

NTS: $P(s_c | \bar{V}) > P(s_q | \bar{V})$
 [deaccented "has" is a cue for competitor]

$$\Leftrightarrow \tau_c q_{\bar{V}} > \tau_q p_{\bar{V}}$$

$$\Leftrightarrow \frac{q_{\bar{V}}}{p_{\bar{V}}} > \frac{\tau_q}{\tau_c}$$

any bias towards competitor must be counterbalanced by the evidence

$$q_{\bar{V}}/p_{\bar{V}} > 1$$

[we could naturally expect this to be the case] even if $\tau_q \neq \tau_c$ because of $[q_{\bar{V}} > p_{\bar{V}}]$

So assume:

$$\left. \begin{array}{l} \tau_q = \tau_c + \epsilon_{\tau} \\ q_{\bar{V}} = p_{\bar{V}} + \epsilon_{\bar{V}} \end{array} \right\} \text{with } 0 \leq \epsilon_{\tau} < \epsilon_{\bar{V}}$$

Then:

$$\frac{p_{\bar{V}} + \epsilon_{\bar{V}}}{p_{\bar{V}}} > \frac{\tau_c + \epsilon_{\tau}}{\tau_c}$$

$$\Leftrightarrow (p_{\bar{V}} + \epsilon_{\bar{V}}) \cdot \tau_c > p_{\bar{V}} (\tau_c + \epsilon_{\tau})$$

$$\Leftrightarrow p_{\bar{V}} \tau_c + \epsilon_{\bar{V}} \tau_c > p_{\bar{V}} \tau_c + p_{\bar{V}} \epsilon_{\tau}$$

$$\Leftrightarrow \epsilon_{\bar{V}} \tau_c > p_{\bar{V}} \epsilon_{\tau}$$

$$\Leftrightarrow \frac{\epsilon_{\bar{V}}}{\epsilon_{\tau}} > \frac{p_{\bar{V}}}{\tau_c}$$

true if $\epsilon_{\tau} < \epsilon_{\bar{V}}$ & $p_{\bar{V}} < \tau_c$

both are natural assumptions

also assumed here: $q_{\bar{V}} > p_{\bar{V}}$ &

$$\tau_q \geq \tau_c \quad \checkmark$$

maybe assume that: $\tau_q = \tau_c + \epsilon_{\tau}$
 with $0 \leq \epsilon_{\tau}$ small & $p_{\bar{V}} + \epsilon_{\bar{V}} = q_{\bar{V}}$
 with $0 \leq \epsilon_{\bar{V}} < \epsilon_{\tau}$

NTS: $P(s_q | V) > P(s_c | \bar{V})$

[proof exists (?) for flat prior $\tau_q = \tau_c$
 and identical string likelihood $p_{\bar{V}} = q_{\bar{V}}$]

$$\Leftrightarrow \frac{\tau_q p_V}{\tau_q p_V + \tau_c q_V} > \frac{\tau_c q_{\bar{V}}}{\tau_q p_{\bar{V}} + \tau_c q_{\bar{V}}}$$

$$\Leftrightarrow \frac{\tau_q p_V}{\tau_q p_V + \tau_c q_V} > \frac{\tau_c (1 - q_V - q_{\bar{V}})}{\tau_q (1 - p_V - p_{\bar{V}}) + \tau_c (1 - q_V - q_{\bar{V}})}$$

$$\Leftrightarrow \frac{\tau_q p_V}{\tau_q p_V + \tau_c q_V} > \frac{\tau_c - \tau_c q_V - \tau_c q_{\bar{V}}}{\tau_q - \tau_q p_V - \tau_q p_{\bar{V}} + \tau_c - \tau_c q_V - \tau_c q_{\bar{V}}}$$

$$\Leftrightarrow \tau_q p_V (\tau_q - \tau_q p_V - \tau_q p_{\bar{V}} + \tau_c - \tau_c q_V - \tau_c q_{\bar{V}}) > (\tau_c - \tau_c q_V - \tau_c q_{\bar{V}}) \cdot (\tau_q p_V + \tau_c q_V)$$

$$\Leftrightarrow \tau_q^2 p_V - \tau_q^2 p_V^2 - \tau_q^2 p_V p_{\bar{V}} + \tau_q \tau_c p_V - \tau_q \tau_c p_V q_V - \tau_q \tau_c p_V q_{\bar{V}} > \tau_q \tau_c p_V + \tau_q \tau_c q_V - \tau_q \tau_c p_V q_V - \tau_c^2 q_V^2 - \tau_q \tau_c p_V q_{\bar{V}} - \tau_c^2 q_V q_{\bar{V}}$$

$$\Leftrightarrow \tau_q^2 p_V - \tau_q^2 p_V^2 - \tau_q^2 p_V p_{\bar{V}} > \tau_q \tau_c p_V - \tau_c^2 q_V^2 - \tau_c^2 q_V q_{\bar{V}}$$

$$\Leftrightarrow (\tau_q^2 - \tau_q \tau_c) p_V - \tau_q^2 p_V^2 - \tau_q^2 p_V p_{\bar{V}} > -\tau_c^2 q_V^2 - \tau_c^2 q_V q_{\bar{V}}$$

$$\Leftrightarrow (\tau_q^2 - \tau_q \tau_c) p_V - \tau_q^2 p_V^2 - \tau_q^2 p_V p_{\bar{V}} > -\tau_c^2 q_V^2 - \tau_c^2 q_V q_{\bar{V}}$$

$$\Leftrightarrow (\tau_q^2 - \tau_q \tau_c) p_V - \tau_q^2 p_V^2 - \tau_q^2 p_V p_{\bar{V}} > -\tau_c^2 q_V^2 - \tau_c^2 q_V q_{\bar{V}}$$

$$\Leftrightarrow (\tau_q^2 - \tau_q \tau_c) p_V - \tau_q^2 p_V^2 - \tau_q^2 p_V p_{\bar{V}} > -\tau_c^2 q_V^2 - \tau_c^2 q_V q_{\bar{V}}$$

$$\Leftrightarrow (\tau_q^2 - \tau_q \tau_c) p_V - \tau_q^2 p_V^2 - \tau_q^2 p_V p_{\bar{V}} > -\tau_c^2 q_V^2 - \tau_c^2 q_V q_{\bar{V}}$$

$$\Leftrightarrow \tau_q \epsilon_{\tau} p_V - \tau_q^2 p_V^2 - \tau_q^2 p_V p_{\bar{V}} > \dots$$

• okay, it is clear that any prior bias for s_q will pull closer towards s_q ; shows that, by mere likelihood, the same result is expected; so set: $\epsilon_{\tau} = 0$

$$\frac{p_V}{p_V + q_V} > \frac{q_{\bar{V}}}{p_{\bar{V}} + q_{\bar{V}}}$$

$$\Leftrightarrow p_V p_{\bar{V}} + p_V q_{\bar{V}} > p_V q_V + q_V q_{\bar{V}}$$

$$\Leftrightarrow p_V p_{\bar{V}} > q_V q_{\bar{V}}$$

$$\Leftrightarrow \frac{p_{\bar{V}}}{q_V} > \frac{q_{\bar{V}}}{p_V}$$

assume:

$$q_{\bar{V}} = q_V + \epsilon_q \quad \epsilon_q > \epsilon_p$$

$$p_V = p_{\bar{V}} + \epsilon_p$$

$$(p_{\bar{V}} + \epsilon_p) p_{\bar{V}} > q_V (q_V + \epsilon_q)$$

$$p_{\bar{V}}^2 + \epsilon_p p_{\bar{V}} > q_V^2 + \epsilon_q q_V$$

$$p_{\bar{V}}^2 + \epsilon_p p_{\bar{V}} > q_V^2 + \epsilon_q q_V + \epsilon_p q_V$$

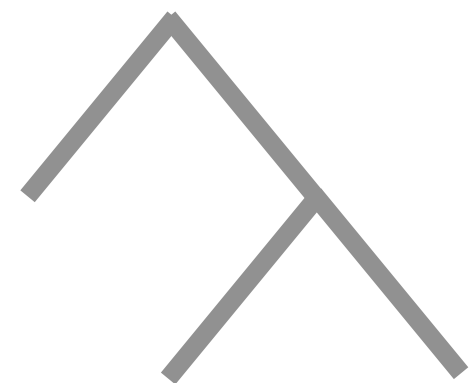
[producing V when adequate is less likely than producing \bar{V} when adequate] $p_V \leq q_{\bar{V}}$

[producing V when inadequate is less likely than producing \bar{V} when inadequate] $p_{\bar{V}} > q_V$

Computational Pragmatics

Non-literal interpretation (chapter III of problang.org)

Sessions 6+7



/lɪŋˈɡwɪstɪks/

$$[[\text{Joe}]] = \lambda e . \lambda w . \text{Joe}(e, w)$$

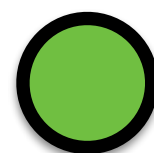
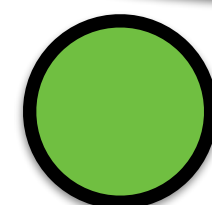
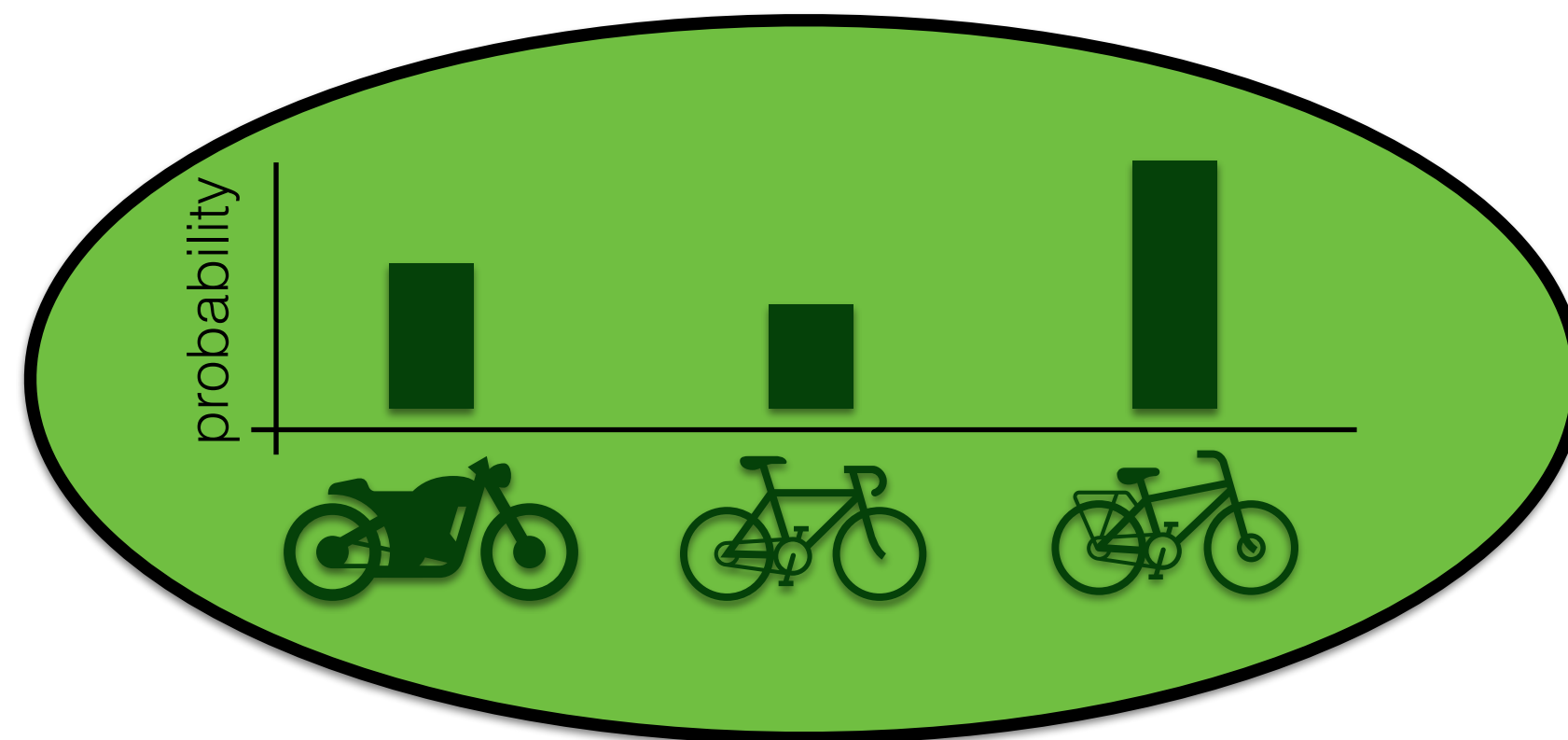
KNOWLEDGE OF LANGUAGE



GENERAL WORLD KNOWLEDGE



ACTUAL CONTEXT OF CONVERSATION

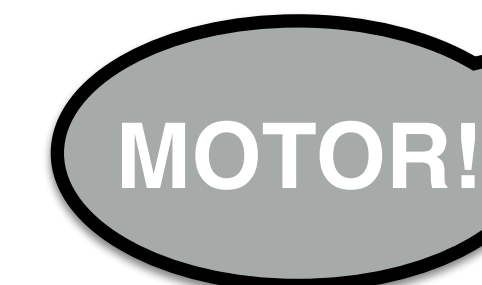


PRAGMATIC INTERPRETER



ACTUAL SPEAKER

MODEL OF SPEAKER BEHAVIOR



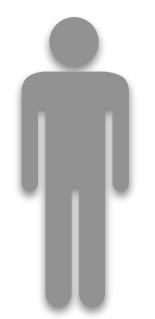
**ALTERNATIVE UTTERANCES
& INTERPRETATIONS**

Rational Speech Act model

severe truth-abidance

speakers never chose false utterances

listeners completely rule out literally false interpretations



L₀

LITERAL INTERPRETATION

STRATEGIC DEPTH 0



$$P_{lit}(s | u) = P(s | \llbracket u \rrbracket)$$



S₁

GRICEAN SPEAKER

STRATEGIC DEPTH 1



$$P_S(u | s) \propto \exp \left(\alpha \left(\log P_{lit}(s | u) - C(u) \right) \right)$$



L₁

GRICEAN INTERPRETATION

STRATEGIC DEPTH 2



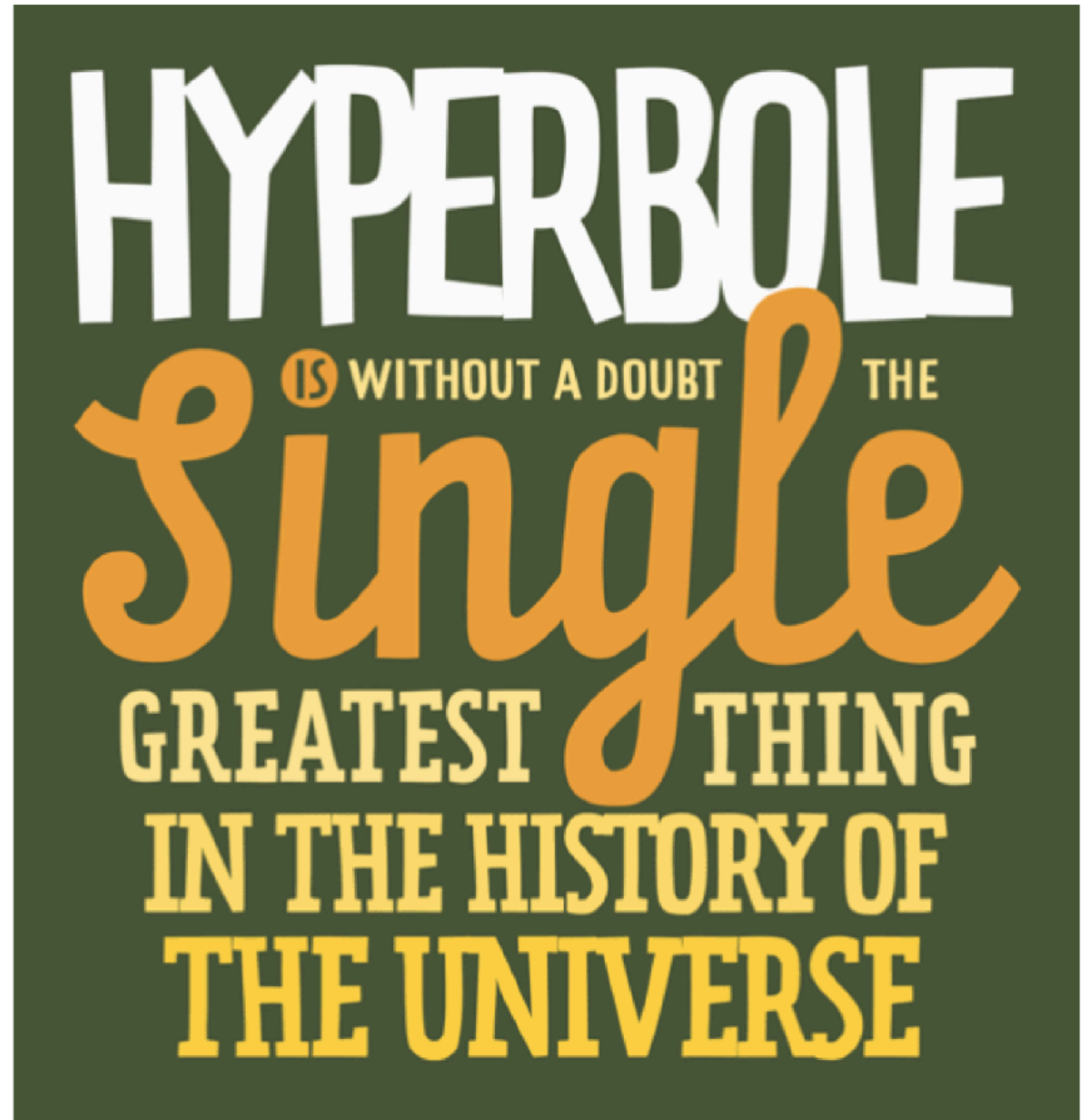
$$P_L(s | u) \propto P(s) P_S(u | s)$$



**non-literal
interpretation**

Hyperbole

the use of exaggeration to
create emphasis or convey
strong emotional feeling

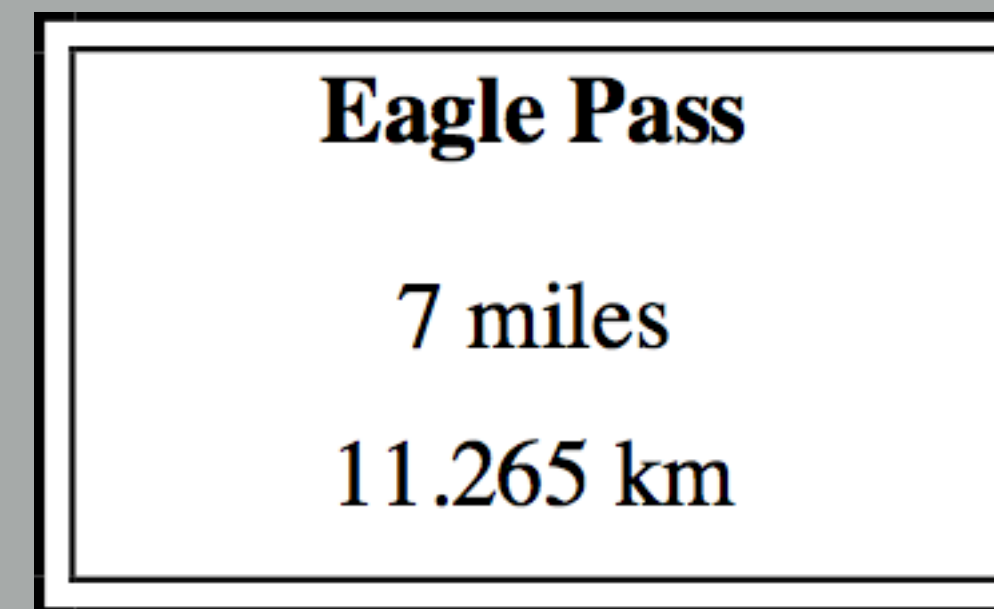


Loose talk

allowable imprecision in the use
of (literally) precise expressions

failure of the metric system

Why did the metric system not catch on [in the US]? There are many reasons. But one that cannot be taken lightly is that certain well-intended public relation attempts intended to familiarize the American people with the metric system just did not work. Since the Metric Conversion Act, road distances in National Parks are often given in miles and kilometers. And since then, travelers encounter signs like the following one:

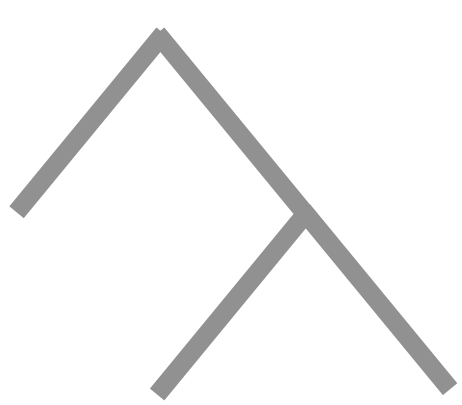


It is not hard to see why road signs like [this] suggest that the metric system is something for intellectuals, or “rocket scientists”, far too unwieldy for everyday purposes.


Krifka (2002)



**joint inference
of state & affect**

 /lɪŋ'gwɪstɪks/
 $[[\text{Joe}]] = \lambda e . \lambda w . \text{Joe}(e, w)$
KNOWLEDGE OF LANGUAGE


GENERAL WORLD KNOWLEDGE


ACTUAL CONTEXT OF CONVERSATION




\$100 😡
"\$10,000!"
ACTUAL SPEAKER

MODEL OF SPEAKER BEHAVIOR
\$100 😡
"\$10,000!"
ALTERNATIVE UTTERANCES & INTERPRETATIONS



PRAGMATIC INTERPRETER