\zeta)(x)]$$

RULE 4 for $[\alpha_T\, prs(\delta_{IV})]_S$:

$$\mathbf{A}(\alpha\, prs(\delta)) = \mathbf{A}(\alpha)(\mathbf{A}(\delta))$$
$$\mathbf{P}(\alpha\, prs(\delta)) = \mathbf{P}(\alpha)(\mathbf{A}(\delta)) \wedge \mathbf{A}(\alpha)(\mathbf{P}(\delta))$$

RULE 5 for $[\delta_{TV}\, acc(\beta_T)]_{IV}$:

$$\mathbf{A}(\delta\, acc(\beta)) = \mathbf{A}(\delta)(\mathbf{A}(\beta))$$
$$\mathbf{P}(\delta\, acc(\beta)) = \lambda x_e[\mathbf{P}(\delta)(\mathbf{A}(\beta))(x) \wedge \exists P\, \mathbf{P}(\beta)(P)]$$

RULE 11 for $[\text{either } \phi_S \text{ or } \psi_S]_S$:

$$\mathbf{A}(\text{either } \phi \text{ or } \psi) = \mathbf{A}(\phi) \vee \mathbf{A}(\psi)$$
$$\mathbf{P}(\text{either } \phi \text{ or } \psi) = (\mathbf{P}(\phi) \vee \mathbf{A}(\psi)) \wedge (\mathbf{A}(\phi) \vee \mathbf{P}(\psi))$$

RULE 14.$n$ for $[\phi_S[\alpha_T/\text{he}_n]]_S$:

$$\mathbf{A}(\phi[\alpha/\text{he}_n]) = \mathbf{A}(\alpha)(\lambda x_n\, \mathbf{A}(\phi))$$
$$\mathbf{P}(\phi[\alpha/\text{he}_n]) = \mathbf{P}(\alpha)(\lambda x_n\, \mathbf{A}(\phi)) \wedge \mathbf{A}(\alpha)(\lambda x_n\, \mathbf{P}(\phi)))$$

TOO RULE$_n$ for $[\phi_S[\alpha_T/\text{he}_n] \text{ too}]_S$:

$$\mathbf{A}(\phi[\alpha/\text{he}_n] \text{ too}) = \mathbf{A}(\alpha)(\lambda x_n\, \mathbf{A}(\phi))$$
$$\mathbf{P}(\phi[\alpha/\text{he}_n] \text{ too}) = \mathbf{P}(\alpha)(\lambda x_n\, \mathbf{A}(\phi)) \wedge \mathbf{A}(\alpha)(\lambda x_n\, \mathbf{P}(\phi)) \wedge \mathbf{A}(\alpha)(\lambda y_e\, \exists z_e[\neg\, z = y \wedge \lambda x_n\, \mathbf{A}(\phi)(z)])$$

RULE 17 for $[\alpha_T\, neg(\delta_{IV})]_S$, $[\alpha_T\, NEG(\delta_{IV})]_S$:

$$\mathbf{A}(\alpha\, neg(\delta)) = \neg\mathbf{A}(\alpha)(\mathbf{A}(\beta)) \qquad \textit{ordinary negation}$$
$$\mathbf{P}(\alpha\, neg(\delta)) = \mathbf{P}(\alpha)(\mathbf{A}(\delta)) \wedge \mathbf{A}(\alpha)(\mathbf{P}(\delta))$$

$$\mathbf{A}(\alpha\, NEG(\delta)) = \neg[\mathbf{A}(\alpha)(\mathbf{A}(\beta)) \wedge \mathbf{P}(\alpha)(\mathbf{A}(\delta)) \wedge \mathbf{A}(\alpha)(\mathbf{P}(\delta))] \qquad \textit{contradiction negation}$$
$$\mathbf{P}(\alpha\, NEG(\delta)) = \top$$

# More Notes on Karttunen & Peters 1979
# Projection from Extensional Contexts

## 1. OVERVIEW

In our extensional fragment of K&P '79 operators like negation and disjunction are introduced syncategorematically, and presupposition projection is dealt with by the **P**-coordinate of the relevant rule (same as for determiners). These rules derive, for example, the results in (1) and (2) (see detailed derivations in SECTION 2 and SECTION 3).

- *Negation*

(1a) the unicorn is not pregnant *ordinary negation*
= the unicorn *not*(be_pregnant) (presup. preserved)

**A**(1a) = ¬**A**(the unicorn is pregnant)
= $\neg\exists y_e[unicorn(y) \wedge \forall z_e(unicorn(z) \rightarrow z = y) \wedge pregnant(y)]$

**P**(1a) = **P**(the unicorn is pregnant)
= $\exists y_e[unicorn(y) \wedge \forall z_e(unicorn(z) \rightarrow z = y) \wedge female(y)]$

(1b) the unicorn is not pregnant *contradiction negation*
= the unicorn *NOT*(be_pregnant) (presup. cancelled)

**A**(1b) = ¬[**A**(the unicorn is pregnant) ∧ **P**(the unicorn is pregnant)]
= $\neg\exists y_e[unicorn(y) \wedge \forall z_e(unicorn(z) \rightarrow z = y) \wedge pregnant(y) \wedge female(y)]$

**P**(1b) = $\top$ ('$\top$' for tautology)

- *Disjunction*

(2a) either Buganda is not a monarchy or the king of Buganda is late.

**A**(2a) = $\neg monarchy(b)$
$\vee\ \exists y_e[kob(y) \wedge \forall z_e(kob(z) \rightarrow z = y) \wedge late(y)]$

**P**(2a) = [**P**(Buganda *not*(be_a_monarchy)) ∨ **A**(the king of Buganda is late)]
∧ [**A**(Buganda *not*(be_a_monarchy)) ∨ **P**(the king of Buganda is late)]

= $[\top \vee \exists y_e[kob(y) \wedge \forall z_e(kob(z) \rightarrow z = y) \wedge late(y)]]$
$\wedge\ [\neg monarchy(b) \vee \exists y_e[kob(y) \wedge \forall z_e(kob(z) \rightarrow z = y)]$
= $\top$ (assuming $monarchy(b) \models \exists y_e[kob(y) \wedge \forall z_e(kob(z) \rightarrow z = y)]$)

(2b) either the king of Buganda is late or Buganda is not a monarchy.

**A**(2b) = **A**(2a)

**P**(2b) = **P**(2a)

## 2. NEGATION

(1a) the unicorn is not pregnant, 17.*not* — *ordinary negation* (presup. preserved)

the unicorn, 2 be_pregnant
unicorn

Basic meanings

$\mathbf{A}(\text{unicorn}) = \lambda y_e\, \mathit{unicorn}(y)$
$\mathbf{P}(\text{unicorn}) = \lambda y_e\, y = y$

$\mathbf{A}(\text{be\_pregnant}) = \lambda y_e\, \mathit{pregnant}(y)$
$\mathbf{P}(\text{be\_pregnant}) = \lambda y_e\, \mathit{female}(y)$

Semantic composition

By RULE 2 (D + CN), 'the unicorn' denotes $\langle \mathbf{A}(\text{the unicorn}), \mathbf{P}(\text{the unicorn})\rangle$, where

$$\begin{aligned}\mathbf{A}(\text{the unicorn}) &= \lambda P_{et}\, \exists y_e[\mathbf{A}(\text{unicorn})(y) \wedge \forall z_e(\mathbf{A}(\text{unicorn})(z) \rightarrow z = y) \wedge P(y)]\\ &= \lambda P_{et}\, \exists y_e[\mathit{unicorn}(y) \wedge \forall z_e(\mathit{unicorn}(z) \rightarrow z = y) \wedge P(y)]\end{aligned}$$

$$\begin{aligned}\mathbf{P}(\text{the unicorn}) &= \lambda P_{et}\, \exists y_e[\mathbf{A}(\text{unicorn})(y) \wedge \forall z_e(\mathbf{A}(\text{unicorn})(z) \rightarrow z = y) \wedge \mathbf{P}(\text{unicorn})(y)]\\ &= \lambda P_{et}\, \exists y_e[\mathit{unicorn}(y) \wedge \forall z_e(\mathit{unicorn}(z) \rightarrow z = y)]\end{aligned}$$

By RULE 17 (T *not*(IV)), 'the unicorn *not*(be_pregnant)' (= 1a) denotes $\langle \mathbf{A}(1a)), \mathbf{P}(1a)\rangle$, where

$$\begin{aligned}\mathbf{A}(1a) &= \neg\mathbf{A}(\text{the unicorn})(\mathbf{A}(\text{be\_pregnant}))\\ &= \neg\mathbf{A}(\text{the unicorn is pregnant})\\ &= \neg\, \exists y_e[\mathit{unicorn}(y) \wedge \forall z_e(\mathit{unicorn}(z) \rightarrow z = y) \wedge \mathit{pregnant}(y)]\end{aligned}$$

$$\begin{aligned}\mathbf{P}(1a) &= \mathbf{P}(\text{the unicorn})(\mathbf{A}(\text{be\_pregnant})) \wedge \mathbf{A}(\text{the unicorn})(\mathbf{P}(\text{be\_pregnant}))\\ &= \mathbf{P}(\text{the unicorn is pregnant})\\ &= \exists y_e[\mathit{unicorn}(y) \wedge \forall z_e(\mathit{unicorn}(z) \rightarrow z = y) \wedge \mathit{female}(y)]\end{aligned}$$

(1b) the unicorn is not pregnant, 17.*NOT* — *contradiction negation* (presup. cancelled)

the unicorn, 2 be_pregnant
unicorn

Basic meanings

As above

Semantic composition

By RULE 17 (T *NOT* (IV)), 'the unicorn *NOT*(be_pregnant)' (= 1b, homophonous with 1a) denotes $\langle \mathbf{A}(1b)), \mathbf{P}(1b)\rangle$, where

$$\begin{aligned}\mathbf{A}(1b) &= \neg[\mathbf{A}(\text{the unicorn})(\mathbf{A}(\text{be\_pregnant}))\\ &\qquad \wedge \mathbf{P}(\text{the unicorn})(\mathbf{A}(\text{be\_pregnant})) \wedge \mathbf{A}(\text{the unicorn})(\mathbf{P}(\text{be\_pregnant}))]\\ &= \neg[\mathbf{A}(\text{the unicorn is pregnant})\\ &\qquad \wedge \mathbf{P}(\text{the unicorn is pregnant})]\\ &= \neg(\exists y_e[\mathit{unicorn}(y) \wedge \forall z_e(\mathit{unicorn}(z) \rightarrow z = y) \wedge \mathit{pregnant}(y)]\\ &\qquad \wedge \exists y_e[\mathit{unicorn}(y) \wedge \forall z_e(\mathit{unicorn}(z) \rightarrow z = y) \wedge \mathit{female}(y)])\\ &= \neg\exists y_e[\mathit{unicorn}(y) \wedge \forall z_e(\mathit{unicorn}(z) \rightarrow z = y) \wedge \mathit{pregnant}(y) \wedge \mathit{female}(y)]\end{aligned}$$

$\mathbf{P}(1b) = \top$

## 3. DISJUNCTION

(2a) either Buganda is not a monarchy or the king of Buganda is late, 11

Buganda is not a monarchy, 17.*not* the king of Buganda is late, 4

Buganda be_a_monarchy the king of Buganda, 2 be_late

king_of_Buganda

Basic meanings

$\mathbf{A}(\text{Buganda}) = \lambda P_{et}\, P(b)$
$\mathbf{P}(\text{Buganda}) = \lambda P_{et}\, \top$

$\mathbf{A}(\text{king\_of\_Buganda}) = \lambda y_e\, kob(y)$
$\mathbf{P}(\text{king\_of\_Buganda}) = \lambda y_e\, \top$

$\mathbf{A}(\text{be\_a\_monarchy}) = \lambda y_e\, monarchy(y)$
$\mathbf{P}(\text{be\_a\_monarchy}) = \lambda y_e\, \top$

$\mathbf{A}(\text{be\_late}) = \lambda y_e\, late(y)$
$\mathbf{P}(\text{be\_late}) = \lambda y_e\, \top$

Semantic composition

By RULE 17.*not* (for 'T *not*(IV)'), and RULE 2 (for 'the CN') and RULE 4 (for 'T *prs*(IV)'), we derive:

$\mathbf{A}(\text{Buganda is not a monarchy}) = \neg\mathbf{A}(\text{Buganda})(\mathbf{A}(\text{be\_a\_monarchy}))$
$= \neg monarchy(b)$

$\mathbf{P}(\text{Buganda is not a monarchy}) = \mathbf{P}(\text{Buganda})(\mathbf{A}(\text{be\_a\_monarchy})) \wedge \mathbf{A}(\text{Buganda})(\mathbf{P}(\text{be\_a\_monarchy}))$
$= \top$

$\mathbf{A}(\text{the king of B. is late}) = \mathbf{A}(\text{the king of B.})(\mathbf{A}(\text{be\_late}))$
$= \exists y_e[kob(y) \wedge \forall z_e(kob(z) \to z = y) \wedge late(y)]$

$\mathbf{P}(\text{the king of B. is late}) = \mathbf{P}(\text{the king of B.})(\mathbf{A}(\text{be\_late})) \wedge \mathbf{A}(\text{the king of B.})(\mathbf{P}(\text{be\_late}))$
$= \exists y_e[kob(y) \wedge \forall z_e(kob(z) \to z = y)]$

Hence by RULE 11 (for 'either $S_1$ or $S_2$'):

$\mathbf{A}(2a) = \mathbf{A}(\text{Buganda is not a monarchy}) \vee \mathbf{A}(\text{the king of Buganda is late})$
$= \neg monarchy(b) \vee \exists y_e[kob(y) \wedge \forall z_e(kob(z) \to z = y) \wedge late(y)]$

$\mathbf{P}(2a) = [\mathbf{P}(\text{Buganda is not a monarchy}) \vee \mathbf{A}(\text{the king of Buganda is late})]$
$\wedge [\mathbf{A}(\text{Buganda is not a monarchy}) \vee \mathbf{P}(\text{the king of Buganda is late})]$

$= (\top \vee \ldots)$
$\wedge (\neg monarchy(b) \vee \exists y_e[kob(y) \wedge \forall z_e(kob(z) \to z = y)])$

$= (\neg monarchy(b) \vee \exists y_e[kob(y) \wedge \forall z_e(kob(z) \to z = y)])$

$= \top$ (assuming $monarchy(b) \models \exists y_e[kob(y) \wedge \forall z_e(kob(z) \to z = y)]$)

# Still More Notes on Karttunen & Peters 1979
# Some Problems

## 1. OVERVIEW

Here are some major problems for the static two-dimensional theory of K&P '79. Both our extensional fragment and the full intensional theory make counterintuitive predictions:

- *Missing links to context*: e.g., anaphoric too

(1) John is hungry, too.

Prediction: $\mathbf{P}(1) = \exists y_e(\neg\, y = john \wedge hungry(y))$

Intuition: too requires a link to some *contextually salient* individual other than John who is hungry.

- *Missing links between* **A** *and* **P**: e.g., in quantified environments

(2) Somebody is pregnant.

Prediction: $\mathbf{A}(2) = \exists y_e(person(y) \wedge pregnant(y))$
$\mathbf{P}(2) = \exists y_e(person(y) \wedge female(y))$

Intuition: *The same* individual must verify **A** and **P**.

- *Missing generalization*: All presuppositions can be cancelled, not just under negation.

(3) Either the king of Buganda or the president of Buganda is late.

(4) Somebody curtsied, and I was surprised that it was a man.

- *Selective cancellation*: Cancellation is not all or none, but selective depending on the context.

(5) It can't be true that [John's sister is pregnant too]. John doesn't have a sister.

Predict: To cancel the presupposition of John's sister we need to interpret the first sentence as a contradiction negation. But then the presupposition of too will also automatically get cancelled.

Intuition: The second sentence defeats the presupposition of John's sister but not of too.