

# Lecture 7: Attribution and Behavior



Cogs 102A \* Distributed Cognition

# The Problem of Attribution

## The Photophilic Fly

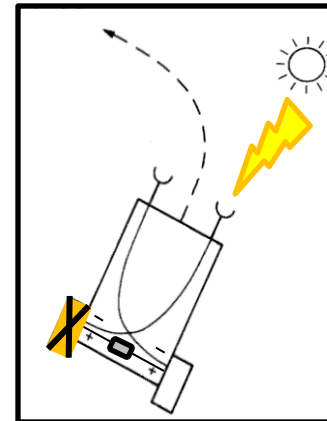
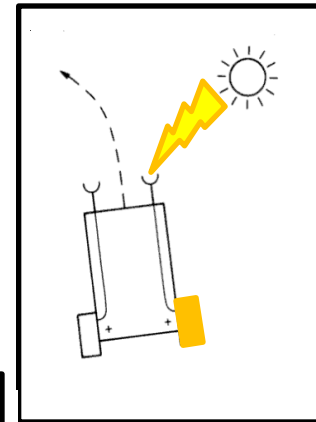
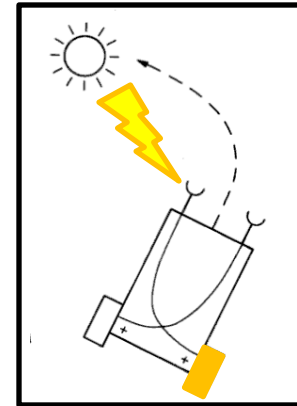
- Flies will fly toward light
  - A “trophism”
  - It “likes” light, it “wants to go” to light
- Should we attribute “desires”, “goals” to flies?
  - To mammals?
  - To primates?
  - To humans?
  - To robots?



# Braitenberg's Vehicle

## Mechanism:

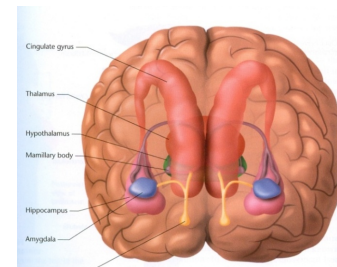
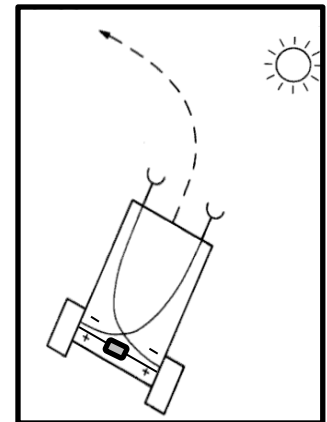
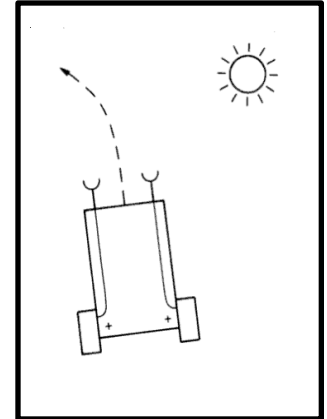
- Activation of left light sensor drives right wheel (& vice versa)
  - >> Vehicle turns toward light
- *Rewired*, activation of right light sensor drives right wheel (& vice versa)
  - >> Vehicle turns from light
- *Rewired*, activation of right sensor inhibits left wheel (& vice versa) driven by internal battery
  - >> Vehicle turns from light
- SO, different mechanisms can produce same behavior



# Braitenberg's Vehicle

Some implications:

- 1) Behavior cannot tell you unequivocally what internal mechanism is involved!
- 2) An attributional term (“want”, “like”) is a convenient summary of regularities of behavior
  - e.g. In both cases shown here, vehicles acts as if it “dislikes”, “wants to avoid” light.
  - In that case, these terms could just as well apply to vehicle, and fly, and human
  - After all, isn't the brain just another kind of wiring...?



Traditionally

researchers DO attribute internal ("cognitive") mechanisms  
based on performance

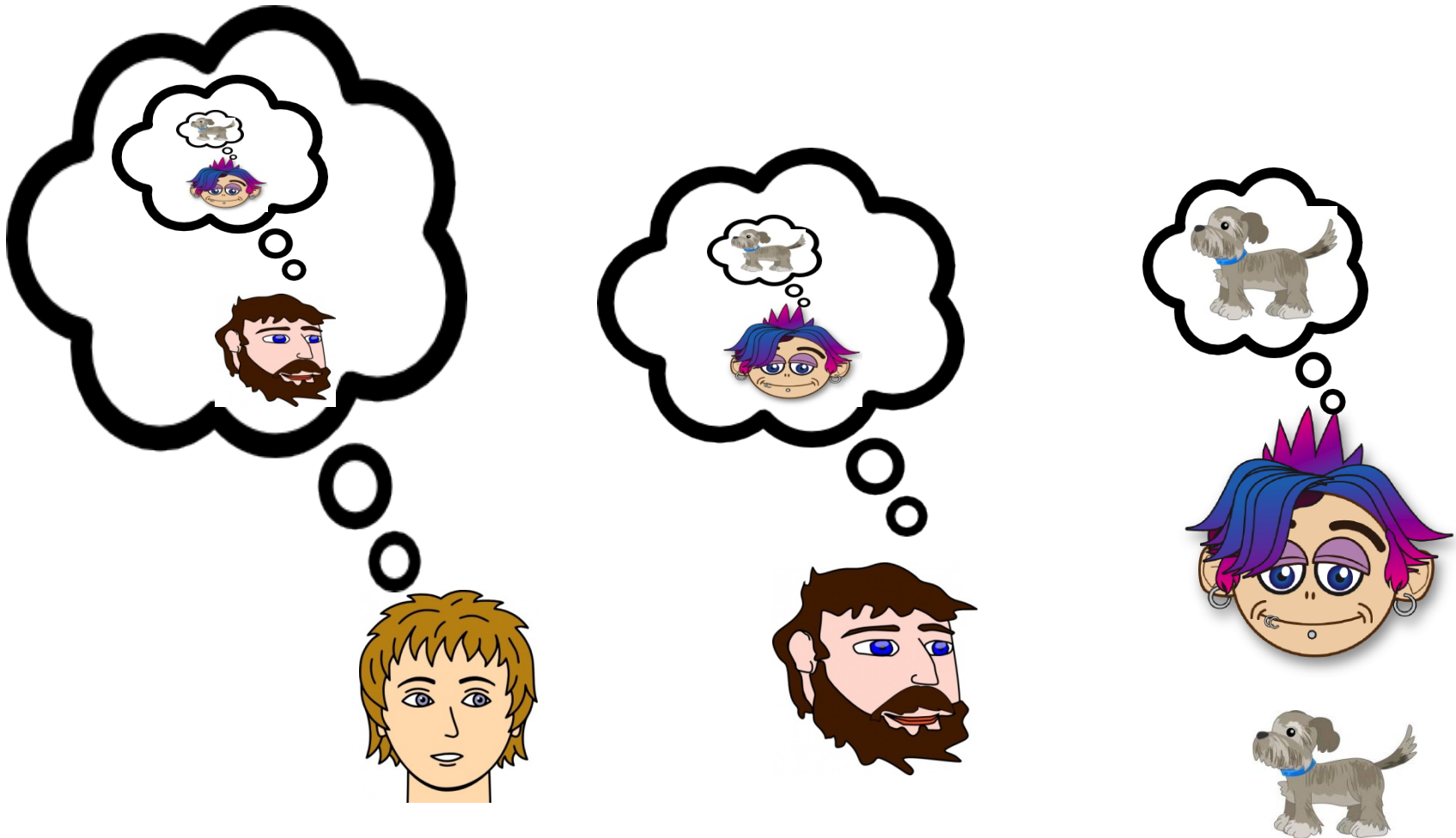
e.g. Children *have* a “Theory of Mind module” that “turns on”  
between 2 & 3 years of age

Let us examine the presumptions at work here...

# Theory of Mind

(ToM)

I have a theory that you (and I) have a mind...



# Theory of Mind

(ToM)

I have a theory that you (and I) have a mind...

## **False Belief Task**

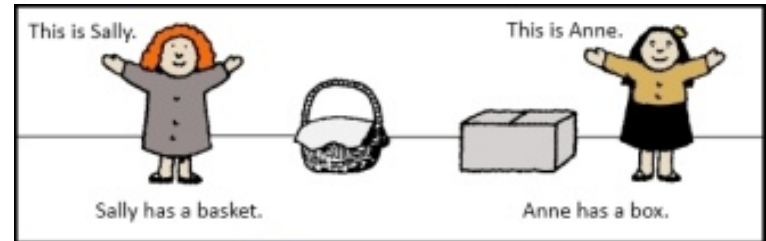
(AKA “Sally-Ann Task”)

Considered the definitive test for ToM

# False Belief Task

## Sally/Ann Task

- Subject sees Sally & Ann (Bert & Ernie, etc)

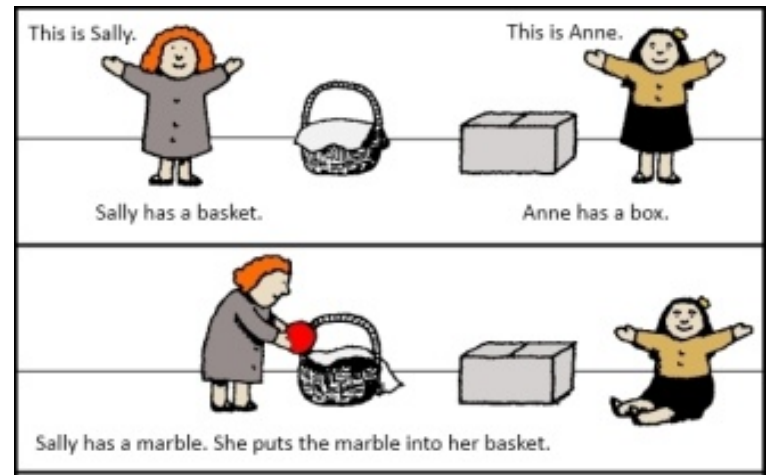




# False Belief Task

## Sally/Ann Task

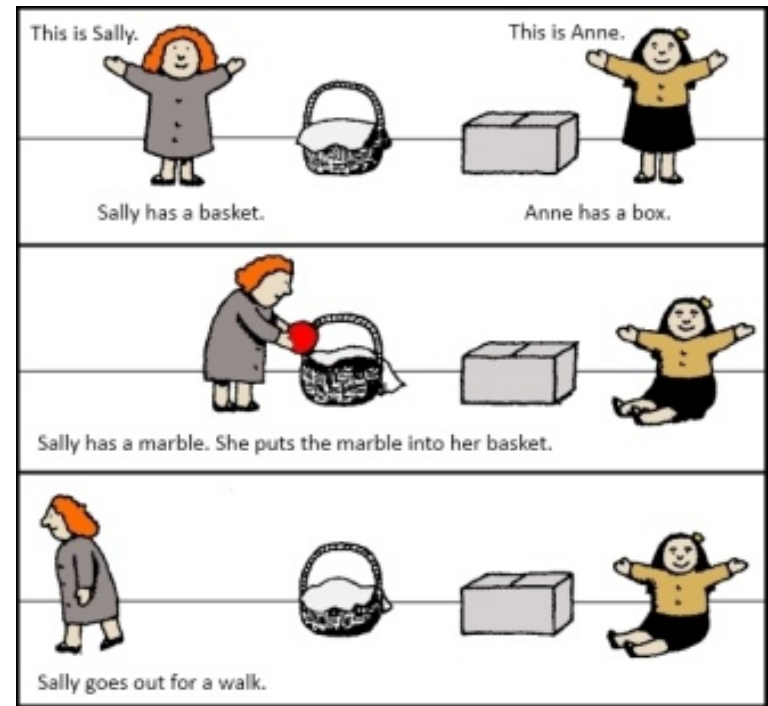
- Subject sees Sally & Ann (Bert & Ernie, etc)
- Sally hides object at A



# False Belief Task

## Sally/Ann Task

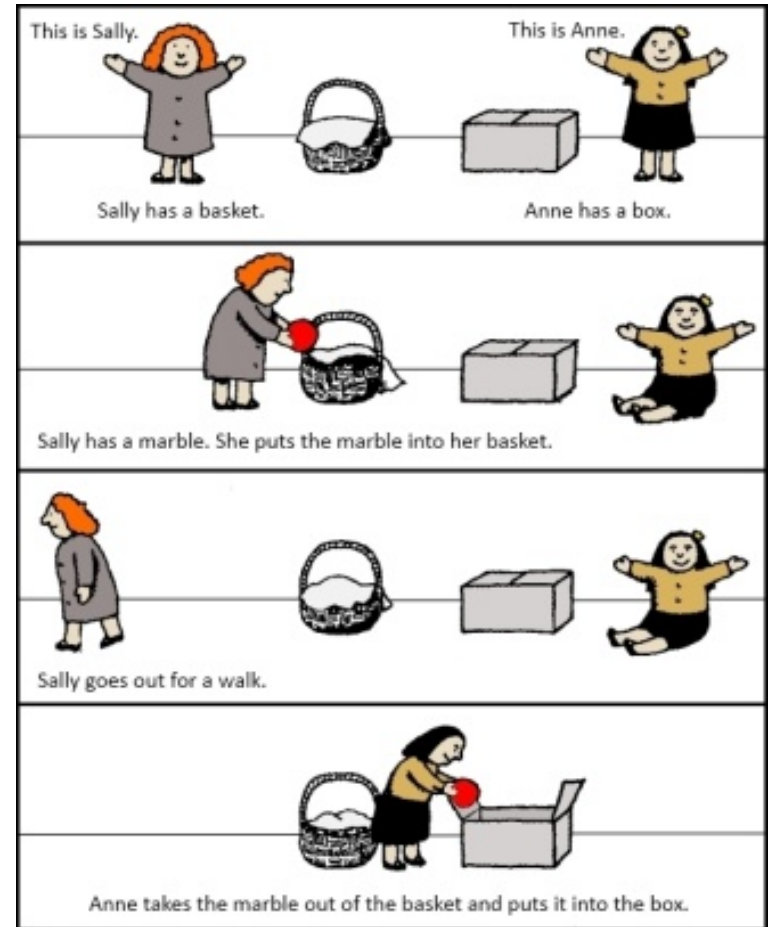
- Subject sees Sally & Ann (Bert & Ernie, etc)
- Sally hides object at A
- Sally leaves, Ann stays



# False Belief Task

## Sally/Ann Task

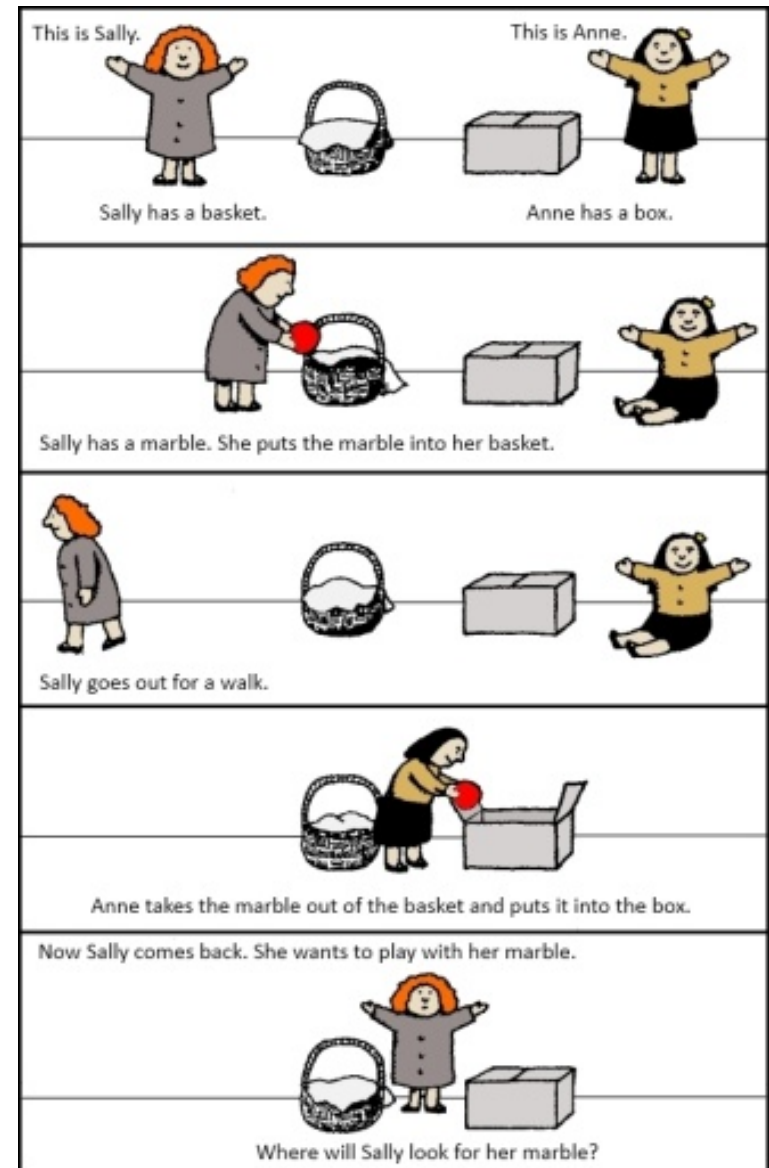
- Subject sees Sally & Ann (Bert & Ernie, etc)
- Sally hides object at A
- Sally leaves, Ann stays
- Ann moves object to B, then leaves



# False Belief Task


## Sally/Ann Task


- Subject sees Sally & Ann (Bert & Ernie, etc)
- Sally hides object at A
- Sally leaves, Ann stays
- Ann moves object to B, then leaves
- Experimenter asks subject:  
“Where will Sally look for object when she returns?”

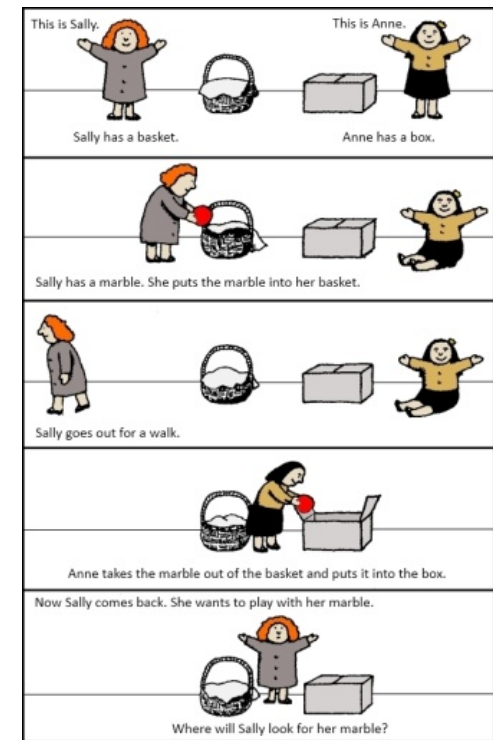


# Attributing False Beliefs ?

## RESULTS

- 2 yr olds “fail” 
  - Pick B (where object is)
  - Interpreted: “They believe others believe the same as they believe”

- 3 yr olds “succeed” 
  - Pick A (where object was when Sally was last present)
  - Interpreted: “They believe other has ‘false belief’ diff from their own”



i.e. Results explained by the presence/absence of a “mental ability” to represent the beliefs of others

# Another Perspective...

- We would say . . .
  - . . . child has learned behavioral contingencies of many complex interactions involving. . .  
multi-party coordination of looking, not looking, seeking, finding, not finding, etc.
- Plus 3 year olds have also developed relevant linguistic competencies
  - e.g. For use of terms like “will”, “where”, “look for” etc.



Tissot “Hide & Seek” 1877

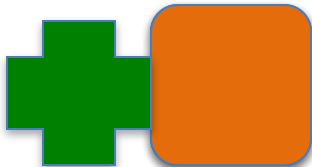
# Theory of Mind

Whatever ToM is, it is not monolithic

- Emerges in stages, typically characterized as...

- **6 month olds** – act as if attribute Animacy

*Behavior:* Treat an object differently if initiates own movement  
vs. if it is only moved by other



# Theory of Mind

Whatever ToM is, it is not monolithic

- **1 year olds** act as if it attributes “Intentions”, “Goals”
  - *e.g.* If adult reaches for object, infant will get it and give it
  - Familiar enough with common sequences of interaction, infant can “complete” task for another



- Some say “representing” intentions required for Imitation



- BUT see deBarbaro, Johnson & Deak 2013!



# Theory of Mind

Whatever ToM is, it is not monolithic

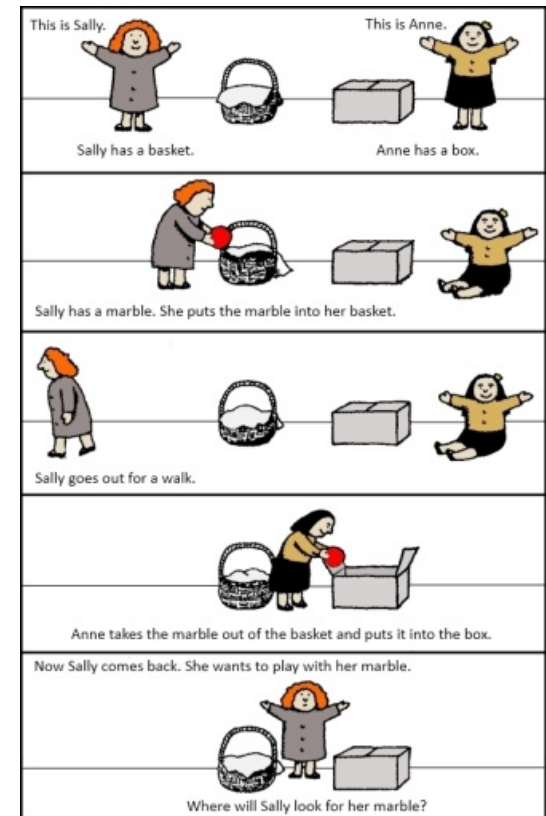
- **2 yr olds** distinguish that diff people respond differently to same stimulus
  - You say “Yum!”, I say “Yuck!”
  - i.e. Come to attribute Preferences



# Theory of Mind

Whatever ToM is, it is not monolithic

- **3 year olds** act as if they attribute beliefs
  - Per classic False Belief Task
  - Traditionally say child has developed the capacity to “represent the beliefs” of others and compare them to their own
  - i.e. “...have a full-blown Theory of Mind”
- **"Mindreading"**



# Nominal Fallacy

- Confusing naming a phenomenon with explaining that phenomenon
  - e.g. Saying that kids have a "ToM ability" as an explanation for their passing the False Belief task

- *We would say, instead...*
- Child had sufficient, scaffolded experience with situations in which players had differential access to an object's shifting location, and thereafter predictably engaged in different search routines



# Nominal Fallacy

- Confusing naming a phenomenon with explaining that phenomenon
  - e.g. Saying monkeys have “ability to deceive” used to *explain* why subordinates have sex in the bushes



- *We would say, instead...*
- Sufficient experience with, and observation of, conditions under which dominant male does/does not show aggression toward subordinates (e.g. not when his back is to them) leads subordinates to recognize & manipulate affordances (e.g. move to place of no line of sight)

# Nominal Fallacy

- Confusing naming a phenomenon with explaining that phenomenon
- So, learned regularities in social & material conditions promote predictable behavior



- Naming the achievement of such behavioral regularity as “*having an ability*” explains nothing
- Can be misleading, actually obscure cognitive processes involved

“Mindreading”  
is behavior reading...

Just what behaviors do we read?

To attribute “Motivation” -- Read Affect & To/From

## AFFECT

- Esp in mammals, “emotional displays” correspond to satisfaction, fear, aggression, etc
- These play a role in negotiating alliances, power struggles, collaboration, parenting, etc.



# To attribute “Motivation” -- Read Affect & To/From

## AFFECT .

- Aspects of facial expressions mimicked at birth
- Smiles shared early in mother-infant interactions
- Usually associated with own evaluation of situation, but potentially “deceptive” for impact on other

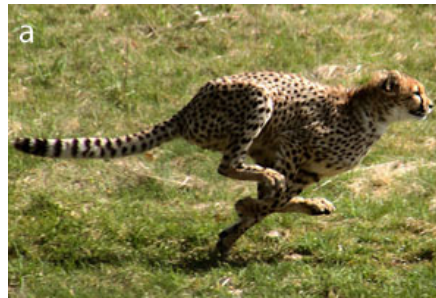




To attribute “Motivation” -- Read Affect & To/From

## TO/FROM

- Animals approach some stimuli (food, mates, friends),
- Avoid others (predators, enemies)



- Ethology (Study of Animal Behavior) long recognized TO/FROM as basic propensities of animate engagement
- Psychology calls stimuli that provoke TO/FROM “positive” vs. “negative” “reinforcers”



To attribute “Motivation” – Read Affect & To/From

## TO/FROM

- Practices “carve up” co-inhabited space, establish “boundaries” in inter-animal distance, etc
  - “Personal space”
  - “Approach/avoidance conflict”
  - Boundaries as trigger points for change



To attribute “Motivation” – Also read Long-Term Patterns

W/repeated experience, can also use long-term behavioral patterns

- Predict will tend to act, in context, as have in the past
- This can become very complex in humans...
  - Who tends to attend, turn to/from whom?
  - Who displays what affect toward whom?
  - How effected are these by who else present/absent?
  - Who sides with whom in conflicts?
  - Who prioritizes gaining which rewards?
  - Who tends to adopt which cultural conventions?
  - Etc...!

## To attribute “Motivation” – Also read Long-Term Patterns

- *Biases* in social inference      “**Fundamental Attribution Error**”
  - 3 Parameters interact: Distinctiveness, Consistency, Consensus
    - **Distinctiveness** – Action/event (by anyone) familiar or novel to B?
    - **Consistency** – Has A tended to do this to B in the past?
    - **Consensus** – Does A tend to do this to others?
  - If high distinctiveness, high consistency, high consensus
    - e.g. B is hurt, A has hurt B in past, A seen hurting others
      - Attribution: A is at fault, A is a “hurter”
  - If high distinctiveness, low consistency, low consensus
    - e.g. B is hurt, A never hurt B before, A never seen to hurt others
      - Attribution: No one at fault, circumstances/accident responsible
  - If high distinctiveness, high consistency, low consensus
    - e.g. B is hurt, A hurt B in past, A never seen to hurt others
      - Attribution: A at fault, deliberately targeted B

## To attribute “Motivation” – Also read Long-Term Patterns

- *Biases* in social inference      “**Fundamental Attribution Error**”
  - 3 Parameters interact: Distinctiveness, Consistency, Consensus
    - **Distinctiveness** – Action/event (by anyone) familiar or novel to B?
    - **Consistency** – Has A tended to do this to B in the past?
    - **Consensus** – Does A tend to do this to others?
  
- **NOTE!**
  - Above reminiscent of “Population, Evaporation, Dispersion” in *ANTS*
    - That is, emergent attribution depends on relations across multi-dimensions
  
  - Above require tracking...
    - Historical “long-term” patterns
    - A+B (you & me) relations as well as A+Others (you & them) relations
      - i.e. Access to full ecology is required, typical of attributors

## To Attribute “Knowledge”...

- Each participant in an interaction can have a different **Epistemic Status** = who knows what

- e.g. One knows more about X than the other does



- On what basis do we make such attributions ?

# To Attribute “Knowledge”...

## Epistemic Status:

Consider Lab on Expert vs. Novice



- Expert acts more “knowledgeable”, Novice acts less
  - Expert: Smooth, contingently narrated demonstration
  - Novice: Hesitant, back-tracking, asking questions, assisted

To Attribute “Knowledge”...

**Epistemic Status:**

e.g. If see another searching, we attribute epistemic status:



Attribution: "He does not know where it is"



To attribute “Knowledge”...

## Epistemic Status

### **SURPRISE!**

Open mouth (gasp!) &  
wide-eyed fixed gaze



- Newborns suck harder when surprised
  - As when dishabituate to unexpected stimuli
- Surprise >> Attribute that subject does NOT know

To attribute “Knowledge” -- Read Attentional Behavior

## Attentional Behavior

- Sensors directed to a target, especially effortful change
  - e.g. Turn head, fixate, reach to touch, reposition for better access, co-ordinate atten/action with others, etc.



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To attribute “Knowledge” -- Read Social Attention

## SOCIAL Attention

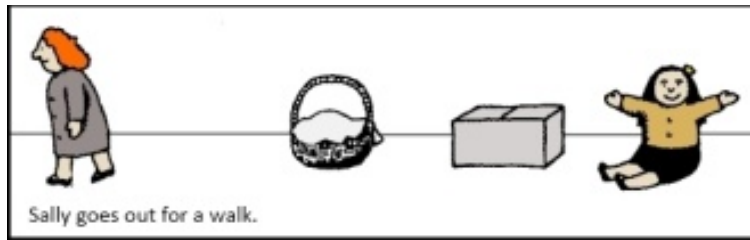
- Target of attention is, or is influenced by, a social other
  - e.g. Solicit attention, Gaze follow, Direct attention of other, Synchronize, Imitate, etc



# Social Attention

## Monitor Attention

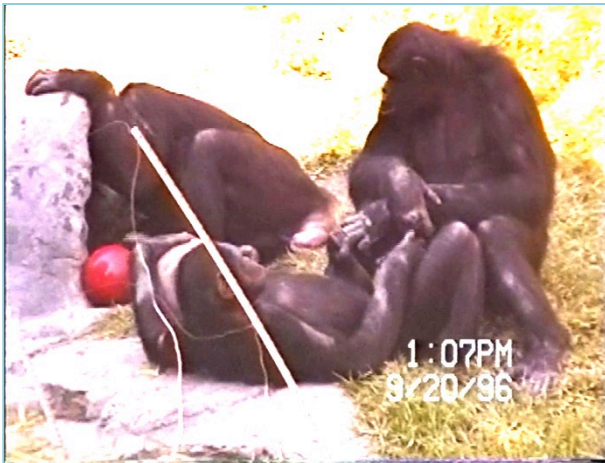
- Tracking others' attention, including their attention to the attention of others
- e.g. In **False Belief** task, above, Subject sees that Sally did not see that object was moved



# Social Attention

## Competition for Attention

- Social attention, itself, is often a valued (worked for) resource
  - Effort to attain attention interpreted as “interest”



## Social Attention

# Change in Salience

**Salience** = increase in likelihood of noticing

- Recall that Affordances are necessarily “in the eye of the beholder”
  - i.e. Affordance is not inherent to object, but based on object+user
- Since affordances change with learning, can use changes in salience to detect (observe!) learning
- *e.g. Ask: How quick to discriminate? ...to adapt to opportunities?*



## Social Attention

# Directing Other's Attention

- Use indexical gestures to point out, show others objects, events



- “Show-er” is knowledgeable
- “Show-ee” is less so

## Social Attention

# Directing Other's Attention

- One critical function of ***Language*** is to attract & direct attention
  - e.g. Name object, place, topic, etc. ("wastebasket") directs attention



- If attention so directed, attribute shared knowledge of focus



# Attributing Knowledge

## Hearsay

- Hearsay = info to which you have no direct (perceptual) access
  - Have only “the word” of (presumably knowledgeable) speaker
  - e.g. If I say “I ride bikes”, you now attribute knowledge of bike-riding to me, w/o even seeing me ride



- Likelihood of access, confidence, institutional status, etc. all contribute to credibility, likelihood of attribution

Attributing Knowledge  
Based on subject's own claims...

## **Epistemic Stance**

Any behavior that displays one's epistemic status



e.g. Conventional displays of familiarity vs. uncertainty

# Adopting an Epistemic Stance

- Heritage 2012: In human conversation, information differential is an “Epistemic Engine”
  - Ignorant asks
  - Informed replies
  - Stabilizes when both informed



- Requesting Information
  - All languages provide grammatical ways to pose a question
  - Who? What? With whom? Where? When? Why?

# Exploiting Epistemic Status

- **Deception**

- Acting "as if" know/don't know, do not notice, etc.

- e.g. Gaze Aversion



Photo by F.B.M. de Waal



In competitive situations, primates may look away from what most interests them

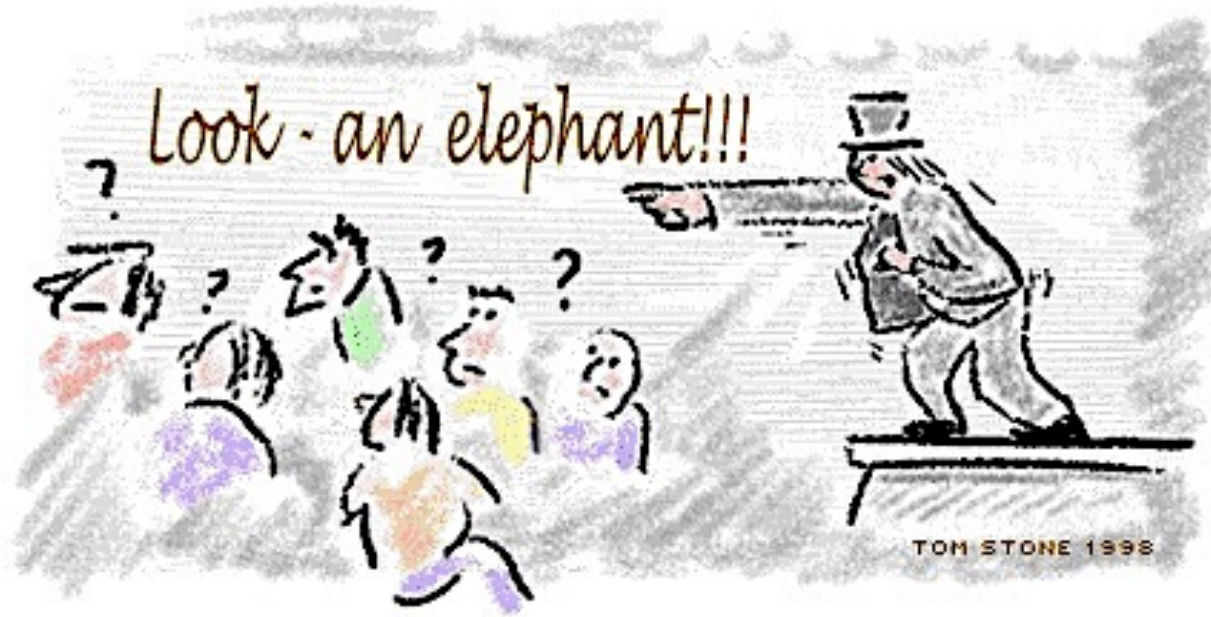
# Attentional Behavior in Deception



Connie "tricks" Lori out of her branch

# Exploiting Epistemic Status

- Deception
  - Acting "as if" know/don't know, do not notice, etc.
  - e.g. **Mis-direction**



- Competitive

*Exploiting Epistemic Status*  
“Alibi”



Teen uses “alibi” to deter mom from interfering with her gaining access to infant

# *Exploiting* Epistemic Status

- Deception
  - Acting "as if" know/don't know, do not notice, etc.
    - e.g. **“Alibi”**
- Teen shows attention to infant, which attracts concerned mom
- All are likely to produce behavior (e.g. approach other, engage) contingent w/their focus of fixation
- When infant’s mom approaches, teen fixates on a distant target – her ALIBI
- Since teen acts in a way that does not easily afford engaging w/infant, mom’s attention subsides





## LAB 5: TWILIGHT GAZE

You will examine the BEHAVIOR that underlies Social Attributions