INCLUDED LECTURES AND READINGS:

Week 4.
Dr. Taylor Scott - Cognition, Distributed

Week 5.
Dr. Chris Johnson - Cetaceans Have Complex Brains

Week 6.
Dr. Federico Rossano - The Ultra-Social Animal.

Week 6.
Dr. Terry Jernigan - ABCD Study.

Week 6.
Dr. Terry Jernigan - Promo for ABCD Study
DISTRIBUTED COGNITION & COGNITIVE ETHNOGRAPHY
Dr. Taylor J. Scott
tjscott@ucsd.edu

Alien Intelligences
The Minds of Other Animals
Dr. Christine M. Johnson
Dept of Cognitive Science, UCSD

Comparative?
- Across the lifespan
- Across cultures
- Across species/genres
Week 4.
Dr. Taylor Scott - Cognition, Distributed

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behaviorism

can only study the observable aspects of thinking
Behavior occurs through conditioning.

Reward and punishment.

can only study the observable aspects of thinking
2. What are general learning principles? Do they apply across all species? Know the examples mentioned in the lecture.

**Event Correlations**

1. Dog is presented with **food** → **salivation**
2. Dog learns to associates **bell** with presentation of **food** (Temporal contiguity)
3. Dog **salivates** with **bell**, even when food is not present
3. What is Win Stay/Lose Shift?

Win Stay / Lose Shift

Peck White-on-Black, Get Reward

3. What is Win Stay/Lose Shift?

e.g. Hummingbirds do poorly on Win Stay / Lose Shift

Drains nectar from flower at each visit

Win-Shift is the SMART strategy!

4. What is taste aversion learning? How does it differ from Pavlov’s Dog experiment?

Taste aversion is learned after having food that causes nausea, sickness, or vomiting.

Temporal contiguity would predict that rat should learn to associate food and illness

BUT, they only learn this association with a >1 hour delay
Cognitivism

Cognitivism is the study in psychology that focuses on mental processes, including how people perceive, think, remember, learn, solve problems, and direct their attention to one stimulus rather than another. Psychologists working from a cognitivist perspective, then, seek to understand cognition. Rooted in Gestalt psychology and the work of Jean Piaget, cognitivism has been prominent in psychology since the 1960s; it contrasts with behaviorism, where psychologists concentrate their studies on observable behavior. Contemporary research often links cognitivism to the view that people process information as computers do, according to specific rules; in this way, it is related to studies in artificial intelligence. In addition, cognitivism has influenced education, as studies of how people learn potentially sheds light on how to teach most effectively.
Noam Chomsky
3. How can computers be used to study cognition and think about it? What are the limitations of these methods?

**Cognitivism**

**YOUR BRAIN IS A COMPUTER**

**But!**

Interaction between the brain and the body+environment is necessary for cognition to arise.

For example, think back to prev. lectures:

- Voytek - tool use in cognition
- Nunez - thinking about time depends on one’s culture/language
- Boyle - embodied “simulation” in understanding language
4. What is post-cognitivism? What are some of the main concepts and important figures of this approach? How does it differ from cognitivism?

<= Input/output, a body is necessary

You need a human body to create cognition.

Cognition arises out of an interaction between the brain and the body

Human cognition doesn’t arise w/o:

- Artifacts
- Culture & Language
- Embodiment
4. What is post-cognitivism? What are some of the main concepts and important figures of this approach? How does it differ from cognitivism?

**Traditional Cognitive Theories**

- User's mind
- Past, Present, Future
- External representations
- Other people

**Distributed Cognition**

- User's mind
- Past, Present, Future
- External representations
- Other people

Units of analysis can be larger

Cognition is built “outside in”
Marvin Minsky
The roots of distributed cognition are deep, but the field came into being under its current name in the mid-1980s. In 1978, Vygotsky’s *Mind in Society* was published in English. Minsky published his *Society of Mind* in 1985. At the same time, Parallel Distributed Processing was making a comeback as a model of cognition (Rumelhart et al. 1986). The nearly perfect mirror symmetry of the titles of Vygotsky’s and Minsky’s books suggests that something special might be happening in systems of distributed processing, whether the processors are neurons, connectionist nodes, areas of a brain, whole persons, groups of persons, or groups of groups of persons.
For many people, distributed cognition means cognitive processes that are distributed across the members of a social group (Salomon 1993). The fundamental question here is how the cognitive processes we normally associate with an individual mind can be implemented in a group of individuals?
5. What is social complexity? How does it contribute to the development of animal cognition?

**Baboon playback experiment**

- Make audio recordings of calls that occur during dominance interactions.

**Simple**
- Power = Rank

**Complex**
- Power not = Rank (de Waal, 1986)

**COALITIONS**
- between lower ranking individuals can out-compete higher ranking individuals

**A > B > C > D > E**

**Dom_A**: Sub_B  
**Dom_B**: Sub_C  
**Dom_C**: Sub_D  
**Dom_D**: Sub_E

- **NO reaction to real interactions**
- **BIG reaction to fabricated interactions**
  - *investigate!*

**Dyadics**
6. What are the examples discussed in lecture of how we can understand animal cognition?

**Cognitive Maps**

Behaviorism predicts: Go forward, turn right

Cognitive Science: Rat has developed a mental representation of the maze

Rat developed representation of a **cognitive map** that it uses to navigate the map, as opposed to performing a learned behavioral response

Rat goes forward, turns **LEFT**

SUCCESS!
6. What are the examples discussed in lecture of how we can understand animal cognition?

**Symbol Use:** Some animals can perform complex reasoning using symbols

Animal learns to reliably pick numbers corresponding to number of objects

Once numbers are learned, apes will exhibit **spontaneous addition** w/o training to sum
6. What are the examples discussed in lecture of how we can understand animal cognition?

**Greedy Giveaway Task**

Chimp 1 inevitably reaches for larger pile...

But, if replace piles with associated numbers...

Large pile of M&Ms

Small pile of M&Ms

Chimp 1 must watch as Chimp 2 gets selected (larger) pile! Chimp 1 gets stuck with remaining pile.

Chimp 1 will reach for smaller number! i.e. respond “rationally”, and gain larger reward
5. From the reading: **What is distributed cognition?**
How is the way we think about memory influenced by distributed cognition?

- Cognition is distributed between the brain, the body, and the surrounding culture, environment and artifacts in time and space
- Cognition emerges out of the interactions between those elements.
4. What is post-cognitivism? What are some of the main concepts and important figures of this approach? How does it differ from cognitivism?

Some Major Players

Don Norman
Design of everyday things

Edwin Hutchins
Cognition in the wild

Jim Hollan
Helped develop DCog theory, HCI
5. From the reading: What is distributed cognition?
How is the way we think about memory influenced by distributed cognition?

How do we remember things?
The Brain's Navigational System

Grid Cells
As a person wanders around a new environment, so-called "grid cells" within the brain are thought to provide a base coordinate system.

Place Cells
Related "place cells" respond to specific locations such as New York City's Washington Square Park.

https://www.quantamagazine.org/
(a) Path integration (also known as dead reckoning) is based on self-referenced information by keeping track of travel distances (time elapsed multiplied by speed) and direction of turns. Calculating translocation relative to the start location allows the animal to return to the start along the shortest (homing) path.

(c) Episodic memory is 'mental travel' in time and space referenced to self.

(b) Map-based navigation is supported by the relationships among visible or otherwise detectable landmarks. A map is constructed by exploration (path integration).

(d) Semantic memory is explicit representation of living things, objects, places and events without temporal or contextual references.
Memory, navigation and theta rhythm in the hippocampal-entorhinal system

Győrgy Buzsáki¹ & Edvard I Moser²

Theories on the functions of the hippocampal system are based largely on two fundamental discoveries: the amnestic consequences of removing the hippocampus and associated structures in the famous patient H.M. and the observation that spiking activity of hippocampal neurons is associated with the spatial position of the rat. In the footsteps of these discoveries, many attempts were made to reconcile these seemingly disparate functions. Here we propose that mechanisms of memory and planning have evolved from mechanisms of navigation in the physical world and hypothesize that the neuronal algorithms underlying navigation in real and mental space are fundamentally the same. We review experimental data in support of this hypothesis and discuss how specific firing patterns and oscillatory dynamics in the entorhinal cortex and hippocampus can support both navigation and memory.
... CONCEPTS AND TERMS TO KNOW

- Behaviorism
- Cognitivism
- Ethnography
- Post-cognitivism
- Distributed cognition
- Cognitive artifacts
- Cognition in the wild
- Society of Mind
- Artificial intelligence
- WEIRD
- Accountability
... Concepts and Terms to Know

- ABCD study
- Ultimatum game
- Rational maximizers
- Comparative study of cognition
- Social interaction
- Wolves, puppies, goats and dogs → voice following
- Dyads
- Social hierarchy
- Stag Hunt
- Food sharing
... CONCEPTS AND TERMS TO KNOW

- How do chimps, humans and bonobos differ
- Property justice
- Behavioral phenotype
- PING
- Brain development trajectories
- Motivation for ABCD study
- ABCD reading details
- Sensory-motor constraints
... CONCEPTS AND TERMS TO KNOW

- General learning principles
- Win-___ (Stay? Shift?)
- Cognitive Maps
- Taste aversion
- Brain in a vat
- Social complexity
- Prospective encoding
- Symbols
- Universal grammar
- Miller’s Law
- Embodiment
... CONCEPTS AND TERMS TO KNOW

- Eye-___ (hand, beak, trunk, foot, etc) coordination.
- Eye location
- Sclera color
- Gaze following
- Head direction information
- Individuals and diversity
- Diversity and assumptions
- Requests/Stealing
... CONCEPTS AND TERMS TO KNOW

- Dimensions of sociality
- What are the objectives and timelines of ABCD?
- What is special about adolescent brain development?
- What is the baseline age for ABCD?
- What type of data is gathered for ABCD?
SOME PEOPLE TO KNOW...

- Hutchins
- Minsky
- Norman
- Hollan
- Vygotsky
- Materazzi
- Jernigan
- Miller
- Chomsky
- Newell
- Watson
- Skinner
- Pavlov
STAY WORKING HARD ... THANKSGIVING IS ALMOST HERE!
MIDTERM2 - TUESDAY NOVEMBER 20, 2018

- 9:30am ñ 10:50am
- Sleep well and study hard.
- You got this!