

Without

House

Accidentally

Face

Leaves

Mask



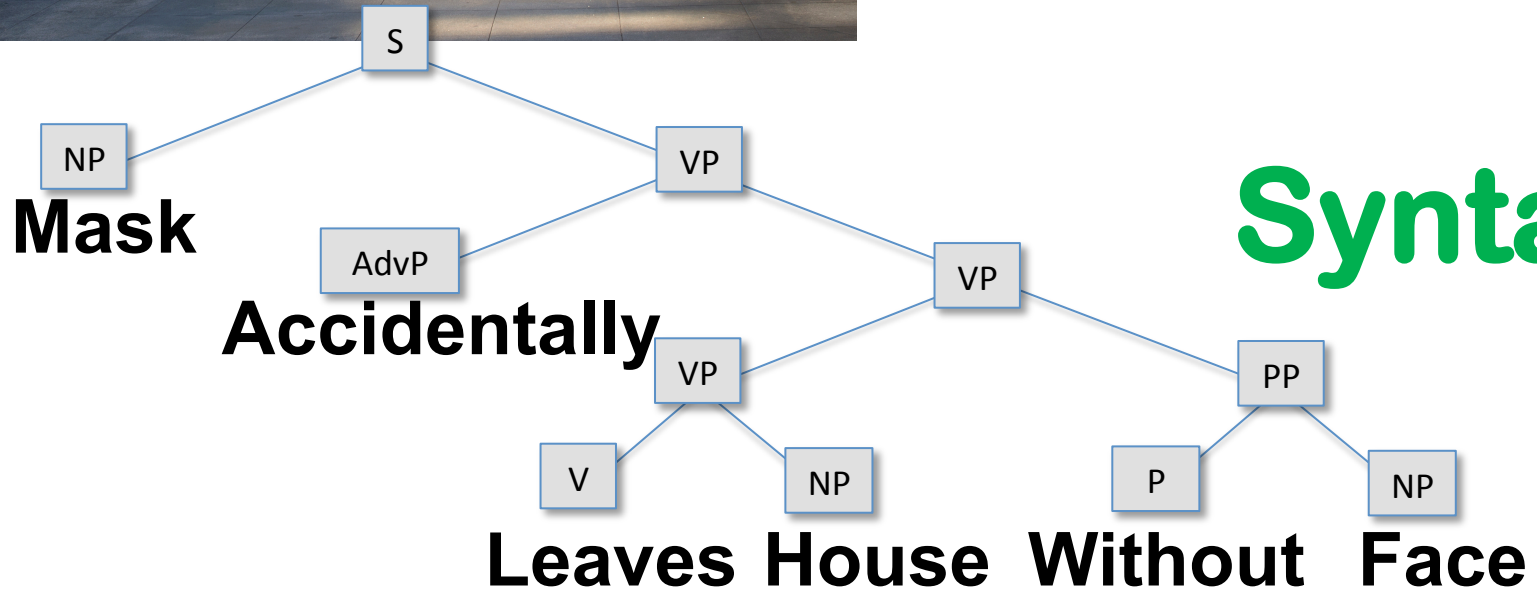
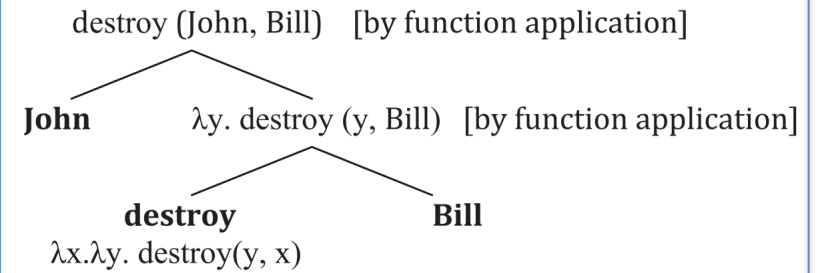
NO: Figure out most plausible meaning from given set of words

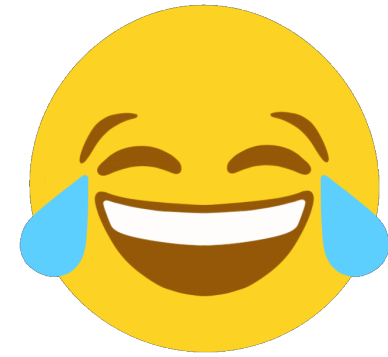
YES: Syntax

Mask Accidentally Leaves House Without Face



Compositional interpretation in formal semantics





Mismatch with **world knowledge**



Three types of knowledge guiding the construction of sentence structure

- How words combine syntactically
- How words combine semantically
- Knowledge about the world

Two transitive verbs:

like



guess



😊 SYN, 😊 SEM, 😊 WORLD

I liked the location.

I liked the price.

I liked the chef.

I liked the gift shop.

I liked the pool.

guess

😊 **SYN**, 😊 **SEM**, 😊 **WORLD**

I liked the location.

I liked the price.

I liked the chef.

I liked the gift shop.

I liked the pool.

😊 **SYN**, varying **SEM**, 😊 **WORLD**

My mom guessed the location. 😊

My mom guessed the price. 😊

My mom guessed the chef. 😞

My mom guessed the gift shop. 😞

My mom guessed the pool. 😞

- Syntactically, both **GUESS** and **LIKE** can take a noun phrase as their direct object.
- But semantically, the meaning of the direct object of **GUESS** needs to be easily convertible to a question meaning.
 - Some nouns make better “concealed questions” than others.
 - Hypothesis: Nouns with relational meanings (Nathan 2006).

😊 **SYN**, 😊 **SEM**, 😊 **WORLD**

I liked the location.

I liked the price.

I liked the chef.

I liked the gift shop.

I liked the pool.

Everything's going great!

😞 **SYN**, 😊 **SEM**, 😊 **WORLD**

I arrived the location.

I fainted the price.

I blushed the chef.

I stood the gift shop.

I floated the pool.

These could make sense but the verbs are intransitive, sorry!!

😊 **SYN**, varying **SEM**, 😊 **WORLD**

My mom guessed the location. 😊

My mom guessed the price. 😊

My mom guessed the chef. 😞

My mom guessed the gift shop. 😞

My mom guessed the pool. 😞

Syntax is good but the semantic type is not always right

😊 **SYN**, 😊 **SEM**, 😞 **WORLD**

I ate the location.

I squeezed the price

I watered the chef.

I dropped the gift shop.

I sliced the pool.

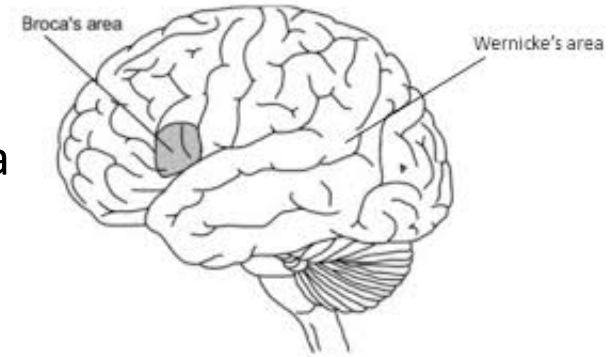
Perfectly grammatical but this stuff just doesn't happen!

Main bodies of research in the cognitive neuroscience of combinatory syntax & semantics

- Violation studies
 - Comprehension of expressions that violate your knowledge of how words should combine together
 - Primarily EEG



- Hemodynamic research on Broca's area
 - Long debate about whether and how Broca's area contributes to syntactic processing



- Basic composition
 - What neural activity reflects the basic operation of composing elements together into larger expressions?

black **cat**