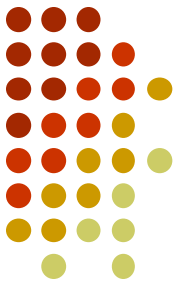


# **Approaches to cognition**

**Introduction to Cognitive Science**  
**Lecture 2**

**Amitabha Mukerjee**



# So far

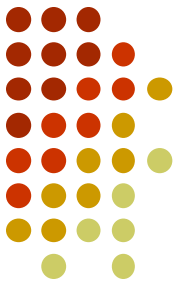
- What is cognition?
  - Input is complex, but we tend to see “wholes” or “gists”
  - basis for Illusions in
    - Perception
    - Language
- Other problems in cognitive science
  - Reasoning,
  - Memory
  - Consciousness
- Many **Views of cognition**

# Approaches to Cognition



- Differing views of Cognition
  - **Philosophy**
  - **Psychology**
  - **Neuroscience**
  - **Linguistics**
  - **Computational Intelligence**

# Philosophy

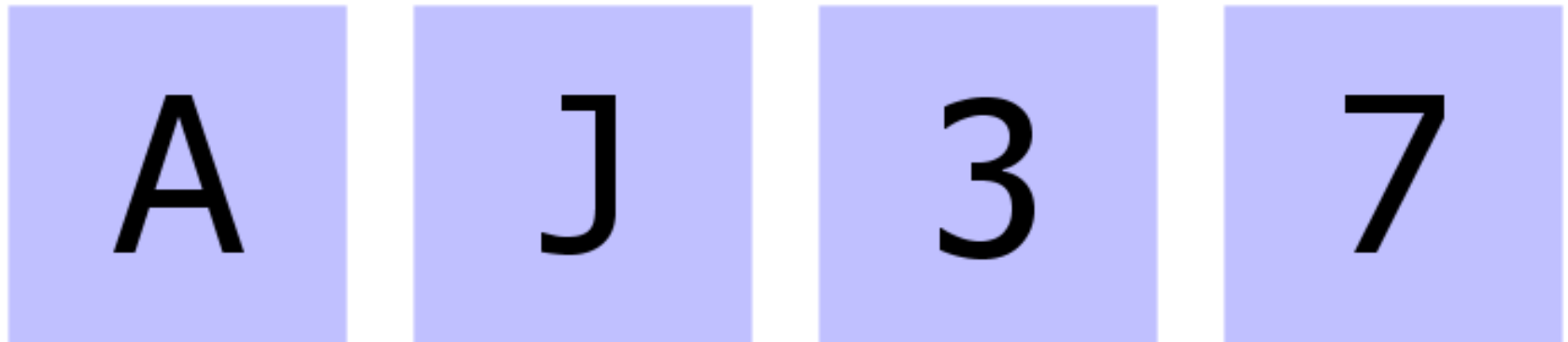


- What is *mind*?
  - The mind separate from the body? [dualism]
  - The mind is a part of the body, made from the same stuff [monism]
- If x behaves identically with the mind, does it have the same attributes that a mind does? [functionalism]
- How do we ascribe beliefs to others?
  - How do we know a dog is conscious, but a car is not? [other minds]
- Are *mental states* like logical prepositions?

# Are humans rational?



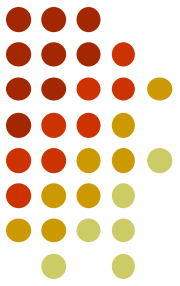
- Claim: If a card has “A” on one side then it has “3” on the other



- Q: Which cards should I turn over to verify this?

[Wason selection task]

# Psychology



- How does the mind perform tasks?
- Given an input, does it perform certain computations to arrive at a decision?

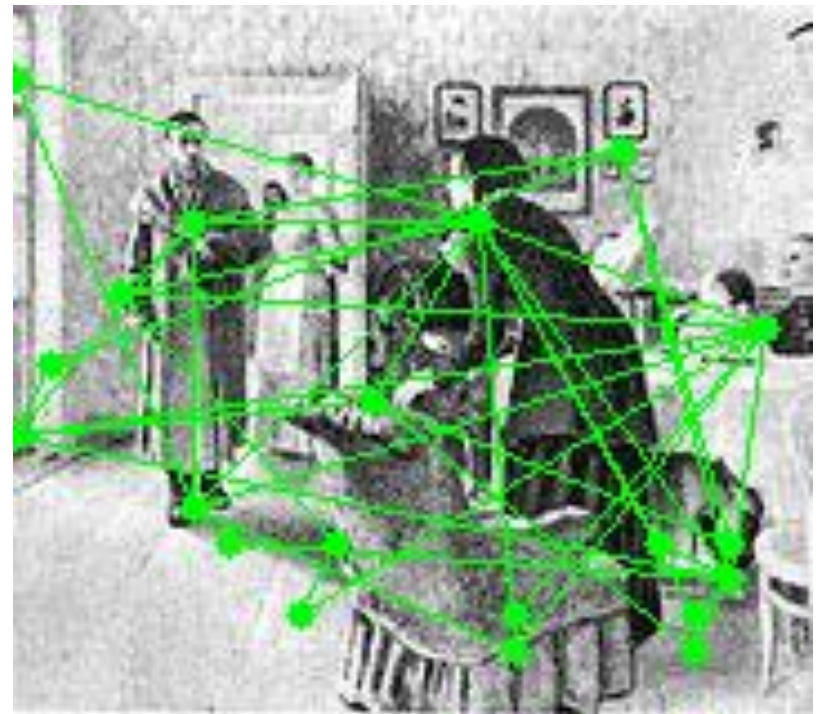
# Attention : Sense from the Blooming Buzzing Confusion



Our gaze moves in  
**saccades**

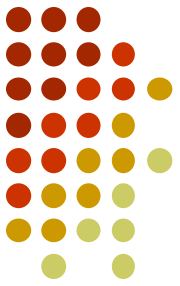
How do you decide  
where to look?

Ilya Repin: Unexpected Visitor, 1888



Yarbus (1967)

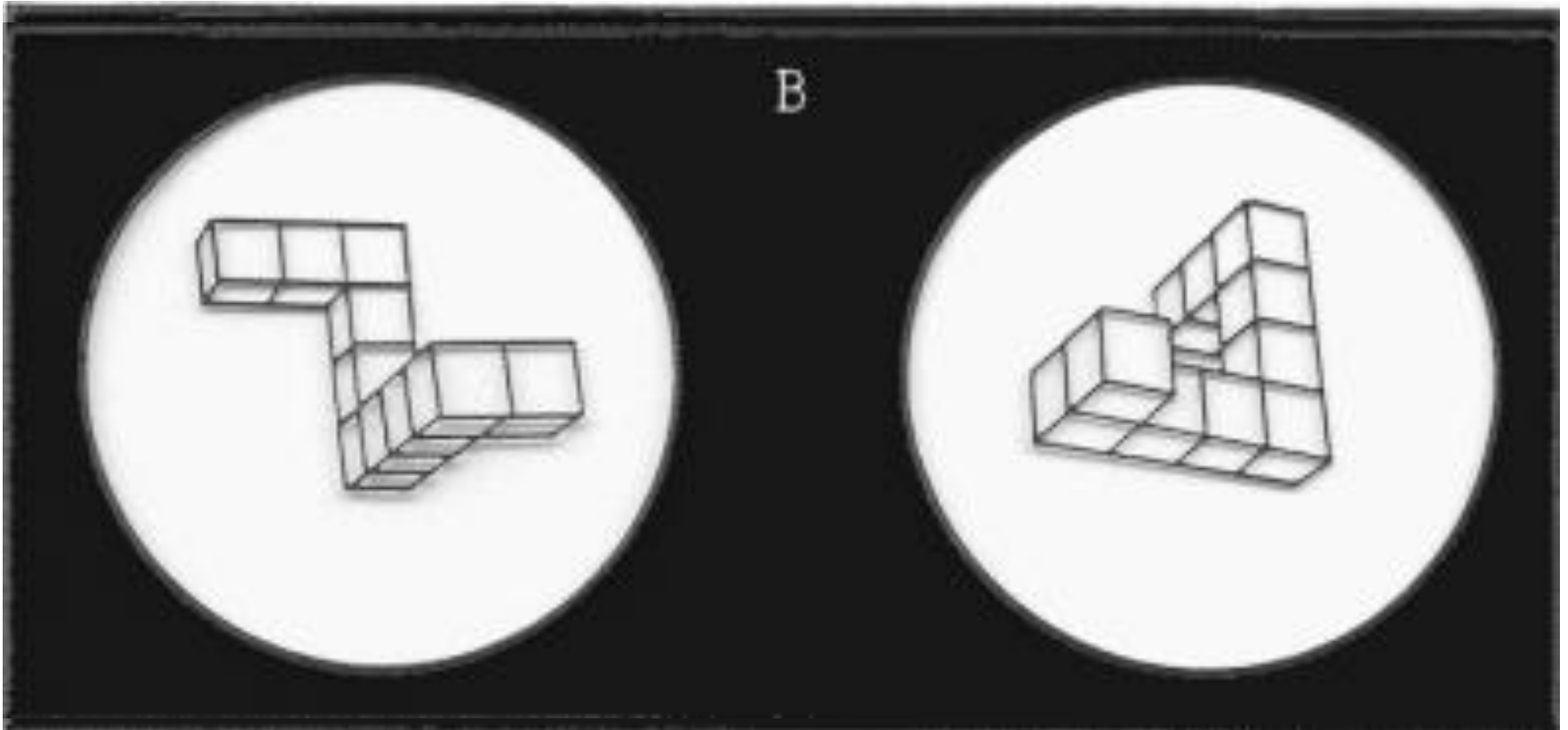
# Psychology



- How does the mind perform tasks?
- Given an input, does it perform certain computations to arrive at a decision?

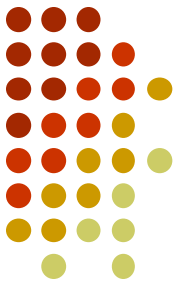


# Mental Rotation



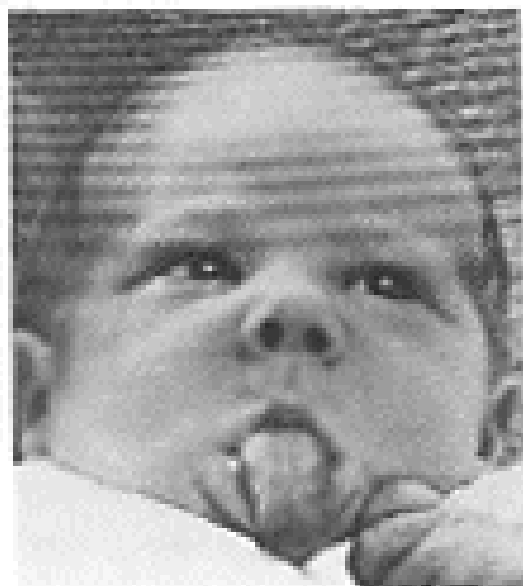
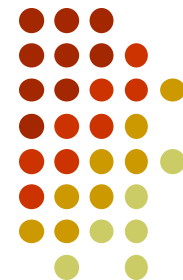
Does it take longer to answer “B” than A?

[Shepard Metzler 1971]



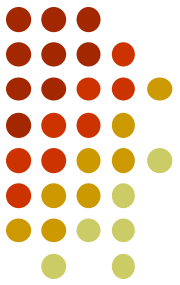
# Psychology

- How does the mind perform tasks?
- Given an input, does it perform certain computations to arrive at a decision?
- Learning: How do we adapt / learn
- Development : Inept infant to capable adults:
  - Nativism – a lot of it is built in...



**Infants' imitation of facial expressions (Meltzoff & Moore, 1977 )**

# Psychology



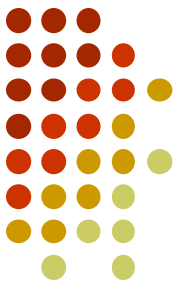
- How does the mind perform tasks?
- Given an input, does it perform certain computations to arrive at a decision?
- Learning: How do we adapt / learn
- Development : Inept infant to capable adults:
  - Nativism – a lot of it is built in
  - Constructivism – most of it is learned
- Conscious? Do you realize :
  - that there's a big hole in our visual field
  - you may miss big changes (change blindness)

# Neuroscience

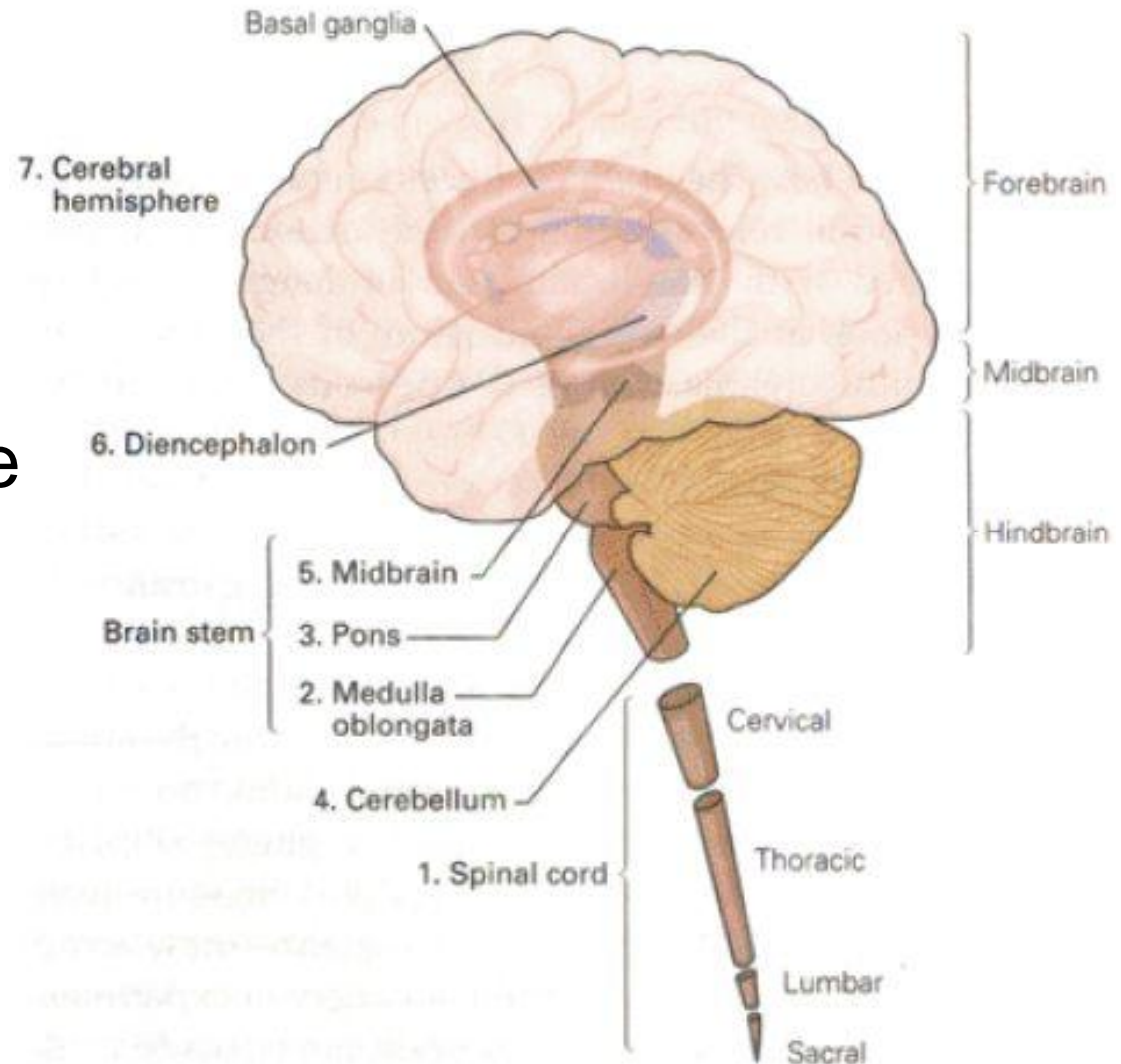


- The brain is the physical hardware for the mind
- How does the brain
  - recognize sensory signals (perception)
  - decide and implement actions (motor)
  - interpret sound patterns (language)
  - construct personal histories (memory)
- Does the brain change, as we learn?
- What creates an awareness of self (consciousness)?
- What happens to the brain as we go from infancy to adulthood to old age?

# Central Nervous System

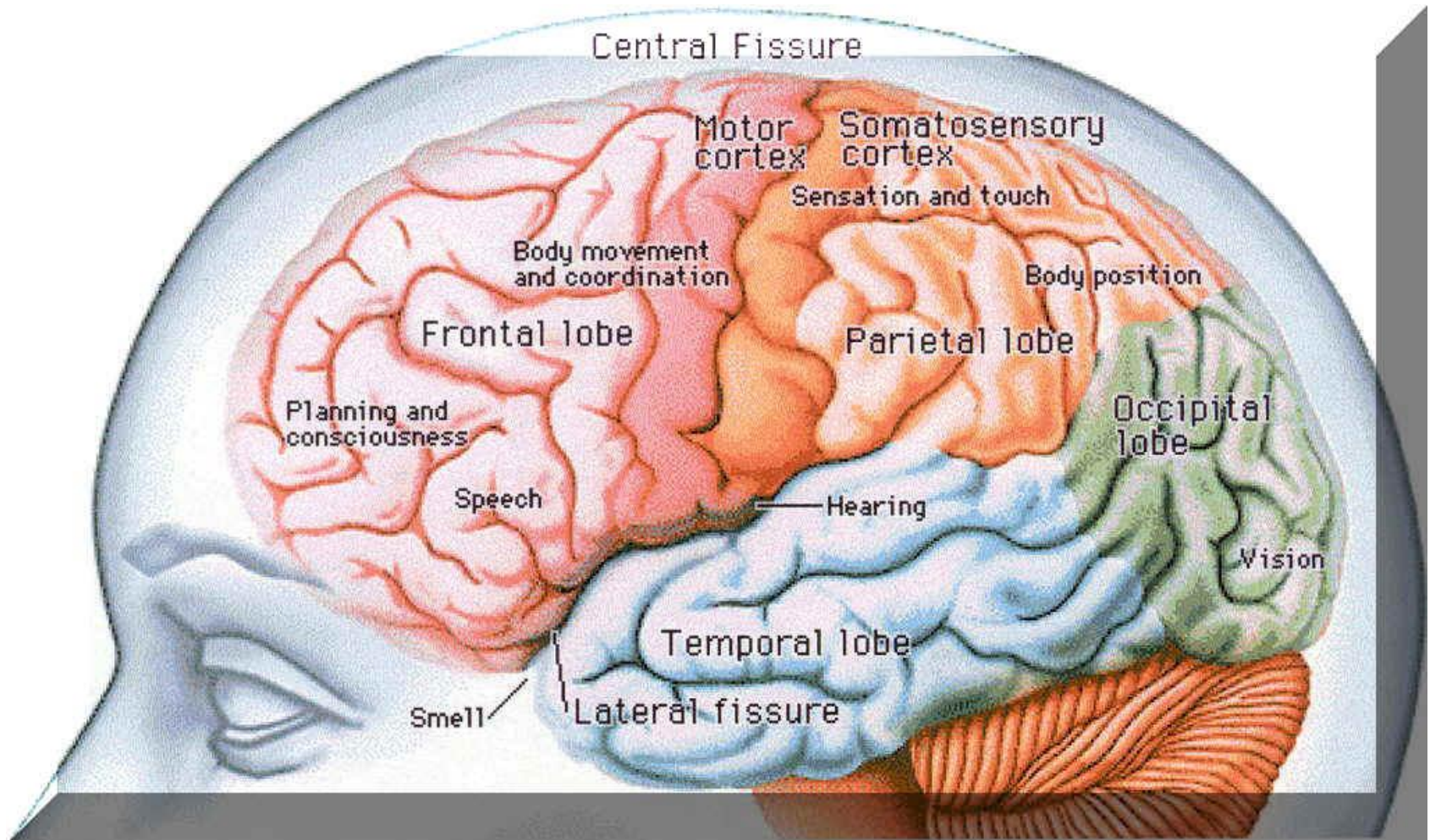
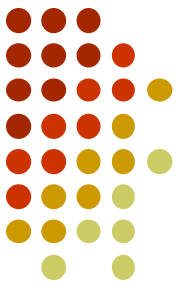


- Most cognitive functions are in the cortical hemispheres
- Functions may be specialized in certain areas  
e.g. Language in left hemisphere

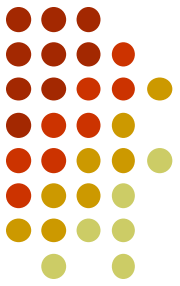




# Central Nervous System



# Linguistics



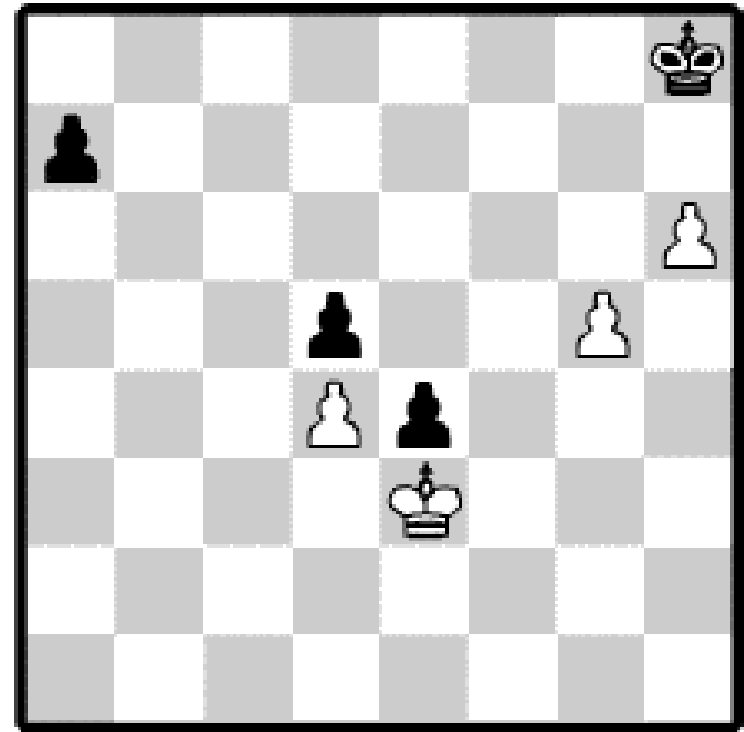
- What is language?
  - A set of words (lexicon) that connect together in systematic ways (syntax) to produce ideally correct sentences [Chomskyan]
  - A set of words and meanings that connect together in systematic ways to produce sentences that have meaning [Functional]
- How does a baby learn language?
  - She adapts a language-independent (universal) grammar to the language she is exposed to
  - Learns by combining the semantics experienced with the sentences heard



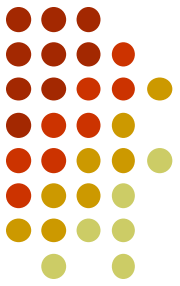
# Computational Intelligence



- If a machine performs intelligently, is it intelligent?
  - Consider a chess playing program. Does it “know” that passed pawns are dangerous?



# Computational Intelligence



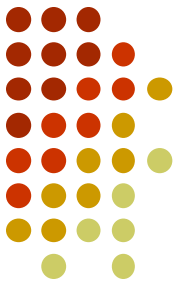
- If a machine performs intelligently, is it intelligent?
  - Consider a chess playing program. Does it “know” that passed pawns are dangerous?
- Cannot enter the brain and make changes at will
  - Simulation: Can use it to study structures in cognition
  - Can posit theories of how cognition works
- Also, can devise solutions that solve societal needs – e.g. robots or machine diagnosis systems (Artificial Intelligence)

# What's Next



- Early history :
  - Philosophy
  - beginnings of Experimental Psychology

# The subconscious brain



- Video by Dan Simons and colleagues
- Claparède experiment on severely amnesic patient
  - would need to re-introduce himself every 15 minutes
  - one day, hid a pin in palm when shaking hands
  - next time, could not recognize, no memory of having met before
  - but refused to shake hands
  - gave other explanations for refusal