



# Language 1

Psyc 364: Week 11

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# Language

- Important
- High achievement
- Social
- Interrelated
- Complex
- Fast and continuous
- Unlimited

# Definitions

- **Linguistics:** The academic discipline that studies language
- **Psycholinguistics:** The study of language as it is used and learned by people
- **Language:** A shared, symbolic system for communication

# Definitions

**Phoneme:** basic unit of spoken language (*a, k, th*)

**Morpheme:** basic unit of meaning (*ness, full*)

**Morphology:** study of morphemes (*combos*)

**Syntax:** grammatical rules that govern how organize words in sentences

**Grammar:** morphology and syntax

**Semantics:** meaning of words and sentences

**Pragmatics:** knowledge of social rules of use

# Many Languages

- Approximately 7000

Languages differ in terms of:

- the meaning of changes in pitch
- use of passive voice
- whether nouns have grammatical gender

# Hockett's (1960) Linguistic Universals

- **Semanticity:**

- Language conveys meaning

- **Arbitrariness:**

- relation between symbols and meaning are changeable.

- **Flexibility of Symbols:**

- Connection between symbols and meaning in language can change.

- **Naming:**

- We name everything.

- **Displacement:**

The ability to talk about something other than the present moment.

*If I can afford to, I will vacation in the south of France next year.*

- **Productivity:**

Language is a productive and inherently novel activity— we generate sentences rather than repeat them.

# Linguistic Relativity Hypothesis

- The Sapir-Whorf hypothesis: language you know shapes the way you think about events in the world around you
- Strong: controls thought and perception
- Weak: influences and shapes thought

# Five Levels of Language Analysis

**Table 9-2 MILLER'S (1973) FIVE LEVELS OF LANGUAGE ANALYSIS**

<b>Level</b>	<b>Explanation</b>
1. Phonology	Analysis of the sounds of language as they are articulated and comprehended in speech
2. Syntax	Analysis of word order and grammaticality (e.g., rules for forming past tense, plurals, rules for determining word ordering in phrases and sentences)
3. Lexical or Semantic	Analysis of word meaning and the integration of word meanings within phrases and sentences
4. Conceptual	Analysis of phrase and sentence meaning with reference to knowledge in semantic memory
5. Belief	Analysis of sentence and discourse meaning with reference to one's own beliefs and one's beliefs about a speaker's intent and motivations

# Level 1: Phonology

- The sounds of language and the rule system for combining them.
- **Phoneme**: A category of language sounds that are treated as the same sound, despite any physical difference among the category members.
- English has about 46 phonemes.



# Phonology: Categorical Perception

- All the sounds within a set of boundaries are perceived as the same, despite physical differences among them (e.g., hard /k/ sounds in *cool* and *keep* are perceived as the same sound).

**continuous**



**categorical**



# Categorical Perception

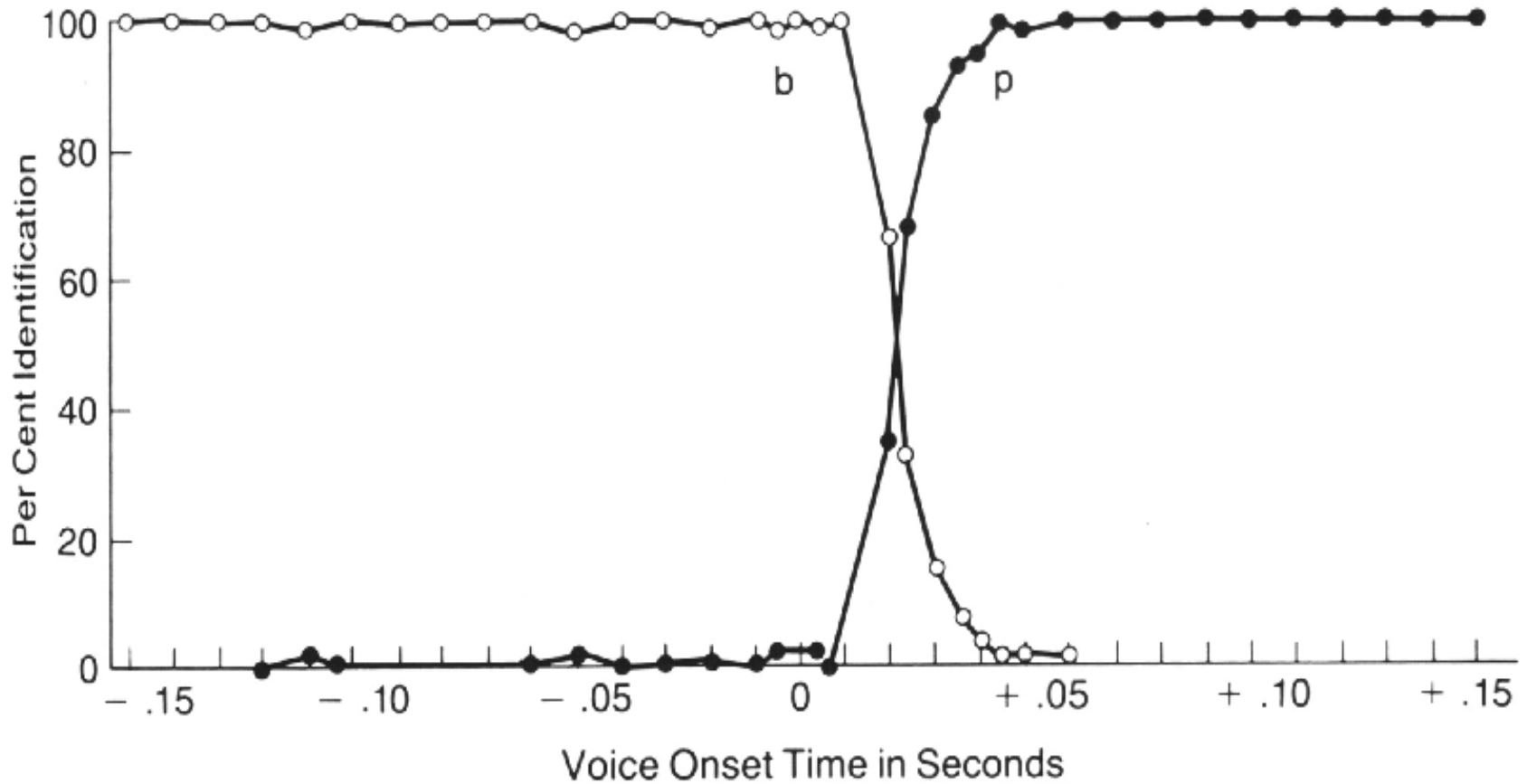


Figure 10-9. Categorization functions for synthetic stimuli varying from [b]

# Speech Perception

- How do we decode the speech stream into meaningful units?
- The “same” sounds change from speaker to speaker, and from word to word, depending on what sounds precede and follow (see, e.g., co-articulation— where more than one sound is articulated at the same time).
- This variability in sounds is called the ***Problem of Invariance***.

# The Effect of Context

Grammatical:

- Accidents kill motorists on the highways

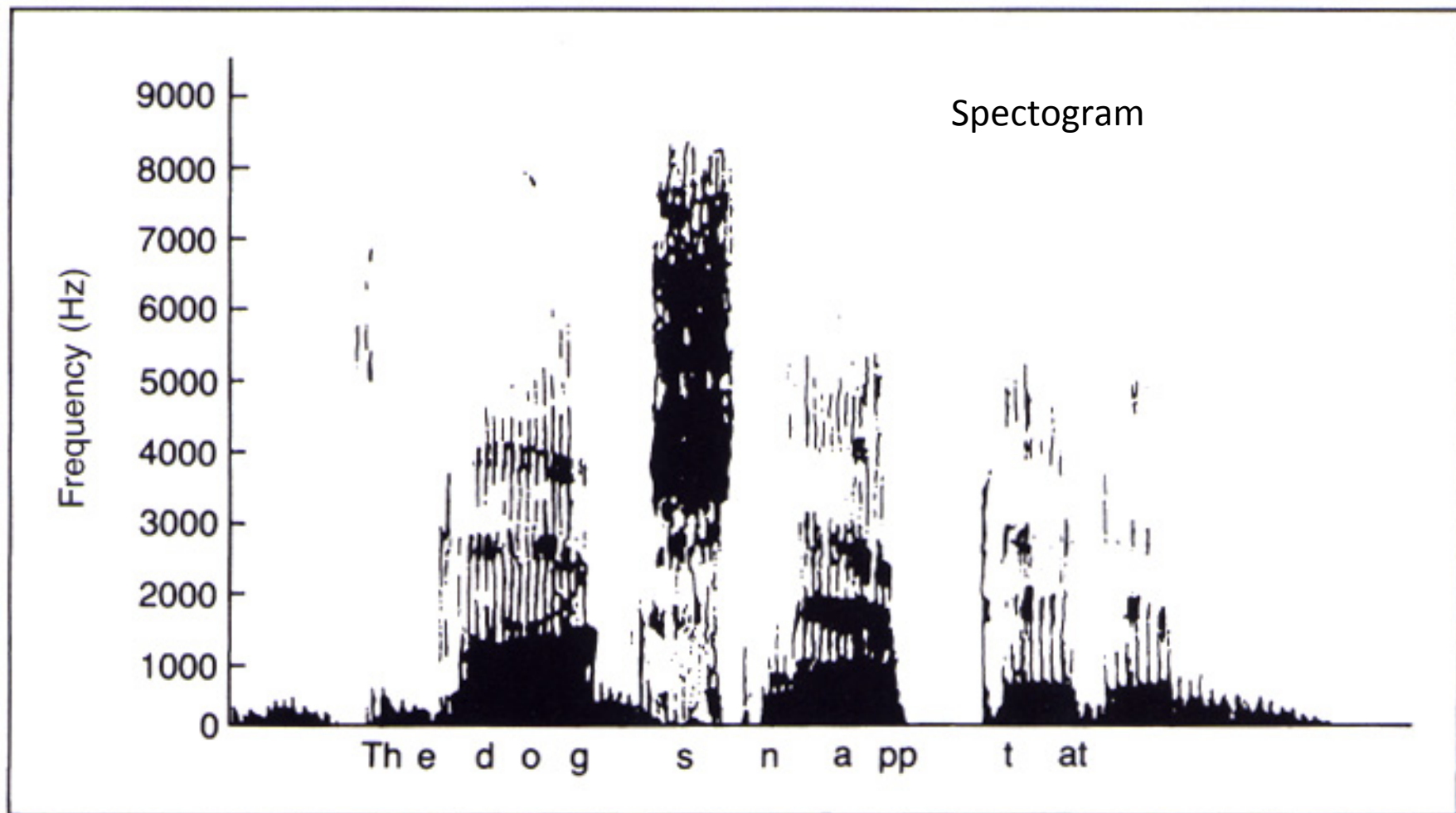
Semantically anomalous:

- Accidents carry honey between the house

Ungrammatical:

- Around accidents country honey the shoot

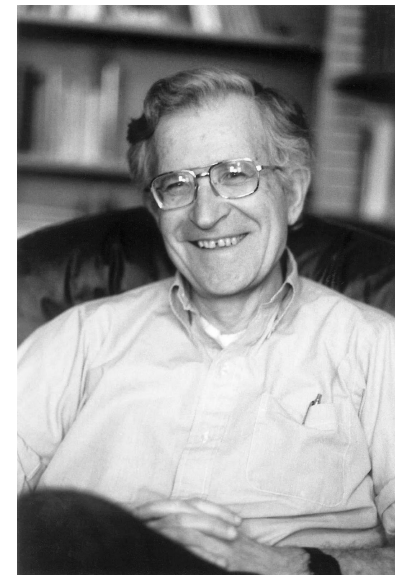
# Are there pauses at the end of spoken words?



# Level 2: Syntax

- The arrangements of words as elements in a sentence to show their relationship to one another; or sentence structure.
- ***Syntactic grammar:*** The set of rules for ordering words into acceptable, well-formed sentences.
  - Word order, phrase order

# Chomsky's (1957) theory of Transformational Grammar



- Language is innate and modular
- Surface structure is what we see/hear of language
- Deep structure is the meaning
- Transformational grammar (rules) allow us to produce actual sentences (surface structure) from the deep structure
- Transformational grammar  $\Leftrightarrow$  syntax

# Transformational Rules

- Convert the deep structure into a surface structure, a sentence ready to be spoken.
- Different transformations lead to different types of sentences (e.g., future or past tense).
- <https://www.youtube.com/watch?v=Zg1bHzBoggk>

# Examples

- Word order
- Phrase order
- Number agreement

- The boy kissed the pretty girl
- The boy kissed the girl who was pretty
- The girl whom the boy kissed was pretty

# Ambiguous Sentences and Parsing

- *Visiting relatives can be a nuisance.*
  - This sentence's surface structure is ambiguous-- has more than one meaning.
- Alternative meanings can be revealed by ***parsing*** the sentence -- dividing the sentence into phrasings and groupings.
- Reveals two deep structures.

# Critique of Transformational Grammar

## Critique

- Makes meaning secondary to the syntactic structure
- Decide on syntax first, and then figure out what we're going to talk about???

## Rejoinder

- Chomsky, however, did emphasize the joint importance of syntax and semantics, but said assignment of meaning comes after syntax is worked out
- Syntactic rules help constrain the possible interpretations of language
  - Leads to acknowledgment of capacity limitations

# Moving forward from Chomsky and linguistic approaches

- Compared to the linguistic approach that was heavily based on grammar, more recent approaches focus on other aspects of cognition.
- Syntax helps the listener determine meaning by minimizing comprehension's processing demands by narrowing down the possible interpretations.

**Automatic Processing:** we tend to use the same few syntactic structures when generating language.

**Planning:** seems to occur on-line while we utter the first portion of a sentence.

- In general, the cognitive approach takes into account limitations and examines flaws in generation (stutters, pauses) e.g., Ferreira's "Good enough" theory that emphasizes heuristics

# Level 3:

## Lexical and Semantic Factors

- ***Lexical access***: Retrieving word meaning from memory.
- The ***Mental Lexicon***: The mental dictionary of words and their meanings.
  - fulcrum
  - quash
  - satire

# Morphemes

- ***Morphemes***: The smallest meaningful unit of language.
- Can be free (car, dog)
- or bound (un---, ---ness)
- Morphemes and lexical representation.

# Polysemy

- My dog wasn't included in the final count.
- The vampire was disguised as a handsome count.

# Case Grammar

- Fillmore (1968): argued that we rely on meaning more than syntax
- The semantic analysis of sentences involves figuring out what **semantic role** is being played by each word or concept in the sentence and computing meaning based on those semantic roles.
- Called ***semantic parsing***  
*The flower ate the cat.*
- We retrieve the meaning, plus possible case roles.

# Interaction of Syntax and Semantics

- Syntax is a clue to understanding sentences.
- But, semantic knowledge can overpower syntax.

Fillenbaum (1974):

Subjects “normalized” perverse sentences.

Suggests that we overlook errors because of semantic expectations.

# Evidence for Semantic Grammar Approaches

- Predicts: Listeners begin to analyze sentences immediately, by assigning each word to a particular semantic case role.
- That is, we do not wait until the sentence has ended before assigning meaning.
- ***Garden Path Sentences***: difficult to parse because grammatical expectations are violated.

# Garden Path Sentences

- When Fred eats food **gets** thrown.
- Mary gave the child the dog **bit** a band aid.
- I convinced her children **are** noisy.
- She told me a little white lie **will** come back to haunt me.
- Until the police arrest the drug dealers **control** the street.
- The man who whistles tunes **pianos**.
- The cotton clothing is made of **grows** in Mississippi.
- The raft floated down the river **sank**.
- We painted the wall with **cracks**.

**More time is spent fixating on highlighted words**

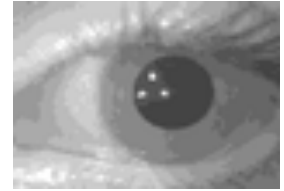
# Level 4: Comprehension at the Phrase / Sentence Level

- Traditional view:
  - People hold information about a sentence in memory until the sentence, or a meaningful clause, is completed.
- BUT ... could be limited by the method.
- On-line techniques yield different conclusions.

# On-Line Measures of Comprehension

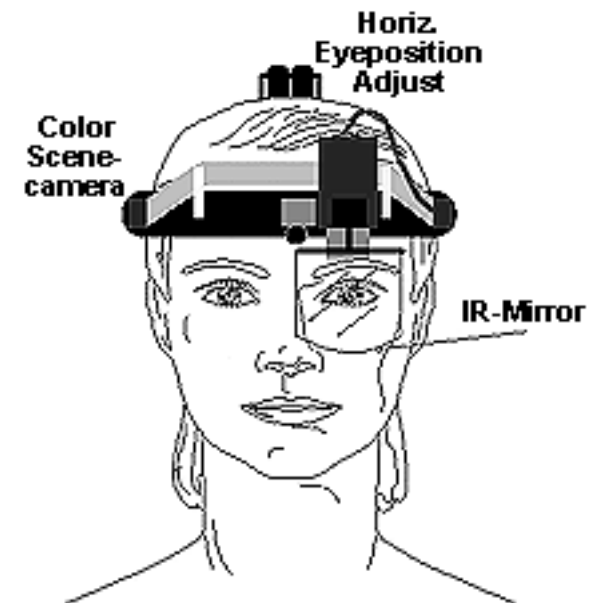
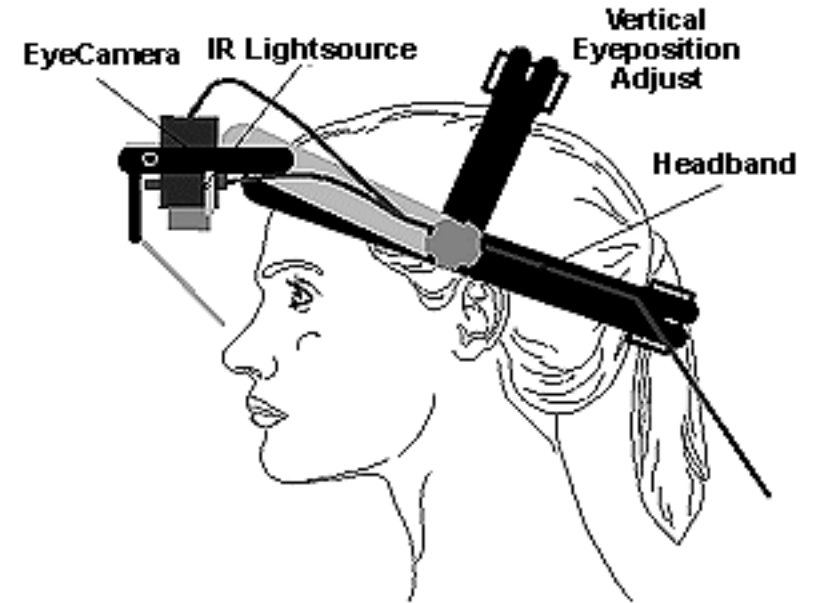
- Measure comprehension as it happens.
- Written Language:
  - A sentence appears on-screen, followed by a word. Subjects decide if the word was in the just-read sentence.
- Spoken Language:
  - The interruption technique: similar to written method above
  - Monitoring: check for /b/ and measure detection RTs at different portions of sentence

# Reading



- Just and Carpenter (1980): research on word-by-word reading times
- **Gaze Duration Procedures:**
  - On line technique for studying reading comprehension.
  - Uses an **eye-tracker** and camera to measure how long the eyes dwell on each word.

# Eye tracker methods



# Gaze Duration Assumptions

- **Immediacy:** Readers interpret each content word of a text as they encounter it in the passage.
- **Eye-Mind Hypothesis:** The eye remains fixated on a word as long as the word is being actively processed during reading.
- Therefore we can gain meaningful information about reading comprehension by examining gaze duration.

# Online Reading Effects

- Most **content words** are fixated on (nouns, verbs).
- **Function words** are rarely fixated on (e.g., the, of).
- **Regressive eye movements** often signal unresolved meanings (going back to a previously-read portion of text).

# Sample Eye Fixations

Fixation  
number

1	2	3	4	5	6	7	8	9
1566	267	400	83	267	617	767	450	450

**Flywheels** are one of the oldest mechanical devices known to man.

1	2	3	4	5	6	7
400	616	517	684	250	317	617

Every internal- combustion engine contains a small

Gaze  
duration

8	9	10	11	12	13
1116	367	467	483	450	383

**flywheel** that converts the jerky motion **of the** pistons into the

14	15	16	17	18	19	20	21
284	383	317	283	533	50	366	566

smooth flow of energy **that** powers the drive shaft.

# Comprehension and Mental Structure Building



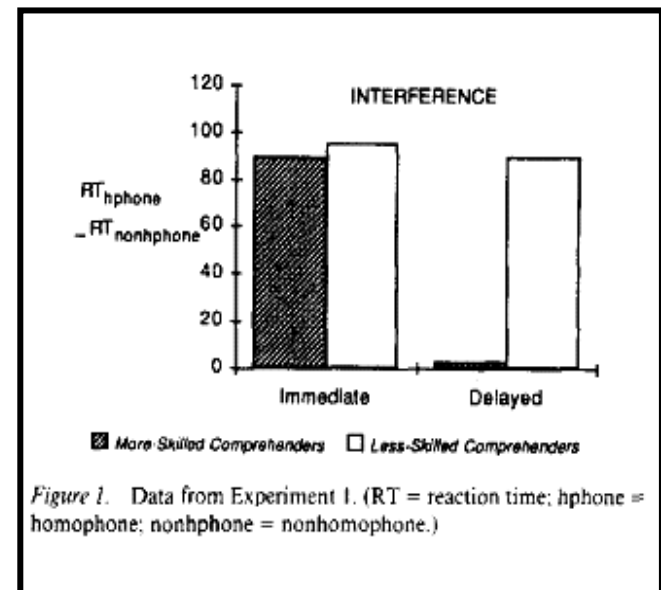
- Gernsbacher (1990)
- Language comprehension is a process of building mental structures

## Processes:

- laying a foundation
- mapping information onto the structure (activation) using enhancement
- shifting to a new structure using suppression

# Gernsbacher and Faust (1991)

- Q: Do we build meaning online?
- Task: Lexical decision with sentence primes
  1. He had lots of patients.
    - CALM -
  2. She dropped the plate.
    - BREAK -
- Expect that the inappropriate meaning is suppressed
- Lexical decision to suppressed items should be slower



# Inhibition and Working Memory

- Hasher and Zacks (1988) proposed that inhibitory processes control the contents of working memory
- Includes the suppression of alternate meanings
- Inhibitory control keeps WM from being cluttered with irrelevant information



# Conversational Rules

- Are derived from the ***Cooperative Principle***

Each participant in a conversation implicitly assumes that all speakers are following the rules and that each contribution to the conversation is sincere and appropriate.

# Grice's Conversational Maxims

**Table 10-7 GRICE'S (1975) CONVERSATIONAL MAXIMS, WITH TWO ADDITIONAL RULES**

## **The Cooperative Principle**

Be sincere, reasonable, and appropriate

- **Relevance:** Make your utterances relevant to the conversation (e.g., stick to the topic; don't state what others aren't interested in).
- **Quantity:** Be as informative as required (e.g., don't overspecify; don't say more or less than you know; don't be too informative).
- **Quality:** Say what is true (e.g., don't mislead; don't lie; don't exaggerate).
- **Manner and tone:** Be clear (e.g., avoid obscurity and ambiguity; be brief; be polite; don't interrupt).

## **Two Additional Rules**

- **Relations with conversational partner:** Infer and respond to partner's knowledge and beliefs (e.g., tailor contributions to partner's level; correct misunderstandings).
- **Rule violations:** Signal or mark intentional violations of rules (e.g., use linguistic or pragmatic markers [stress, gestures]; use blatant violations; signal the reason for the violation).

# Online Theories During Conversation

- **Direct**

- Model of what our conversational partner knows and is interested in, what the partner is like

- **Second-Order**

- An evaluation of the other participant's direct theory -- what you think he/she believes about you

# Animal Communication

- Dolphins:

<https://www.youtube.com/watch?v=827Yavg3cuA>

- Extra, for your interest:

<https://www.youtube.com/watch?v=hnVAv77gEqo>

<http://documentaryheaven.com/girl-who-talked-to-dolphins/> (because the story is kinda crazy!)

- Vervet Monkeys:

<https://www.youtube.com/watch?v=3lsF83rHKFc>