



# SOCIAL LEARNING & MEMORY

PSYCHOLOGY 461 – LEARNING & MEMORY

DR. CLARK-FOOS

# SPEAKING WITH THE ANIMALS



- Dolphins, Apes, ...?
  - <https://vimeo.com/112851595>

# BEHAVIORAL PROCESSES

- Social Learning (Observational Learning)

- *What is being perceived?*
- Thorndike (1898)



- Powerful form of learning in humans:

- Learn from watching others, watching video, reading books...

- Difficult to study, especially in nonhumans:

- Usually, no reward/punishment
- Depends on the learner's attention/perception of the situation
- Up to the learner to decide when/how actually perform behaviors
- Hard to predict and measure what is learned

# COPYING WHAT IS SEEN

Seminal experiments by  
Albert Bandura et al.

The intent of these  
experiments was to see if  
aggressive behavior in adults  
would be copied by children.

- Exposure:
  - Children watched an adult **modeling** aggressive behavior (beating on an inflatable Bobo doll) or an adult modeling quiet play.
- Test:
  - Children were watched while playing with toys, including the Bobo doll.
  - Some children were provoked by taking away their first toy of choice.



# COPYING WHAT IS SEEN PART 2

If provoked, *more* likely to be aggressive.

- Often copied specific actions and words
- If unprovoked, those who had viewed adult aggression were *less* likely to be aggressive themselves.



Courtesy Albert Bandura, Stanford University

# COPYING WHAT IS SEEN PART 3

- Conclusions
  - Just observing adult behavior influences child behavior
  - Complex cognitive operations, including perspective taking.



Courtesy Albert Bandura, Stanford University

# SOCIAL LEARNING: MORE THAN ONE WAY TO SKIN A CAT

**True imitation:** copying specific actions learned from another

Not just hitting Bobo, but hitting it the same way and yelling the same phrases

- Encoded the specific actions of the model and selected those precise memories to guide their ongoing behavior: cognitively complex
- Behaviorists...
  - True imitation vs. more simple forms of learning
    - Emulation
    - Observational conditioning
    - Contagion
    - Stimulus enhancement



# SOCIAL LEARNING: MORE THAN ONE WAY TO SKIN A CAT



**Emulation:** accomplishing the same overall goal as the model but in a different way

- Example: A child might puncture Bobo, which is aggressive, but not in the exact same way as the adult modeled.
- Psychologically ambiguous.
  - Learned their own way of accomplishing it?
  - Doesn't demonstrate full cognitive representation of the model.

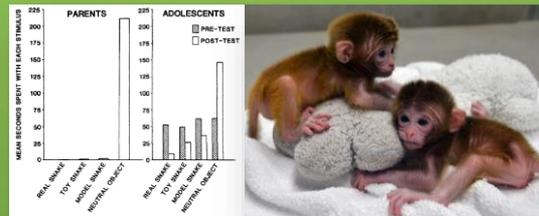
**Contagion:** inborn tendency to react to cues from other members of the same species

- Example: A friend yawns, and then you do too.
- Example: Someone throws up, and you may too!
- Not really learning, and definitely not true imitation
- Just a complex reflex; doesn't require complex cognitive operations

# SOCIAL LEARNING: MORE THAN ONE WAY TO SKIN A CAT

**Observational conditioning:** when cues in the environment become associated with contagion reactions

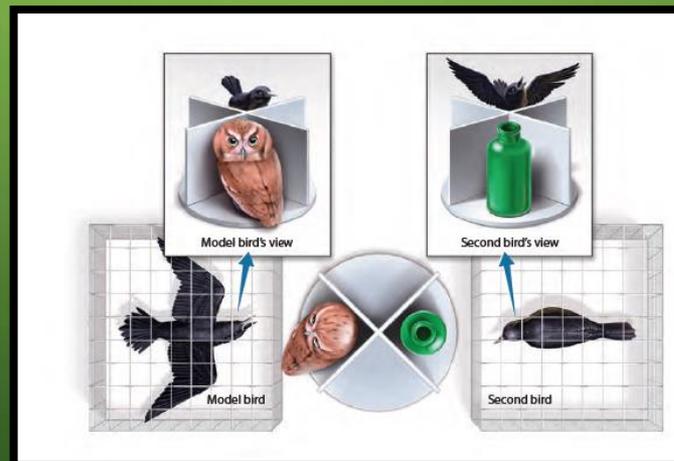
- Rhesus Monkeys, Mommies, and Snakes (Mineka et al., 1984)



- Transmission of learned associations, but fits classical conditioning.
  - No complex cognitive processing is required. (The monkey doesn't need to understand why the other monkeys are afraid; it simply reacts to their fear and associates this with stimuli around at the time.)
- Seems like true imitation, but...does not involve any complex cognition.

# SOCIAL LEARNING: MORE THAN ONE WAY TO SKIN A CAT

- Observational conditioning is “**dumb**”
  - A “model” blackbird has learned to attack a stuffed owl, which preys on blackbirds.
  - A naïve blackbird observes the attack but is shown only a plastic bottle, not the owl.
    - Contagion, stimulus pairing with environment.
    - Just a complex form of classical conditioning.



# SOCIAL LEARNING: MORE THAN ONE WAY TO SKIN A CAT

**Stimulus enhancement:** when a teacher directs the attention of the learner to particular parts of the environment

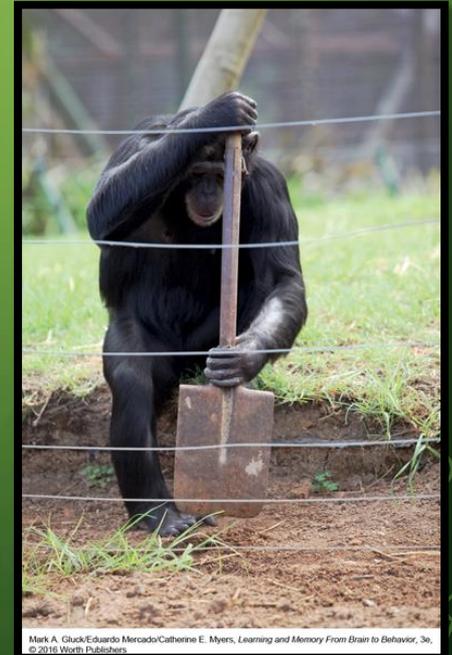


- May then be faster to learn that, when the floor is wet, running will cause falls.
- Traditional instrumental or classical conditioning
  - Highlighting a discriminative stimulus.
  - Doesn't require complex cognitive operations

# SOCIAL LEARNING: MORE THAN ONE WAY TO SKIN A CAT

**True imitation:** copying specific actions learned from another; cognitively complex; challenges behaviorism.

- **Cheap knock-offs** seem like true imitation
  - Emulation
  - Observational conditioning
  - Contagion
  - Stimulus enhancement
    - *Does true imitation really occur? If so, in what species?*
    - Humans, some other primates, and dolphins.



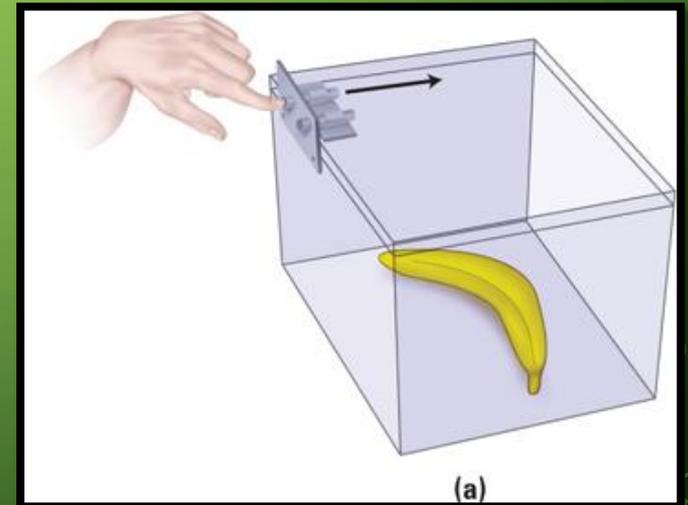
Mark A. Gluck/Eduardo Mercado/Catherine E. Myers, *Learning and Memory From Brain to Behavior*, 3e  
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# STUDIES OF TRUE IMITATION

Two-action test detects true imitation and is passed by young humans and chimps.

Procedure:

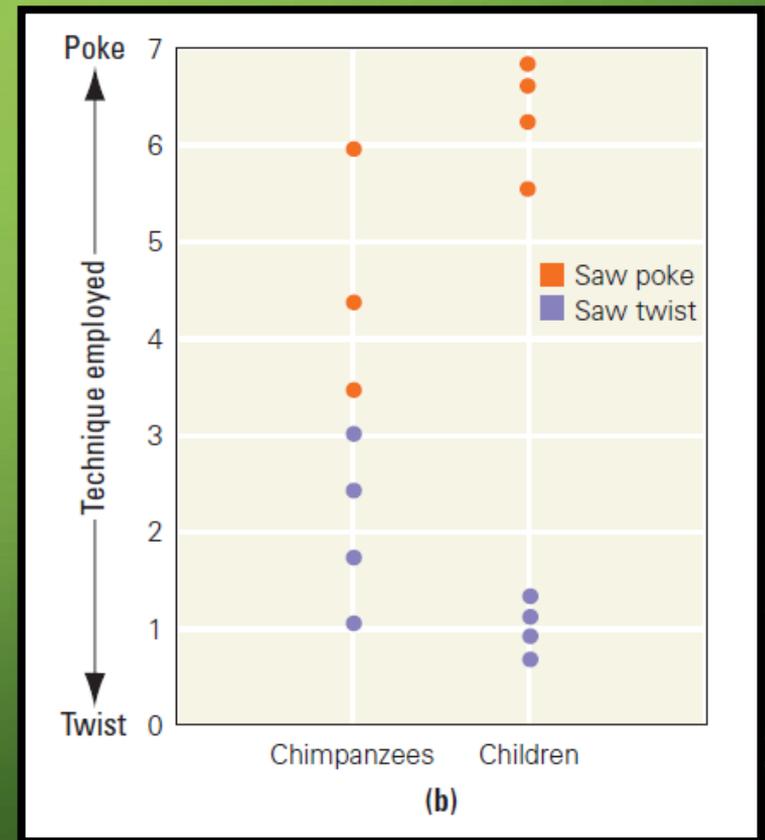
- Adult human models opened a box by (a) poking pins out of its latch or (b) twisting and pulling the pins out of the latch.
- Next, young chimps and humans observed to see if they would copy the precise style of opening.



# STUDIES OF TRUE IMITATION, PART 2

## Results

- Human children precisely copied: **true imitation**.
- Young chimps : mix of true imitation and emulation.
  - Adult humans : mix of imitation and emulation.
- At least some imitation in birds and rodents as well—  
indicating true cognitive representation of their models



# STUDIES OF TRUE IMITATION, PART 2

- Do-as-I-do task
  - “Do this” command, where reward only if animal repeats the next behavior of the trainer or model
    - Remember the Dolphin Research Center video
      1. A trainer signs “do this,” then claps her hands; the monkey must clap its hands to get a reward.
      2. Trainer now demonstrates a novel action

- **Results:**

- Dolphins and chimps can learn this game
  - Two chimps could complete 30 novel actions (Custance, Whiten, & Bard, 1995).

# COPYING WHAT IS HEARD



**Vocal learning:** learning to produce particular sound patterns

Many ways for an animal to learn to produce a particular sound

- Instrumental conditioning: trial and error
- Innate/fixed sound patterns (the “ribbit” of a frog)
- True **vocal imitation** – listening to sounds in the environment and trying specifically to copy them; a form of true social learning

**Question: Does true vocal imitation occur?  
If so, in what species?**

# COPYING WHAT IS HEARD PART 2

- Vocal imitation is rare in animals
  - Seems to be limited: humans, some birds, some marine mammals
  - Evolutionarily strange set of species
    - Our close primate relatives show no ability to imitate sounds.
  - Physical structures necessary to control precise vocalization?
- Songbirds...

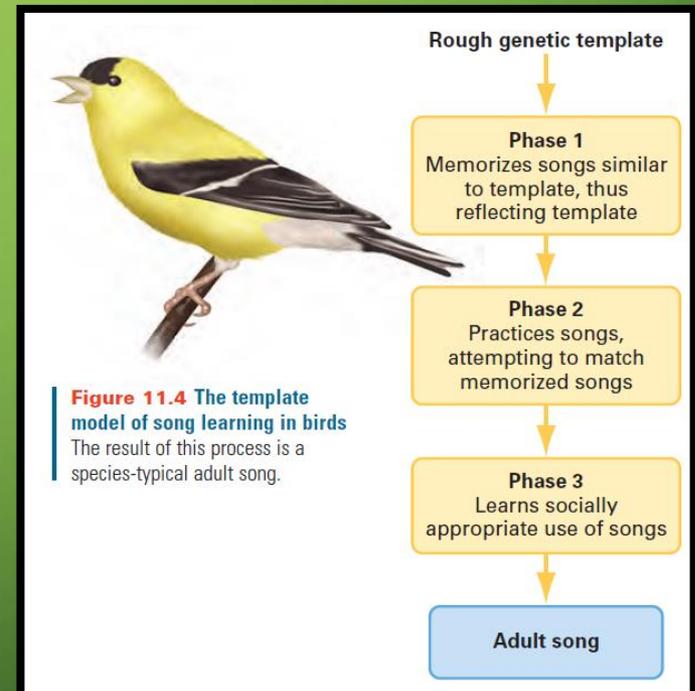


# COPYING WHAT IS HEARD PART 3

- Songbirds learn socially
  - If raised in isolation, correct singing doesn't develop.
  - Dialects based region.
  - Cross-fostering if the chick interacts with the parent.

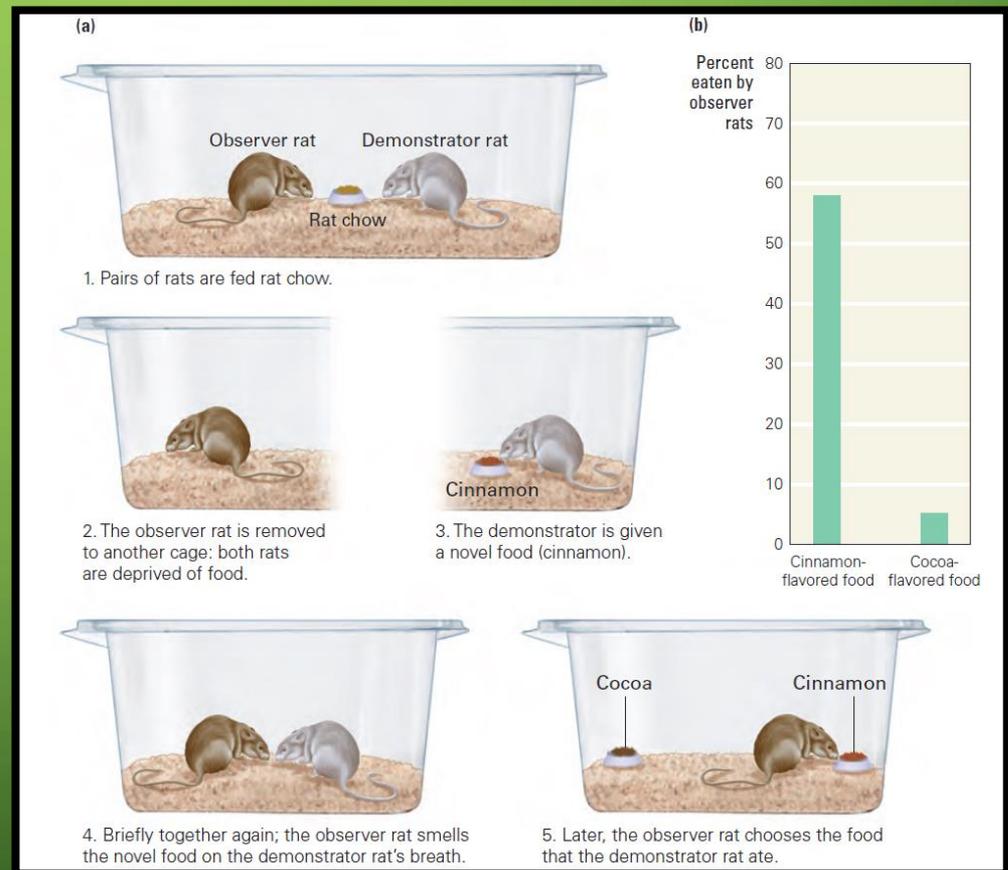
- Template model

- Memorize songs similar to genetic template
- Refine own production to template
- Learn when/why to sing



# SOCIAL TRANSMISSION OF INFORMATION

- **Social transmission of information:** a process in which an observer learns something through experiences involving other agents
  - Ubiquitous in humans
  - Broken Soda Machines



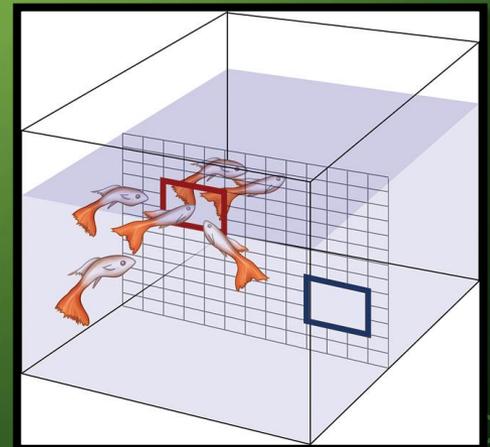
# SOCIAL TRANSMISSION OF INFORMATION PART 2

- **Social conformity:** tendency to adopt behaviors of the group.
  - Enables adaptive behaviors to spread rapidly
  - Can also impair learning of novel solutions ...

- Demonstrator guppies trained to swim to one of two open holes in a net to escape an aversive stimulus
- Naïve guppies then tested with the presence of the demonstrators and an additional, better escape route

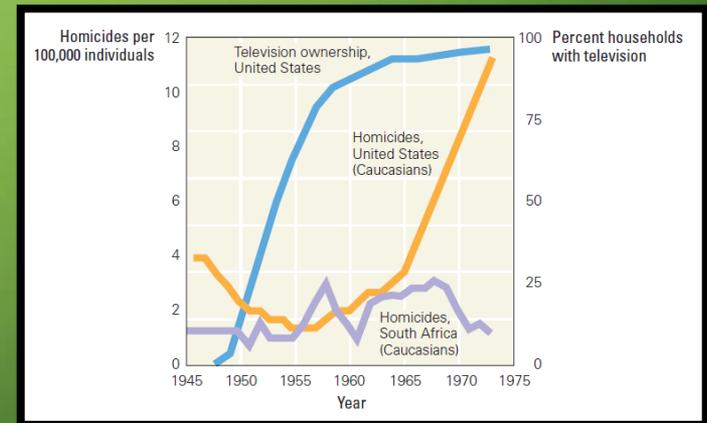
## Results:

- Naïve fish tended to follow the demonstrators
- Decreasing the number of demonstrators decreased conformity.



# SOCIAL TRANSMISSION OF INFORMATION PART 3

- Media?
  - Violent movies and video games
  - Sexualized behavior in the media
  - Images of health and beauty
  - Centerwall (1992): TV ownership in the United States increased in tandem with homicide rates
    - No change in South Africa, TV was banned.
    - Correlation is NOT Causation
    - Other countries introduced TV without increases in homicide rates (e.g., France, Japan)



# SOCIAL TRANSMISSION OF INFORMATION PART 4



- Children exposed to videos of aggression
  - 7- to 9-year-old aggressive boys were more likely to assault other boys during a hockey game after watching a violent video (Josephson, 1987).
    - Most of this research examines only short-term changes.
    - Possible positive benefits (e.g., becoming a medic after watching a war movie.
    - It is still controversial whether or not there is a true causal relationship.
- NIMH still cautions that repeated exposure to media violence may decrease sensitivity and increase aggressive behavior.

# BRAIN SUBSTRATES OF SOCIAL LEARNING: ISSUES

Same or different as other forms of learning?

## Same

Involves memories for both episodes (I saw her do this) and skills (now I'm going to do the same).

Brain substrates the same as traditional episodic and skill memory?

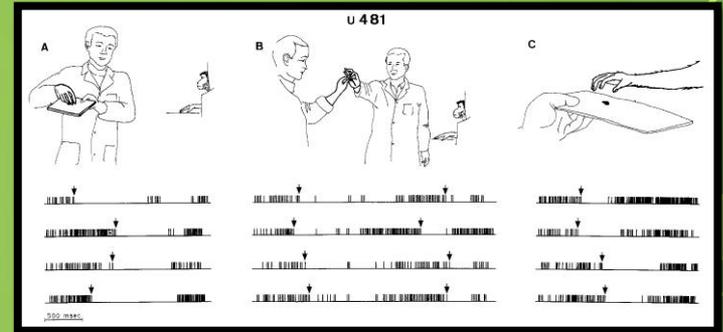
- How is it done?
  - Encoding: visual or auditory observations (what the model did)
  - Retrieval: actions or speech (what you do)
    - *How are memories for model actions translated into motor plans?*

## Different

Only evident in some species.

Specialized brain structures?

# MIRROR NEURONS

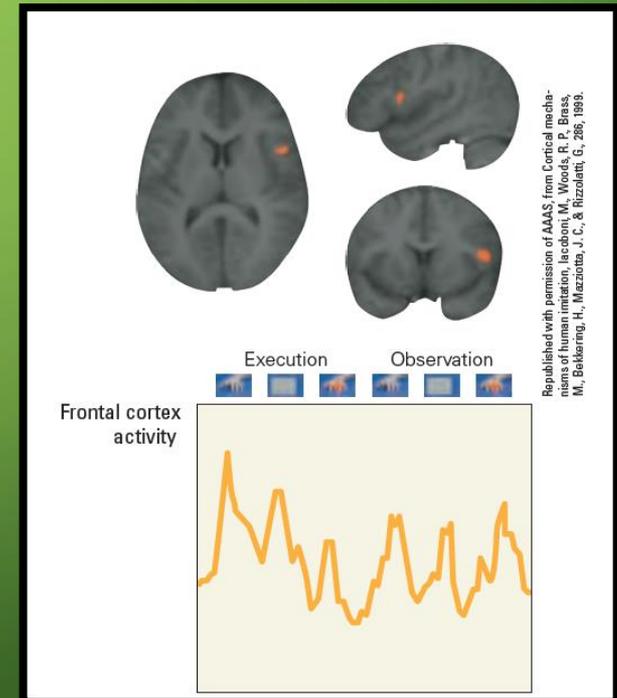
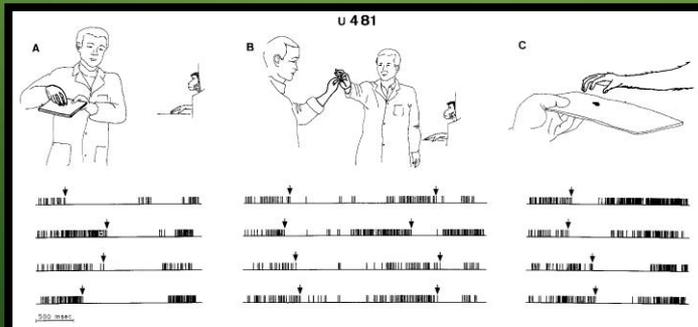


- Recordings from awake primates (di Pellegrino et al., 1992)
  - **Mirror neurons**
    - Fire for both *watching* and *doing* an action.
    - Might fire when a monkey grasps an object **and** when it sees another monkey grasp an object.
  - Represent a neural component of social memory
    - Linking observed behaviors with motor outputs.
    - True imitation: some mirror neurons fire only during specific activities, when observed and performed.
    - Emulation: other mirror neurons fire for specific *outcomes*, regardless of how achieved, when observed and performed.

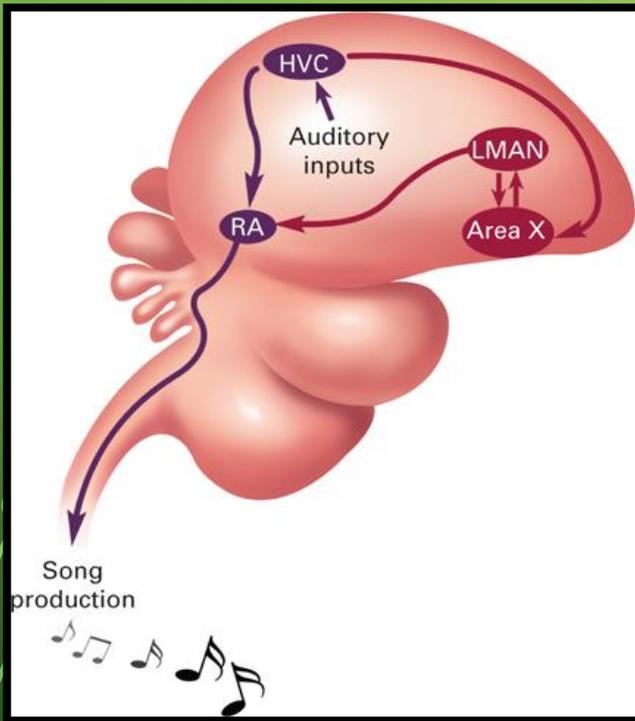
Do humans have mirror neurons?

# MIRROR NEURONS IN HUMANS

- Humans do seem to have mirror neurons.
  - Hard to record directly
  - EEG and fMRI indicate that some brain regions are activated for both observing and performing action.
    - Maybe thinking of related actions (embodied cognition)
  - Same location as in primates



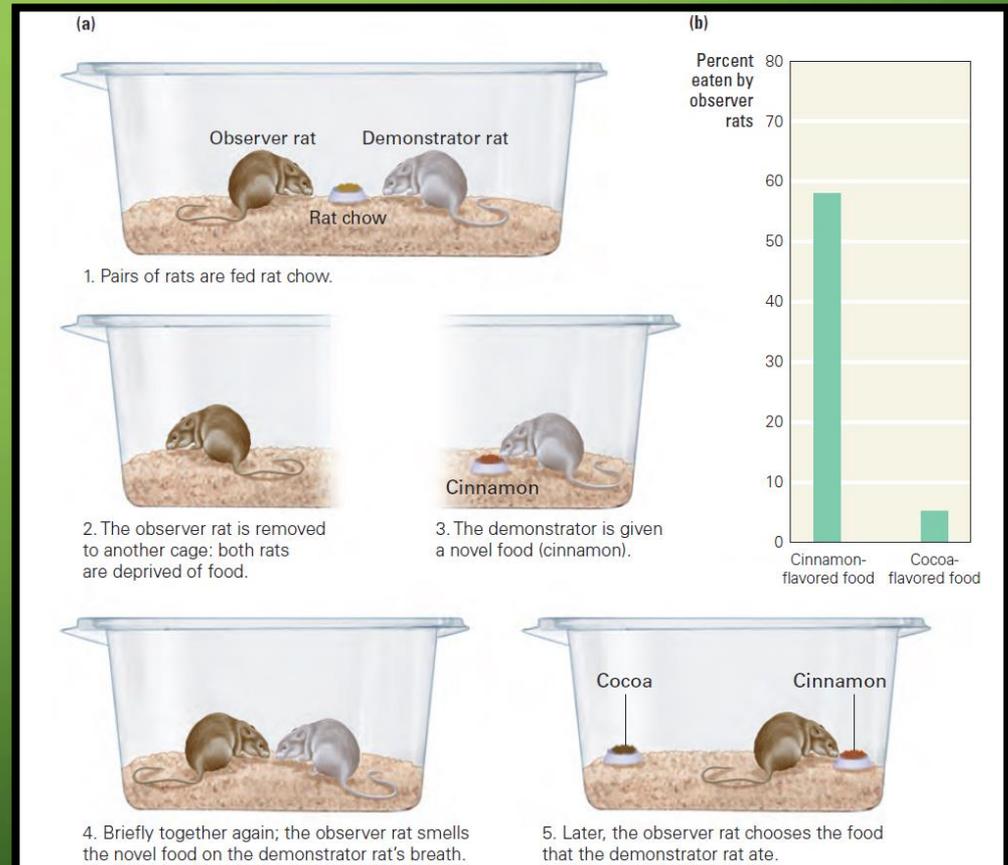
# SONG LEARNING IN BIRDS



- Birds exhibit brain activity that seems to help map observations (songs heard) onto performance (songs being sung):
  - Song centers: High Vocal Center (HVC) & Robust Nucleus of the archistriatum (RA)
    - Active both when listening and producing songs.
- As with skill learning in mammals, song learning in birds also requires the function of a brain area homologous to the basal ganglia (area X).

# SOCIALLY TRANSMITTED FOOD PREFERENCES

- Learning paradigm:
  - A demonstrator rat is fed food with a novel odor (e.g., cinnamon-flavor food).
  - The demonstrator rat is then placed in a cage with a food-deprived observer.
  - The observer smells the scent of food on the demonstrator's breath, and will form a long-lasting preference for that flavor food.



# SOCIALLY TRANSMITTED FOOD PREFERENCES

- Lesion studies indicate important roles for the hippocampus and the basal forebrain.
  - Hippocampus lesions
    - Temporally-graded retrograde amnesia with a temporal gradient
      - Most recent food preferences affected more
  - Basal forebrain lesions
    - Completely eliminate ability to retrieve socially learned food preferences
      - New preferences can be formed

*Very similar to the brain substrates of episodic memory*

# AUTISM SPECTRUM DISORDER

- Impaired social function:
  - Poor social interactions, Need to have strict routines, Sensory overload, Stereotypical/repetitive movements
    - Echolalia – repeating words and spoken phrases
  - Symptoms are quite varied across those afflicted.
  - Recognized as a disorder in the 1940s
  - Definitions and diagnosis are tricky, and always under debate
- A type of “mind blindness”—an inability to understand the mental life of others?
  - Should have great difficulty with true imitation?

# AUTISM SPECTRUM DISORDER PART 2

- Autism is associated with some deficits of imitation:
  - Some studies have shown strong deficits, others less so.
    - Autistic children can complete do-as-I-do tasks for simple actions (e.g., drinking) but have difficulty with action sequences.
    - In the two-action task, older autistic children tested normally, but younger autistic children were impaired.
    - Probably not a global deficit of all social learning, but some specific impairments seem common.
  - Studying affected brain areas might give us a clue but...
    - Sensory cortex, PFC, Hippocampus, Cerebellum, Amygdala, Basal ganglia, Corpus callosum, Temporal lobes, Mirror neuron system

# IMITATIVE DEFICITS AFTER STROKE

- Stroke can also cause problems with imitation and social learning.
  - Parietal lesions can cause difficulty initiating movement (apraxia) that includes difficulty imitating.
  - Frontal-lobe lesions can cause “involuntary imitations,” including echolalia. These make the patient susceptible to disruption.

