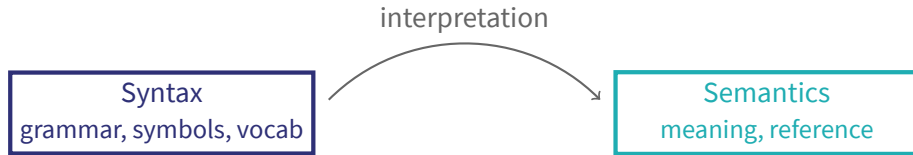


LANGUAGE AND REASONING

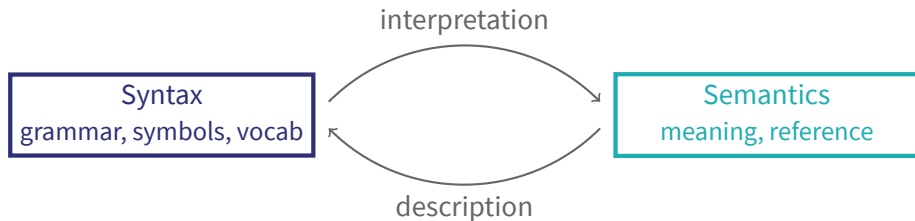
Evan Piermont
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Leverhulme Project on Social Norms
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Syntax
grammar, symbols, vocab

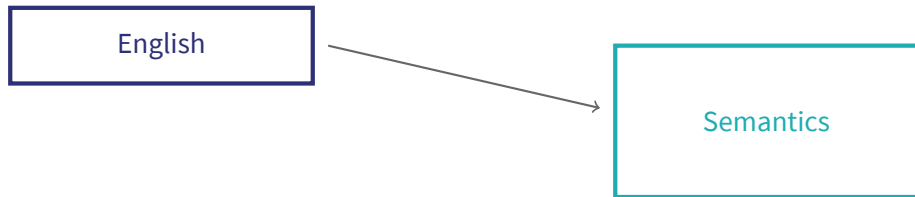
Semantics
meaning, reference



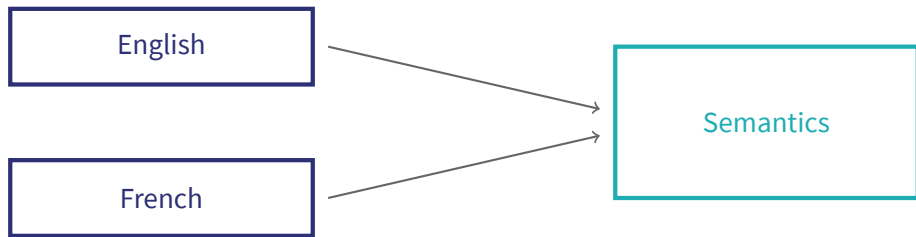
- ◇ We *interpret* a syntactic object as a reference to something (what it means)



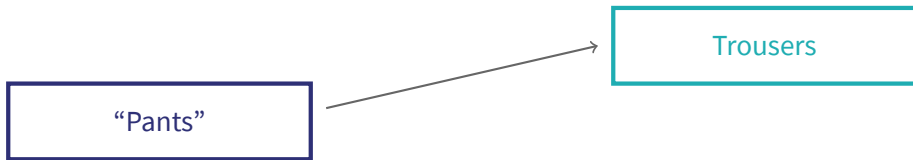
- ◇ We *interpret* a syntactic object as a reference to something (what it means)
- ◇ We *describe* a semantic object using words and phrases (how its called)



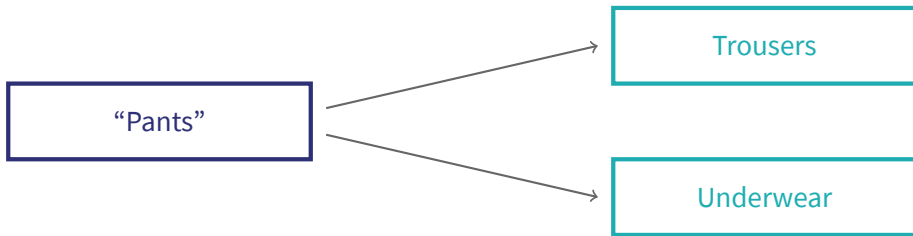
- ◇ This presentation is in English



- ◇ This presentation is in English
- ◇ It could be translated into French



"Its too hot today to wear **pants**!"



"Its too hot today to wear **pants**!"

- ◇ The mapping between syntax and semantics is not fixed
- ◇ Effective communication requires coordination
 - ◇ agreement is a social norm
 - ◇ equilibrium of some meta coordination game

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- ◇ Generally take a syntax/semantic correspondence for granted:
 - ◇ Work directly with semantics (state-spaces, actions, contracts)
 - ◇ Suppress the syntax/context/framing of these ideas

- ◇ I think economists largely intuit this, but
- ◇ Generally take a syntax/semantic correspondence for granted:
 - ◇ Work directly with semantics (state-spaces, actions, contracts)
 - ◇ Suppress the syntax/context/framing of these ideas
- ◇ Also suppresses many attendant issues:
 - ◇ Strategic vagueness, plausible deniability, misinterpretation, etc

What I am going to discuss today:

- ◇ Human reasoning is language / social norm dependent.
- ◇ We do not reason directly with semantics: models that only deal with abstractions will overlook this

Example 1: Framing Effects¹

The US is preparing for the outbreak of an unusual [REDACTED] disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimate of the consequences of the programs are as follows

A 200 people will be saved.

◇ [[72 percent]]

B 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved.

◇ [[28 percent]]

C 400 people will die.

◇ [[22 percent]]

D 1/3 probability that nobody will die, and 2/3 probability that 600 people will die.

◇ [[78 percent]]

¹Tversky, A., & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science*, 211(4481), 453-458.

Example 2: Conjunction Fallacy²

When a man was young, he began inflicting harm on animals. It started with just pulling the wings off flies, but eventually progressed to torturing stray cats and other animals in his neighborhood. As an adult, the man found that he did not get much thrill from harming animals, so he began hurting people instead. He has killed 5 homeless people that he abducted from poor neighborhoods in his home city. Their dismembered bodies are currently buried in his basement.

Which is more likely:

A The man is a teacher

B The man is a teacher and does not believe in any gods.

C The man is a teacher

D The man is a teacher and is a religious believer.

²McKay, R., et al. (2017). Global evidence of extreme intuitive moral prejudice against atheists. *Nature Human Behaviour*, 1(8), 0151.

Example 3: Egocentric v Relative Direction³

- ◇ In the Guugu Yimithirr language, there are no egocentric directions (right and left)

When older speakers of Guugu Yimithirr were shown a short silent film on a television screen and then asked to describe the movements of the protagonists, their responses depended on the orientation of the television when they were watching. If the television was facing north and a man on the screen appeared to be approaching, the older men would say that the man was “coming northward.”

³Deutscher, G. (2010). Through the language glass: Why the world looks different in other languages. Metropolitan books.

Example 4: Intertemporal Choice

Languages differ in whether or not they require speakers to grammatically mark future events (future time reference, FTR)

- ◇ Strong FTR: future events need to be grammatically marked
 - ◇ English: “It rains today.” // “It **will** rain tomorrow.”
- ◇ Weak FTR: future events do not need to be grammatically marked
 - ◇ German: “It rains today.” // “It rains tomorrow.”

Example 4: Intertemporal Choice^{4 5}

- ◇ Bilingual participants were asked to make a set of future-oriented economic decisions.
- ◇ When addressed in a Strong-FTR language, participants tended to value future events less
- ◇ Further, addressed in Strong-FRT language participants express more precise temporal beliefs
- ◇ Also: correlation between weak-FTR languages and future-oriented behavior, both cross-country and within country analysis

⁴Ayres, I., Katz, T. K., & Regev, T. (2023). Languages and future-oriented economic behavior—Experimental evidence for causal effects. *P-NAS*, 120(7), e2208871120.

⁵Chen, M. K. (2013). The effect of language on economic behavior: Evidence from savings rates, health behaviors, and retirement assets. *American Economic Review*, 103(2), 690-731.

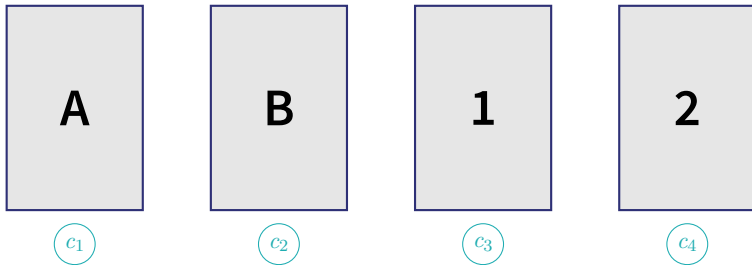
Example 5: Wason selection task⁶

- ◇ Cards have a letter on one side and a number on the other
- ◇ Consider the statement:

φ = “Every card with a vowel has a odd number”

⁶Wason, P. C. (1968). Reasoning about a rule. *Quarterly journal of experimental psychology*, 20(3), 273-281.

Example 5: Wason selection task



◇ Which cards would you need to turn over to verify φ ?

Example 5: Wason selection task⁷

People make less logical errors when the context is about enforcing social norms:

- ◇ The drinking age is 18
- ◇ You can see some people's IDs and some people's drinks

⁷ Cosmides, L., & Tooby, J. (1992). Cognitive adaptations for social exchange. The adapted mind: Evolutionary psychology and the generation of culture, 163, 163-228.

Example 5: Wason selection task



c_1



c_2



c_3



c_4

- ◇ Who do you need to check to ensure the bar is not breaking the law?

Example 6: Causal Judgments⁸

The receptionist in the philosophy department keeps her desk stocked with pens. The administrative assistants are allowed to take the pens, but faculty members are supposed to buy their own. The administrative assistants typically do take the pens. Unfortunately, so do the faculty members. The receptionist has repeatedly emailed them reminders that only administrative assistants are allowed to take the pens. On Monday morning, one of the administrative assistants encounters Prof. Smith walking past the receptionist's desk. Both take pens. Later that day, the receptionist needs to take an important message... but she has a problem. There are no pens left on her desk.

- ◇ Experimental participants tend to state that *Professor Smith*, rather than the administrative assistant, caused the problem.
- ◇ Their actions are the same, and occur with the same statistical regularity
- ◇ But the prof's violated a perceptive norm

⁸Knobe, J., & Fraser, B. (2008). Causal judgment and moral judgment: Two experiments. *Moral psychology*, 2, 441-447.

How can we take this seriously in economics?

Syntactic Decision Theory^{9 10}

- ◇ Object of choice are syntactic (acts defined in some language)
- ◇ The semantics / interpretation is a representation object
- ◇ Meaning and logical reasoning arise endogenously

⁹Blume, L., Easley, D., & Halpern, J. Y. (2021). Constructive decision theory. *Journal of Economic Theory*, 196, 105306.

¹⁰Piermont, E., & Zuazo-Garin, P. (2020). Failures of contingent thinking. *Mimeo*.

- ◇ Let \mathcal{L} be a set of statements.
- ◇ For $\Phi \subseteq \mathcal{L}$, let b_Φ be a bet of b that some statement in Φ is true
- ◇ Say $\phi \succsim \psi$ if $b_\psi \sim b_{\psi, \phi}$
 - ◇ Represents subjective implication
- ◇ We provide conditions for the existence of a unique state space, Ω , and interpretation $t : \mathcal{L} \rightarrow 2^\Omega$ such that

$$\phi \succsim \psi \quad \text{if and only if} \quad t(\phi) \subseteq t(\psi)$$

Thank You!