

# Language and Thought

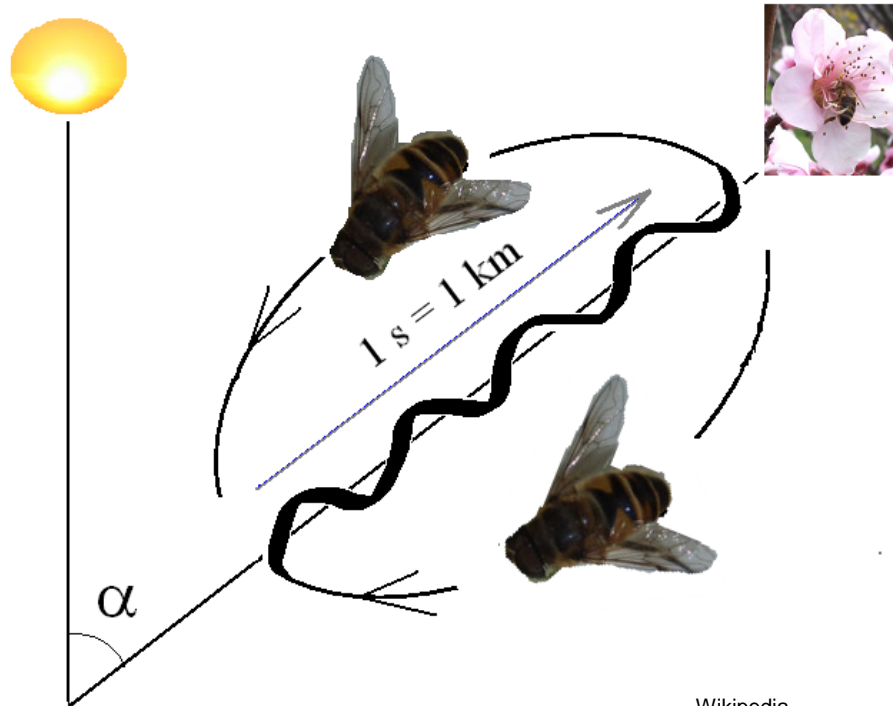
## Lecture 25

# Language in Cognition

- Language as a Tool for Communication
  - Experience, Thought, and Action
- Language as a Tool for Thought
  - Labels for Objects, Events, Attributes, Concepts
  - Reasoning, Problem-Solving

# Social Displays

- Zig-Zag Dance of the Stickleback
- Alarm Reaction in Birds
- “Waggle Dance” in Bees



# Birdsong

- Males Sing Characteristic Song
  - Territorial dialects
- “Learned” Through Exposure
- Critical Period
- Female Response to Song
  - Testosterone
- Template Refined Through Experience



# Parallels Between Birdsong and Human Speech

- Universal
- No Reinforcement
- Critical Period
  - Isolation Until Puberty
- Second-Language Accent

# Properties of Human Language

- Meaning
- Reference
- Interpersonal
- Structure
  - Prescriptive vs. Descriptive
- Creativity
  - $10^{30}$  Sentences in English
  - $10^9$  Seconds in a Century

# “Human Language is an Embarrassment for Evolutionary Theory”

Premack (1986, p. 68)



Washoe



Ron Cohen / Gorilla Foundation

Koko



Sarah



Nim Chimpsky

# Hierarchical Organization of Language

- Phonemes (40 in English)
- Morpheme (50,000 in English)
  - Roots, Stems, Prefixes, Suffixes
  - Open- vs. Closed-Class
- Word (200,000 in English)
  - Root/Stem + Prefix, Suffix
- Phrases, Sentence (1 Nonillion in English)
  - Language Basics (*Mommy go store*)
  - Language Elaborations (*Mommy goes to the store*)



# Phrase Structure Grammar

## Rewrite Rules

**Noun** → man, woman, horse, dog, etc.

**Verb** → saw, heard, hit, etc.

**Article** → a, an, the

**Adjective** → happy, sad, fat, timid, etc.

**Noun Phrase** → Art + Adj + N

**Verb Phrase** → V + NP

**Sentence** → NP + VP

**The 1<sup>st</sup> NP *verbed* the 2<sup>nd</sup> NP**

# The Structure of a Sentence

Sentence						
Noun Phrase			Verb Phrase			
			Verb	Noun Phrase		
				Art	Adj	Noun
A	fat	man	saw	the	timid	dog

# “The Jabberwocky”

Lewis Carroll, in *Through the Looking Glass, and What Alice Found There* (1871)

'Twas brillig, and the slithy toves  
Did gyre and gimble in the wabe;  
All mimsy were the borogoves,  
And the mome raths outgrabe.



And as in uffish thought he stood,  
The Jabberwock, with eyes of flame,  
Came whiffing through the tulgey wood,  
And burbled as it came!

"Beware the Jabberwock, my son!  
The jaws that bite, the claws that catch!  
Beware the Jubjub bird, and shun  
The frumious Bandersnatch!"

One, two! One, two! and through and through  
The vorpal blade went snicker-snack!  
He left it dead, and with its head  
He went galumphing back.

He took his vorpal sword in hand:  
Long time the manxome foe he  
sought—  
So rested he by the Tumtum tree,  
And stood awhile in thought.



"And hast thou slain the Jabberwock?  
Come to my arms, my beamish boy!  
O frabjous day! Callooh! Callay!"  
He chortled in his joy.

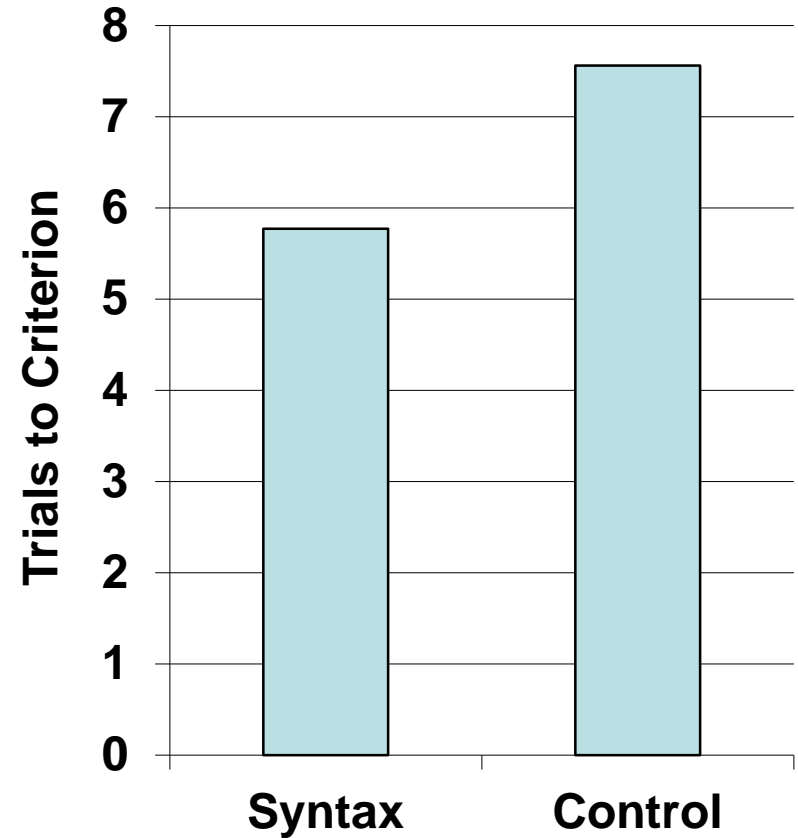
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# Phrase Structure and Memory

Epstein (1961), after Osgood (1957)

**THE YIG WUR VUM  
RIX HUM IN JAG  
MIV**

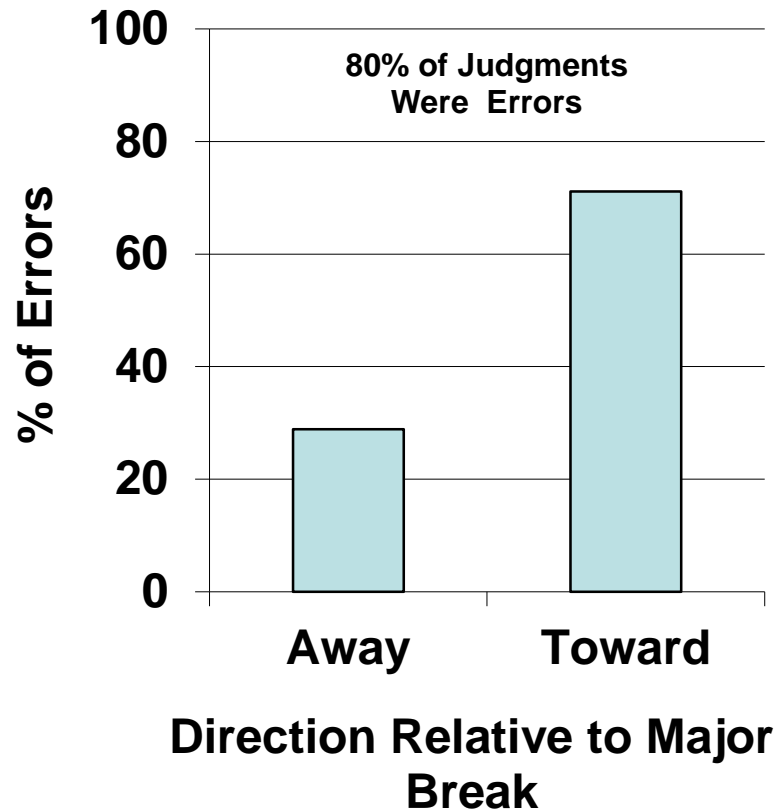
**THE YIGS WUR  
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MIV**



# Phrase Structure Boundaries

Fodor & Bever (1965)

That he was happy was evident from the way he smiled  
A O B



# Surface Structure vs. Deep Structure

Chomsky (1957, 1965)

John saw Sally.  
John heard Sally.

John is easy to please.

It is easy to please John.

John is eager to please.

It is eager to please John.

John saw Sally.

Sally was seen by John.

It was John who saw Sally.

It was Sally who was seen  
by John, wasn't it?

# Transformational Grammar

Chomsky (1957, 1965)



- Kernel of Meaning
  - Proposition → NP + VP
- Transformational Rules
  - Attitude → Assertion, Denial, Question Focus on Subject, etc.
  - Sentence → Att + Prop

Kernel as “Gist” or Deep Structure

Transformational Rules Yield Surface Structure

# From Deep Structure to Surface Structure

Chomsky (1957, 1965)

- Kernel Proposition
  - Assertion
  - Denial
  - Question
  - Focus on Object
  - Combination
- The boy hit the ball.
  - The boy hit the ball.
  - The boy did not hit the ball.
  - Did the boy hit the ball?
  - The ball was hit by the boy.
  - The ball was not hit by the boy, was it?

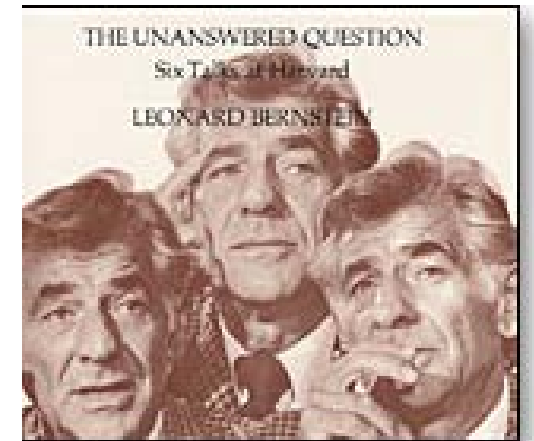


# Psychological Reality of Deep Structure and Transformational Grammar

- Novice Language
  - I no go sleep
  - Why Mommy hit Billy?
- Phrase and Paraphrase
  - He sent a letter to Galileo
    - Galileo sent a letter about it to him.
    - A letter about it was sent to Galileo by him.
- Meaning Verification
  - The boy hit the ball.
    - Has the boy hit the ball?
    - Was the ball hit by the boy?

# The Evolution of Generative Grammar

- Standard Theory
  - Extended
    - Revised
- What Makes Us Unique
  - Language Module
  - “Universal Grammar”
  - “Language Acquisition Device”



# Semantics

- Types of Reference

- Denotative
- Connotative

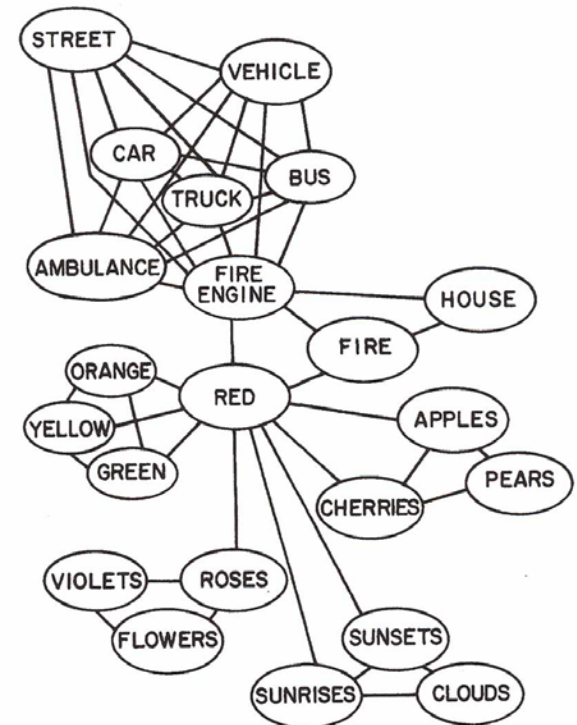
- Semantic Memory Networks

- Associative
- Propositional

- Categorization

- Prototypes
- Exemplars

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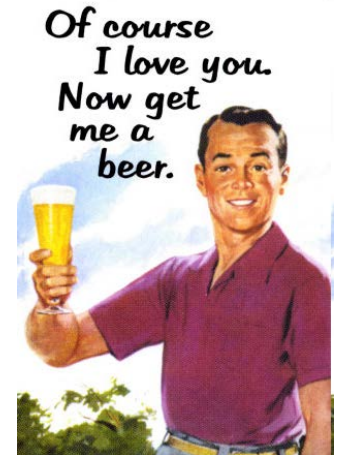


# Ambiguous Sentences

- Someone stepped on his trunk.
- Harvey saw a man eating fish.
- They are visiting firemen.
- Visiting relatives can be boring.
- Smoking volcanoes can be dangerous.
- Make me a milkshake.

# Pragmatics and Context

- Linguistic
  - Surrounding Sentences
- Nonlinguistic
  - Environmental Context
  - Prosody
    - “What am I doing here?”
  - Gesture
    - Sign Language in the Deaf
  - Facial Expressions, Other “Body Language”



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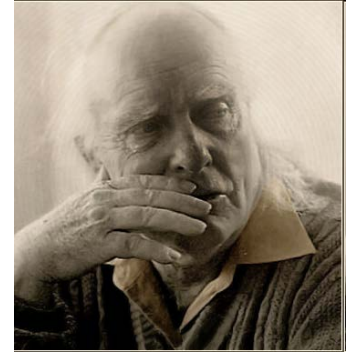
# Conversational Rules

Gordon & Lakoff (1971); Grice (1975, 1978); Clark (1979)

## *Could you pass the salt?*

- Common Ground
- The Cooperative Principle
- Conversational Maxims
  - Quantity
  - Quality
  - Relevance
  - Manner

“Make your conversational contribution such as is required, at the stage at which it occurs, by the accepted purpose or direction of the talk exchange in which you are engaged”





# Linguistic Relativity?

Whorf (1940) and Sapir (1941); after Boas (1911)



- “Eskimo Words for Snow”
  - *Aput* – “Snow on the Ground”
  - *Qana* – “Falling Snow”
  - *Piqsirpoq* – “Drifting Snow”
  - *Qimuqsuq* – “A Snow Drift”
- Linguistic syntax and semantics provide a “program and guide for an individual’s mental activity”.... The relativity of all conceptual systems... and their dependence upon language stand revealed.”

# Variants on the Sapir-Whorf Hypothesis

After Au (1983)

- Linguistic Determinism
  - The structure of a language determines the way its native speakers perceive and think about the world.
- Linguistic Relativity
  - Structural differences between two languages are paralleled by non-linguistic cognitive differences between native speakers of those languages.



# Space and Time in the Pormpuraaw Tribe

Boroditsky & Gaby (2010)

- Spatial Direction Terms in *Kuuk Thaayore*
  - Left/Right vs. North/South/East/West
  - Spatial Location Ability
- Arrange Pictures in Temporal Sequence
  - English: Left to Right
  - Hebrew: Right to Left
  - Kuuk Thaayore: East to West
    - Facing South: Left to Right
    - Facing North: Right to Left



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# “How Language Shapes Thought”

Boroditsky (2011, p. 65)



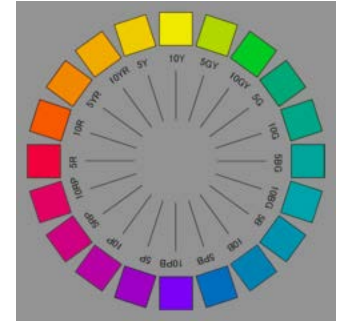
“A hallmark feature of human intelligence is its adaptability, the ability to invent and rearrange conceptions of the world to suit changing goals and environments. One consequence of this flexibility is the great diversity of languages that have emerged around the globe. Each provides its own cognitive toolkit and encapsulates the knowledge and worldview developed over thousands of years within a culture. Each contains a way of perceiving, categorizing, and making meaning in the world....”

# Color Perception in the Dani

Rosch Heider & Olivier (1972), after Berlin & Kay (1969; Kay and Moffi, 1999)

## • Evolution of Color Terms

1. All Languages Have Black & White (Light vs. Dark, Warm vs. Cool)
2. If 3 Color Terms, Add Red
3. If 4 Color Terms, Add Green or Yellow
4. If 5 Color Terms, Add Yellow or Green
5. If 6 Color Terms, Add Blue
6. If 7 Color Terms, Add Brown
7. If 8+ Color Terms, Add Purple/Pink/Orange/Gray; then Light Blue



## • Two Color Names

- *Mili* – Dark and Cold
- *Mola* -- Light and Warm



## • Experimental Tasks

- Naming Colors
- Matching Colors from Memory



dianawaring.com

# Thought Without Language

- Classical and Instrumental Conditioning
  - Expectations, Prediction, and Control
- Natural Concepts in Pigeons
- Curiosity in Rhesus Monkeys
- Problem-Solving in Primates
- Learning in Infants



Kohler, *the Mentality of Apes* (1925)



# “Thinking for Speaking”

Slobin (1987; 1996, p. 91)  
L. Gleitman & Papafragou (2005)



“We can only talk and understand one another in terms of a particular language. The language or languages that we learn in childhood are not neutral coding systems of an objective reality. Rather, each one is a subjective orientation to the world of human experience, and this orientation affects the ways in which we think while we are speaking.”


- Language Influences Thought “Online”
  - Speaker Must Attend to Some Features of World

# Grammatical Gender

- Masculine, Feminine, Neuter

- Spanish: *el* vs. *la* 

- French: *le* vs. *la* 

- German: *der*, *die*, *das* 

- “*My friend Pat*”

- *In Spanish*

- *Mi amigo Pat* if Male
    - *Mi amiga Pat* if Female

- *In German*

- *Mein Freund Pat* if Male
    - *Meine Freundin Pat* if Female



Julia Sweeney as “Pat”  
*Saturday Night Live*

# Hopi Sibling Terminology

Eggan (1950); Nerlove & Romney (1967)

- Elder Brother
- Elder Sister
- Younger Sister of Male
- Younger Brother of Male  
– *or* Younger Sibling of Female



Philbrook Art Center



“Language doesn’t have so much to do with words and what they mean as it does with people and what they mean”

Clark (1979)



Any Thought Can Be Expressed  
in Any Language



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