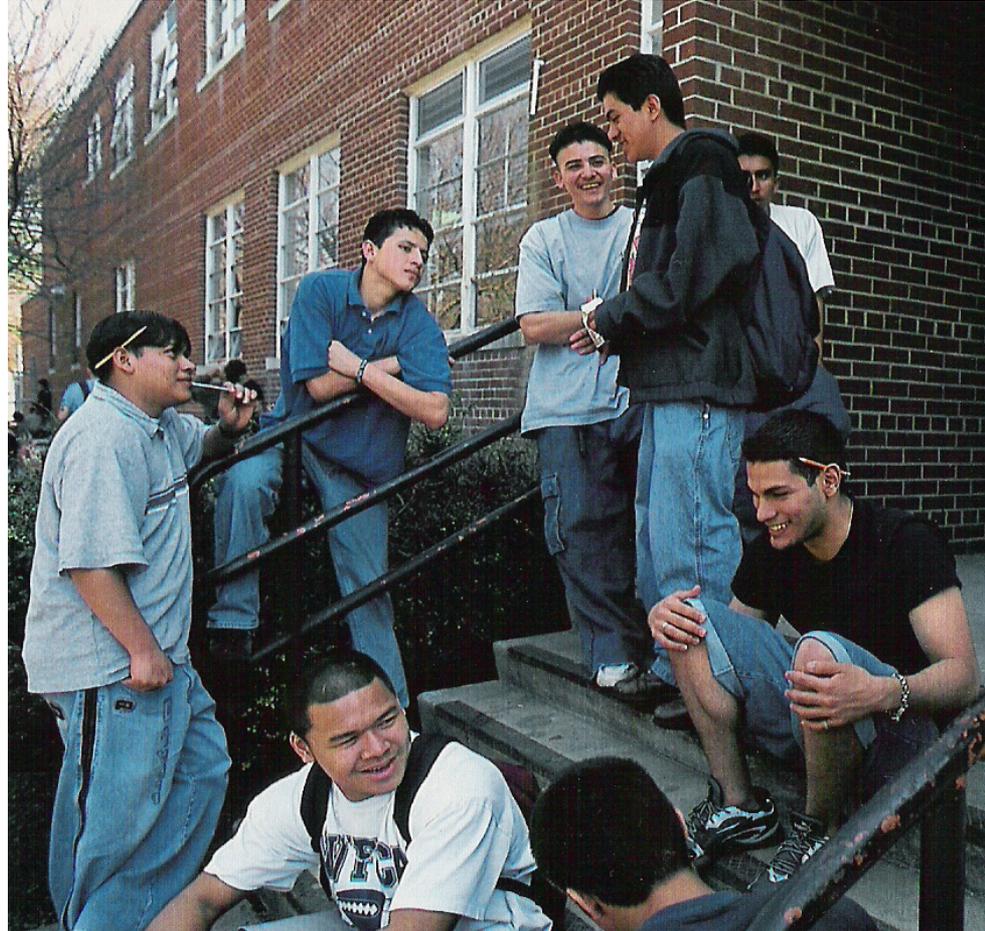


Social Attention



Paying attention to the attention of others

- Can provide significant payoffs

- Predator defense
- Identifying, finding food
- Skill learning
- Social negotiations



Primates: "The eyes have it"

The eyes are the most salient part of a primate's face

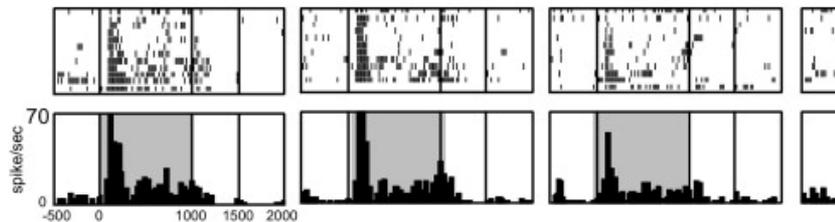
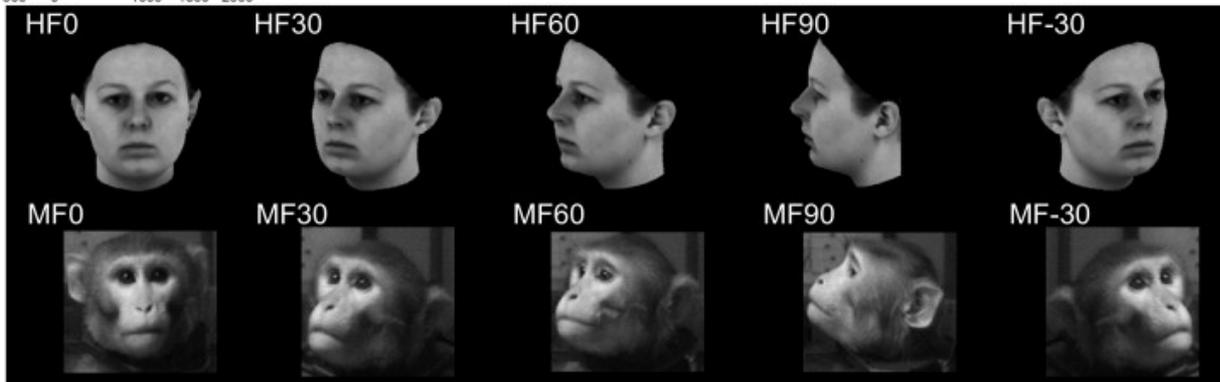
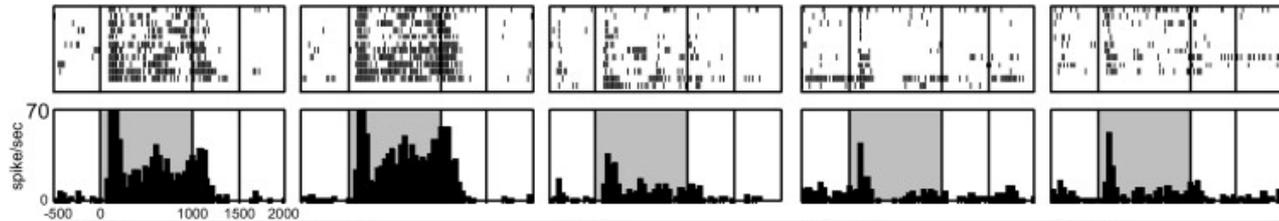


Eyes are highlighted in many species, marking them as an important facet of communication



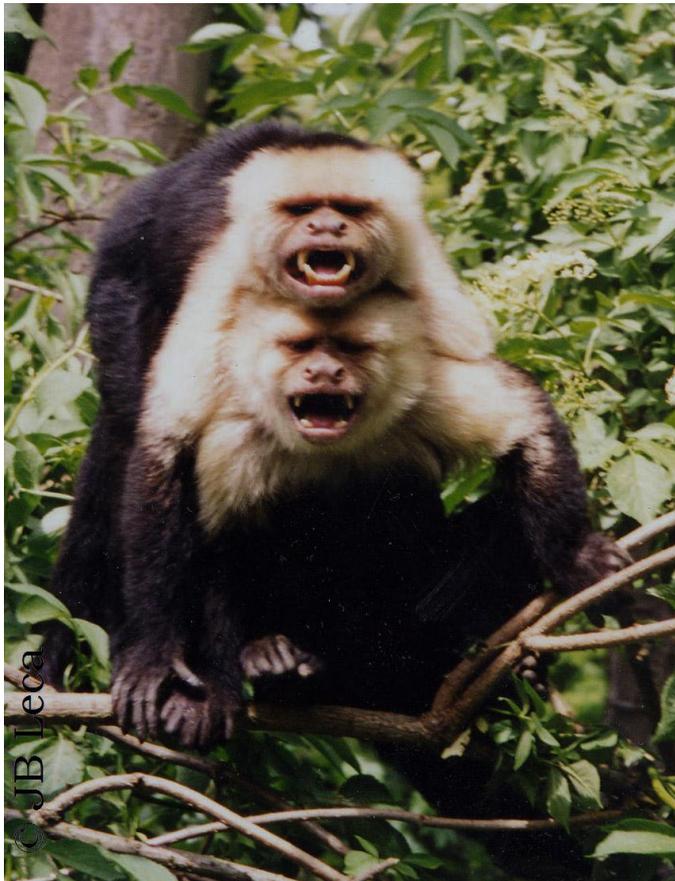
Primates: "The eyes have it"

Multiple neural mechanisms dedicated to recognizing faces, reading expressions, detecting line-of-sight etc.

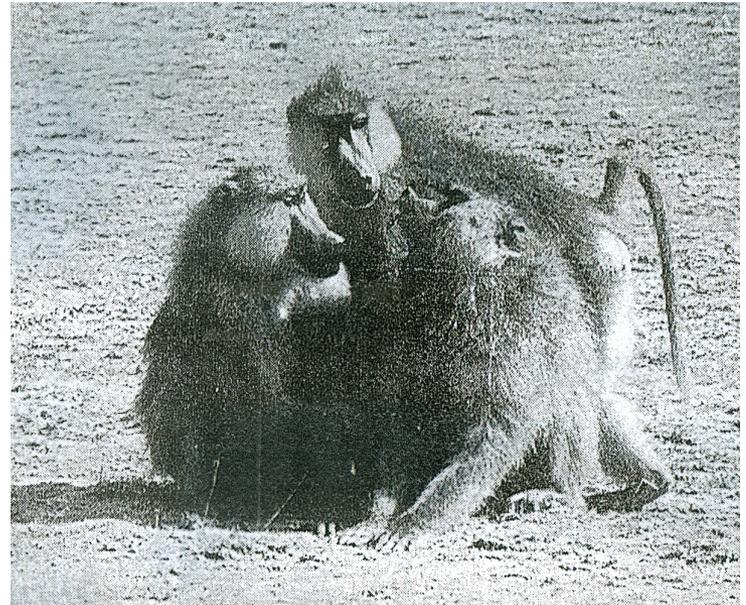


Direct eye contact is arousing

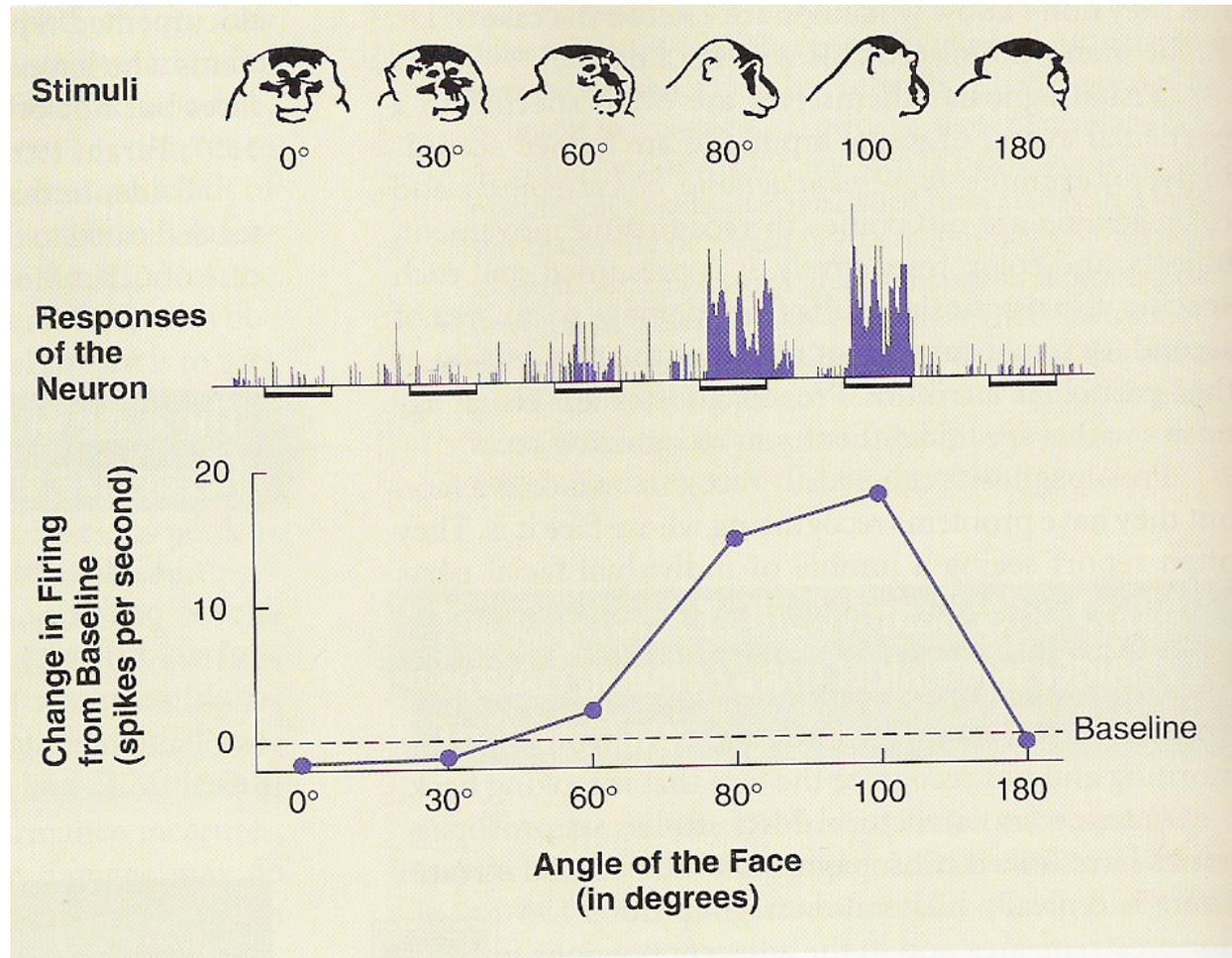
Triggers Sympathetic Nervous System
("Fight or Flight") response)



Direct gaze often a threat



STS (Superior Temporal Sulcus)



Detects shifting of head/gaze relative to perceiver

Primates monitor the attention of others

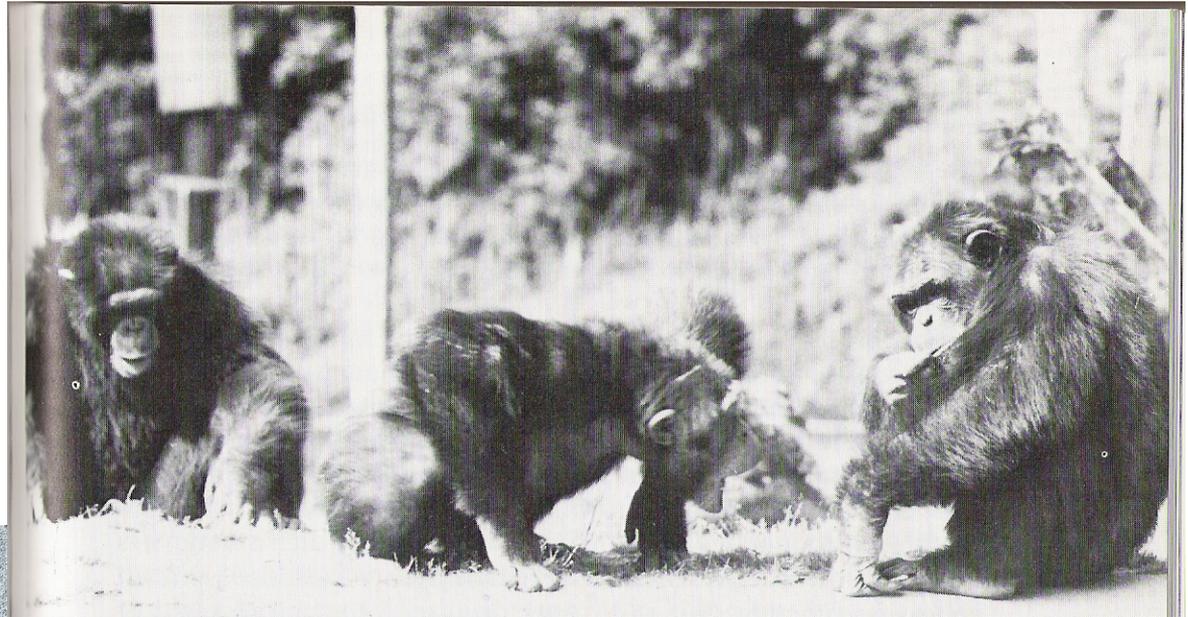
- If see approaching eye contact, get ready to engage
- **Attention** as predictor
 - of likely engagement,
 - of interest,
 - of consequences,
 - etc. etc. etc.



Primates monitor the attention of others

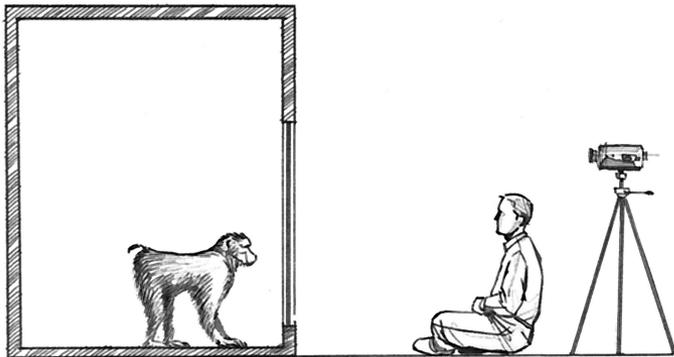
Gaze Aversion -

Can preclude (forestall) engagement

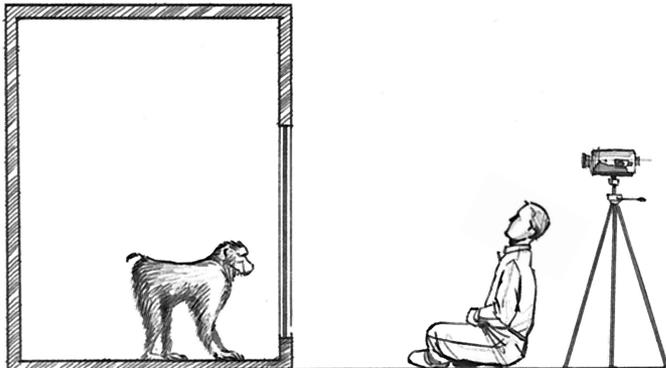


Even deter aggression

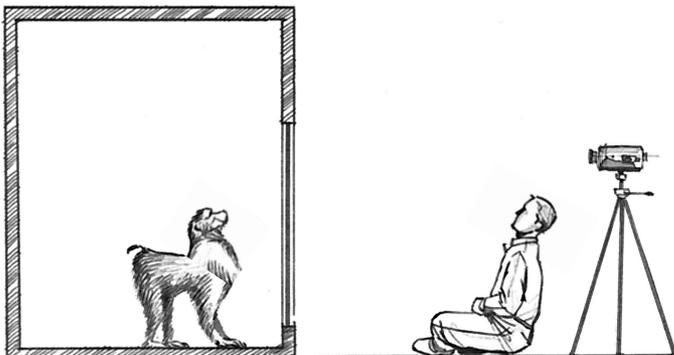
Primates monitor the attention of others



All higher primates tested show
(untrained) gaze-following



Best at using head turns,
but some can use just eyes

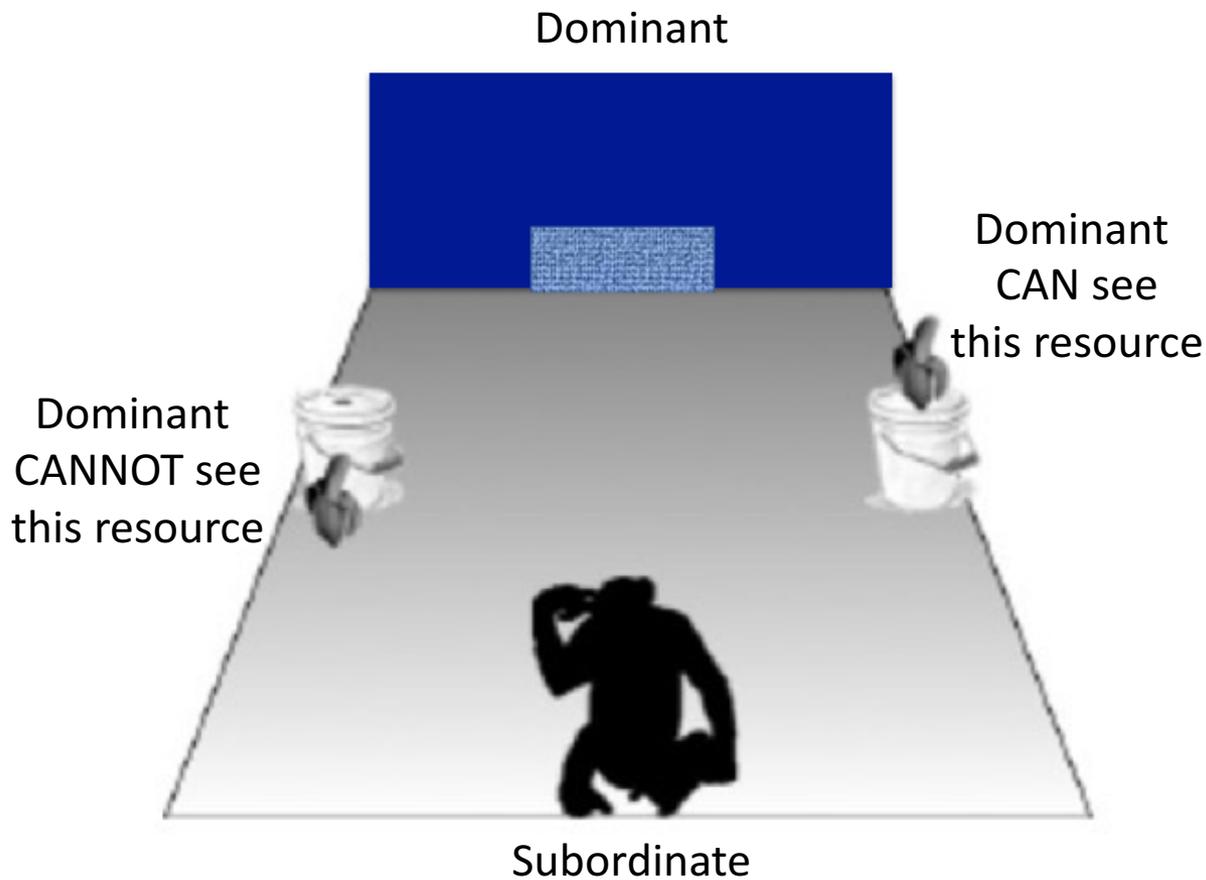


© Orangutan Foundation International

Primates monitor the attention of others

Perspective Taking

Use the orientation of other as a factor in decision-making

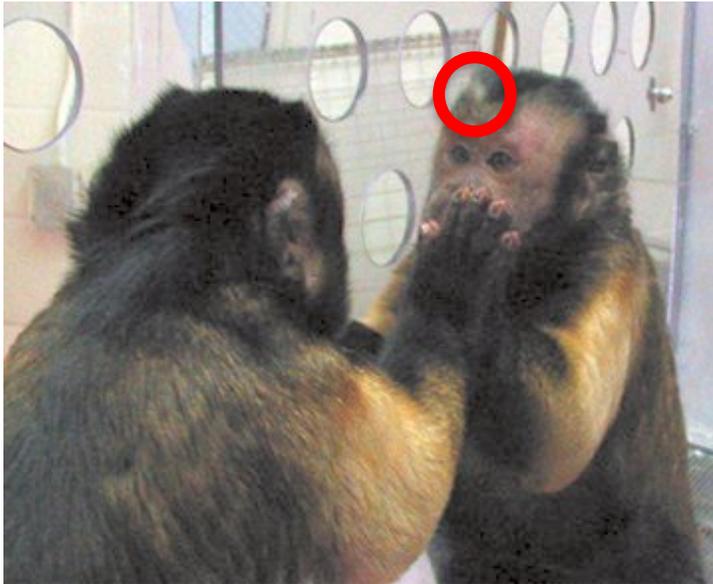


Subordinate most likely to go for food dominant can not see.

Hare et al. 2001

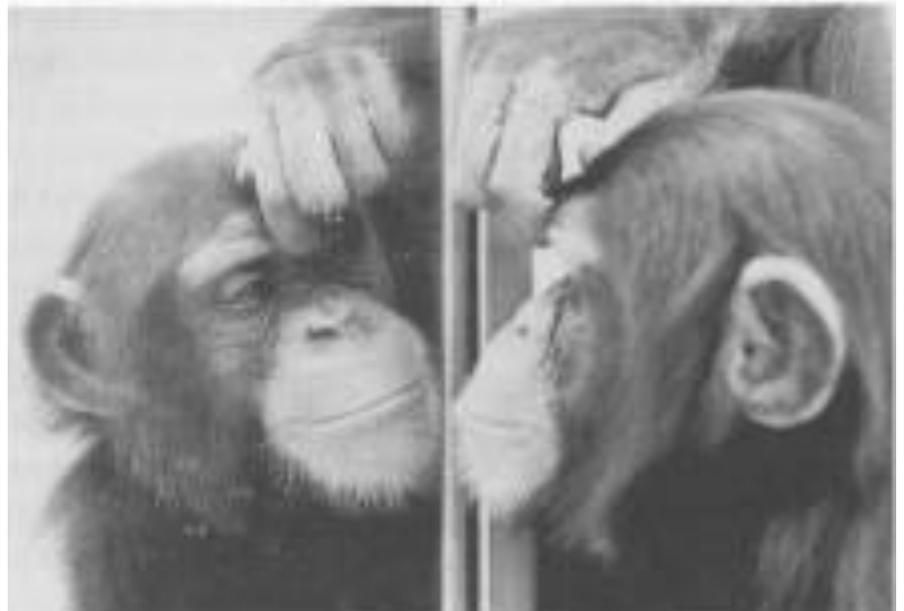
Self Recognition – “Mark Test”

Anesthetize primate, mark its face w/dye, then watch how respond to mirror



Monkeys tend to react
SOCIALLY to a mirror
i.e. as if seeing another Monkey

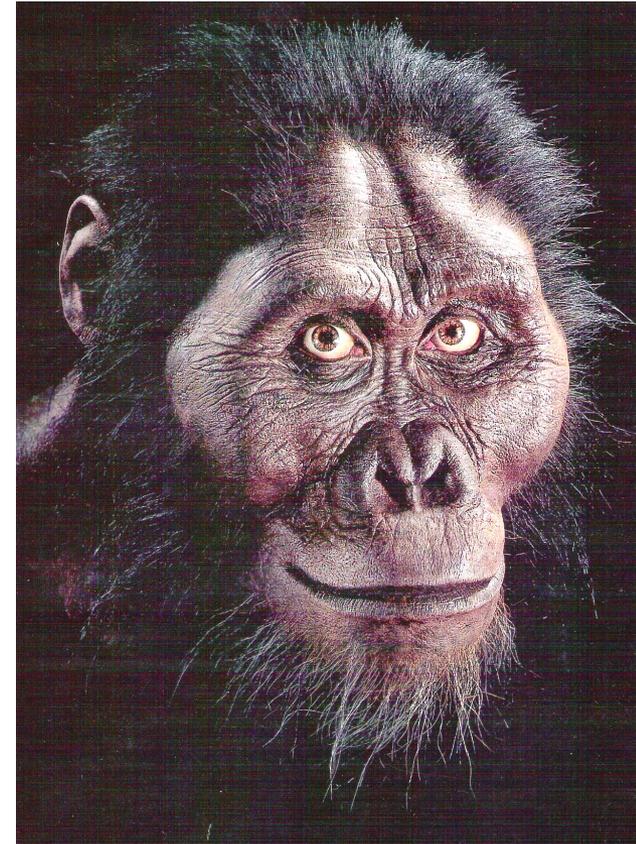
Apes tend to react as if seeing themselves,
i.e. GROOM the mark



“Self” as “seeable”?

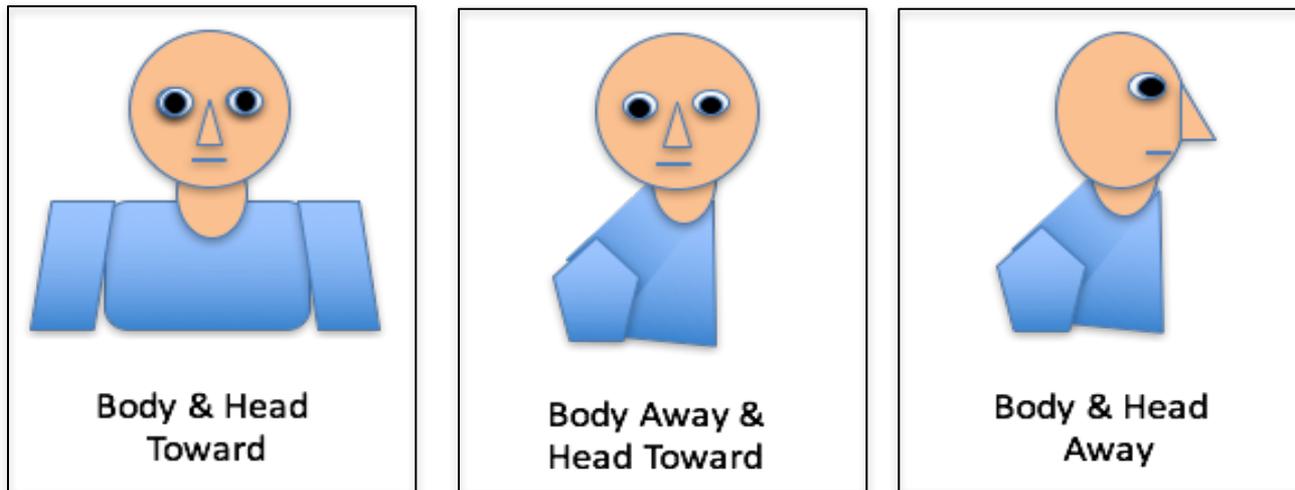
Hominid Elaborations of Social Attention

- Hominid shift to collaborative foraging etc. (see Lecture 3)
placed higher demands on both . . .
- The socialization of hand-eye coordination
(Mirror Cell System)
- *and*
- The social coordination of attention
(Limbic/Prefrontal, “Theory of Mind” system)



Eye contact synchronizes EEGs

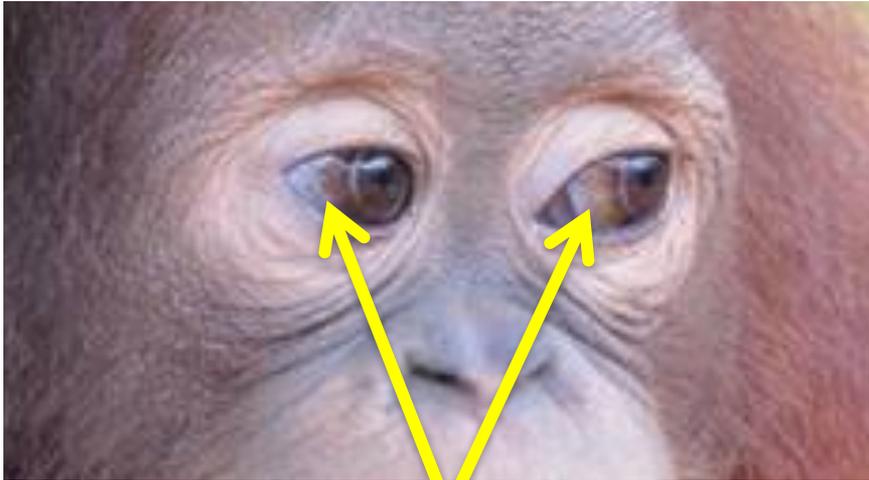
- In real-time interaction (vs. in static images), subjects make eye contact
- Body + Head To > Body Away + Head To > Body + Head Away
- Speech also a salient reset, esp in conjunction w/above



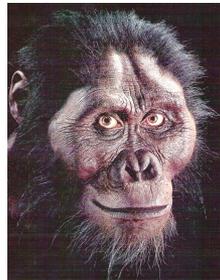
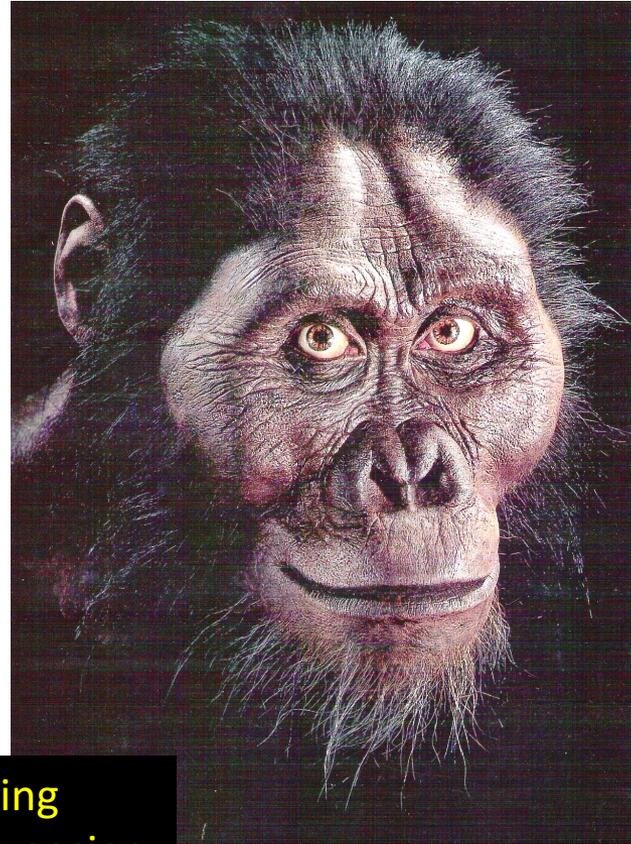
- No data on NHPs – tho chimps will gesture preferentially to face
 - Mother & infant: *Leong et al (2017)*
 - Adult & adult: *Hari et al. (2013)*

Unpigmented Sclera in Hominids

At some point, hominids lost this pigmentation – exaggerating contrast between sclera & iris



Note brown pigmentation surrounding iris in nonhuman primates



Makes detecting gaze direction easier, even at a distance

Theory of Mind

Attribute "mental states" (knowledge, desire, intention, etc.) to others based on observing their attentional behavior



I see that you see a dog . . .

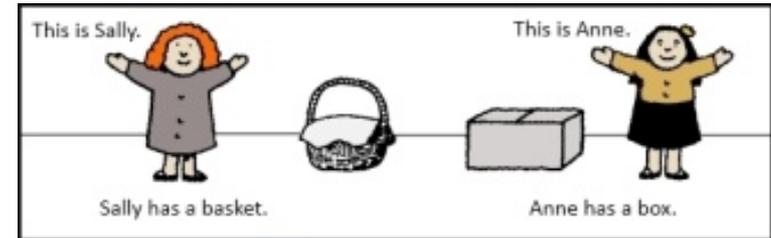
I believe that you know about dog



False Belief Task

Sally/Ann Task

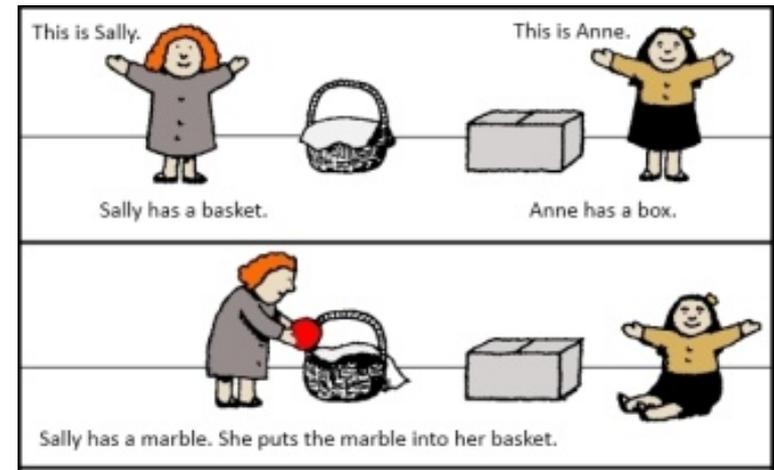
- Subject sees Sally & Ann (Bert & Ernie, etc)



False Belief Task

Sally/Ann Task

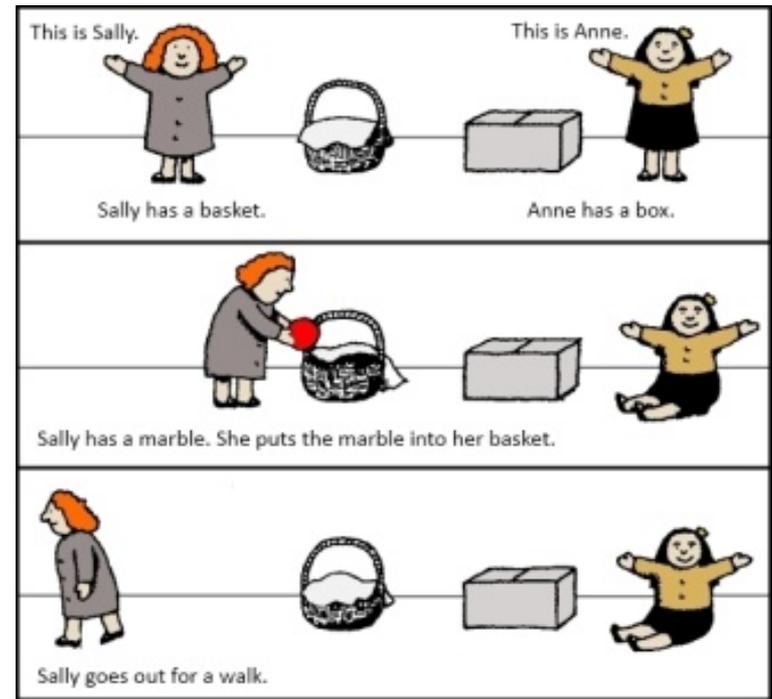
- Subject sees Sally & Ann (Bert & Ernie, etc)
- Sally hides object at A



False Belief Task

Sally/Ann Task

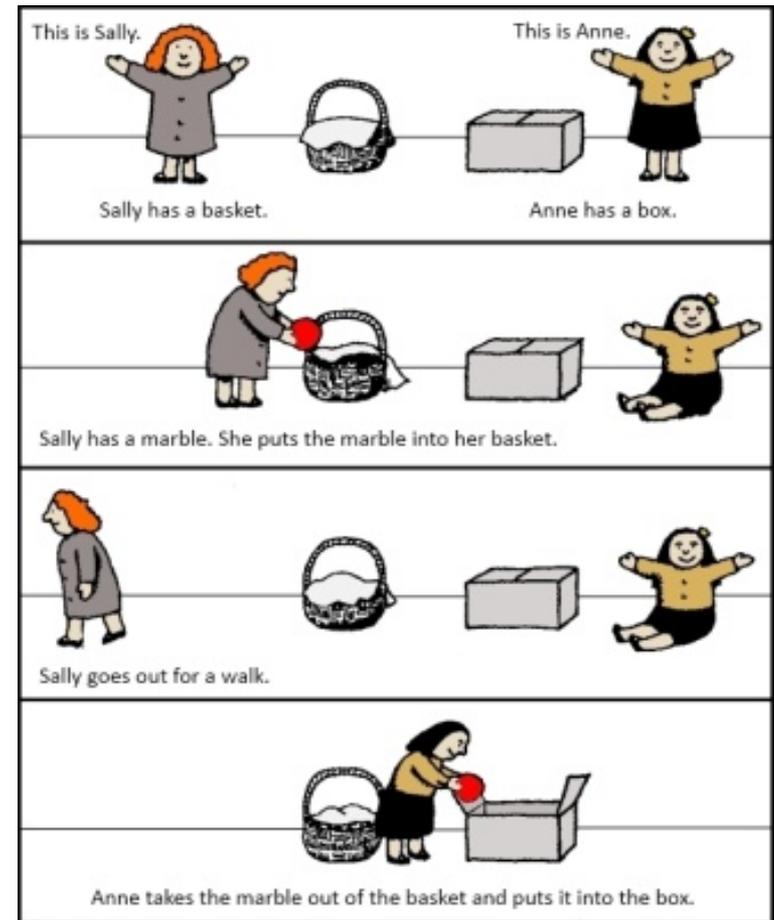
- Subject sees Sally & Ann (Bert & Ernie, etc)
- Sally hides object at A
- Sally leaves, Ann stays



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

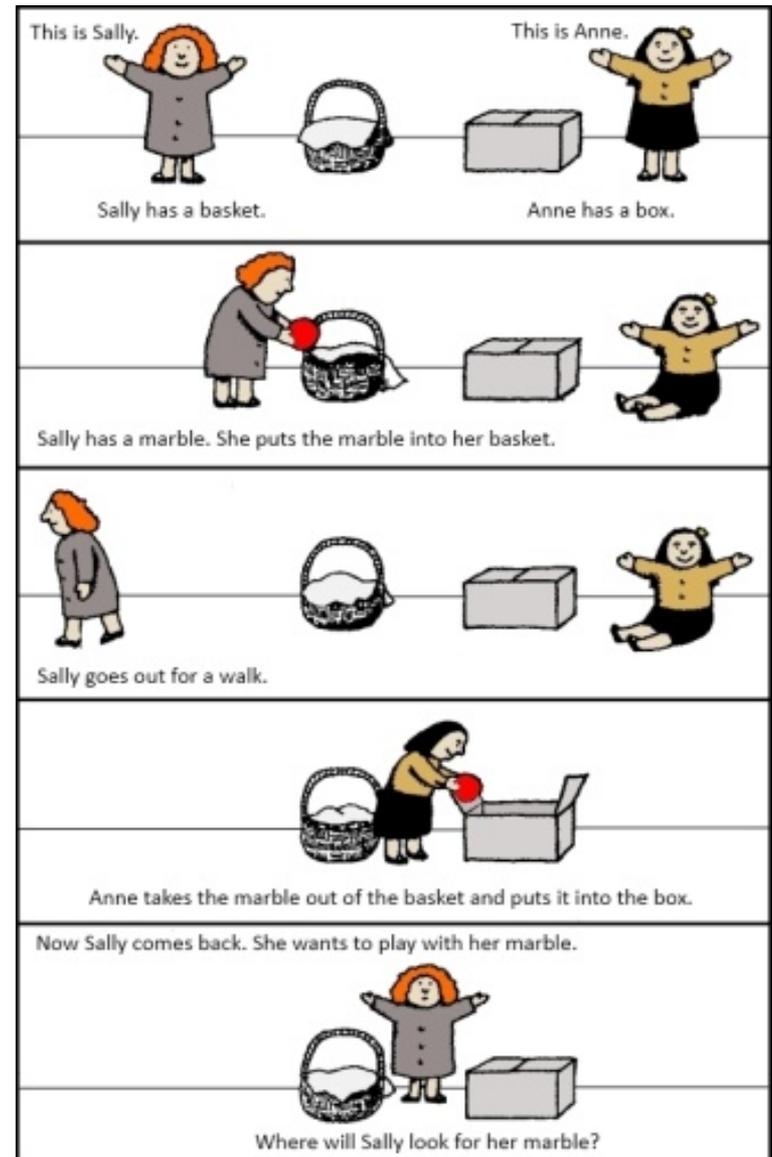


False Belief Task

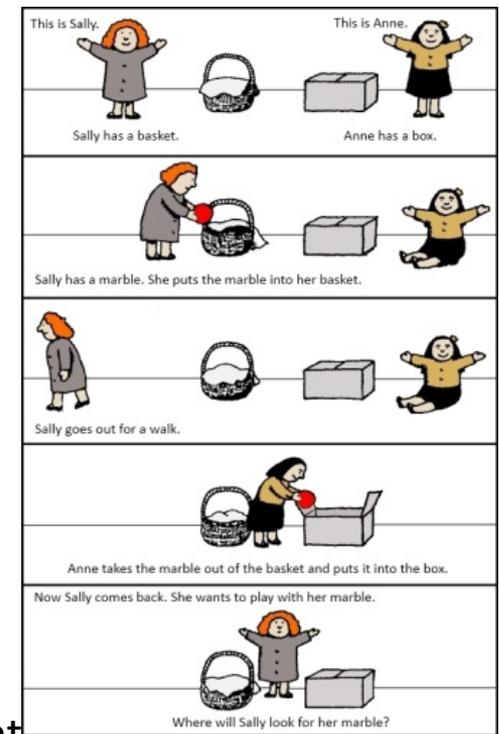
Sally/Ann Task

- 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?”



False Belief Task



RESULTS

- 2 yr olds “fail”



- Pick B (where object is)

- 4 yr olds “succeed”



- Pick A (where object was when Sally was last present),

- Although recent data suggest if task less dependent on language, children can do at younger age (e.g. Baillargeon et al. 2010)
- Apes also fail, tho do show anticipatory looking to other’s likely next focus (see Krupenye et al 2017)

Some Cognitive Implications of Theory of Mind

ToM is a **suite** of abilities

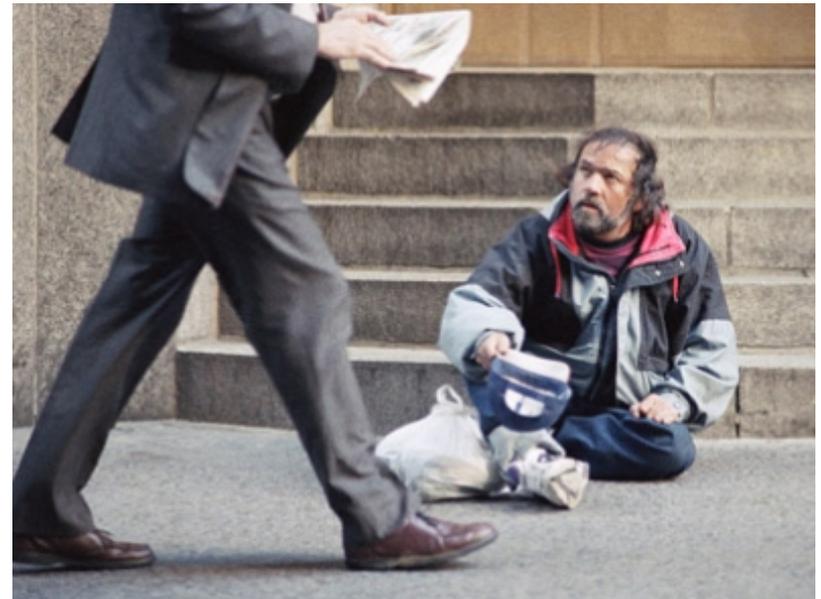
e.g. Feelings: Attribution of likes/dislikes

- e.g. 2 year olds attribute different preferences
 - You say “Yum!”, I say “Yuck!”
 - Appears earlier than attribution of False Beliefs



ToM is more complex than I see you see = I know you know

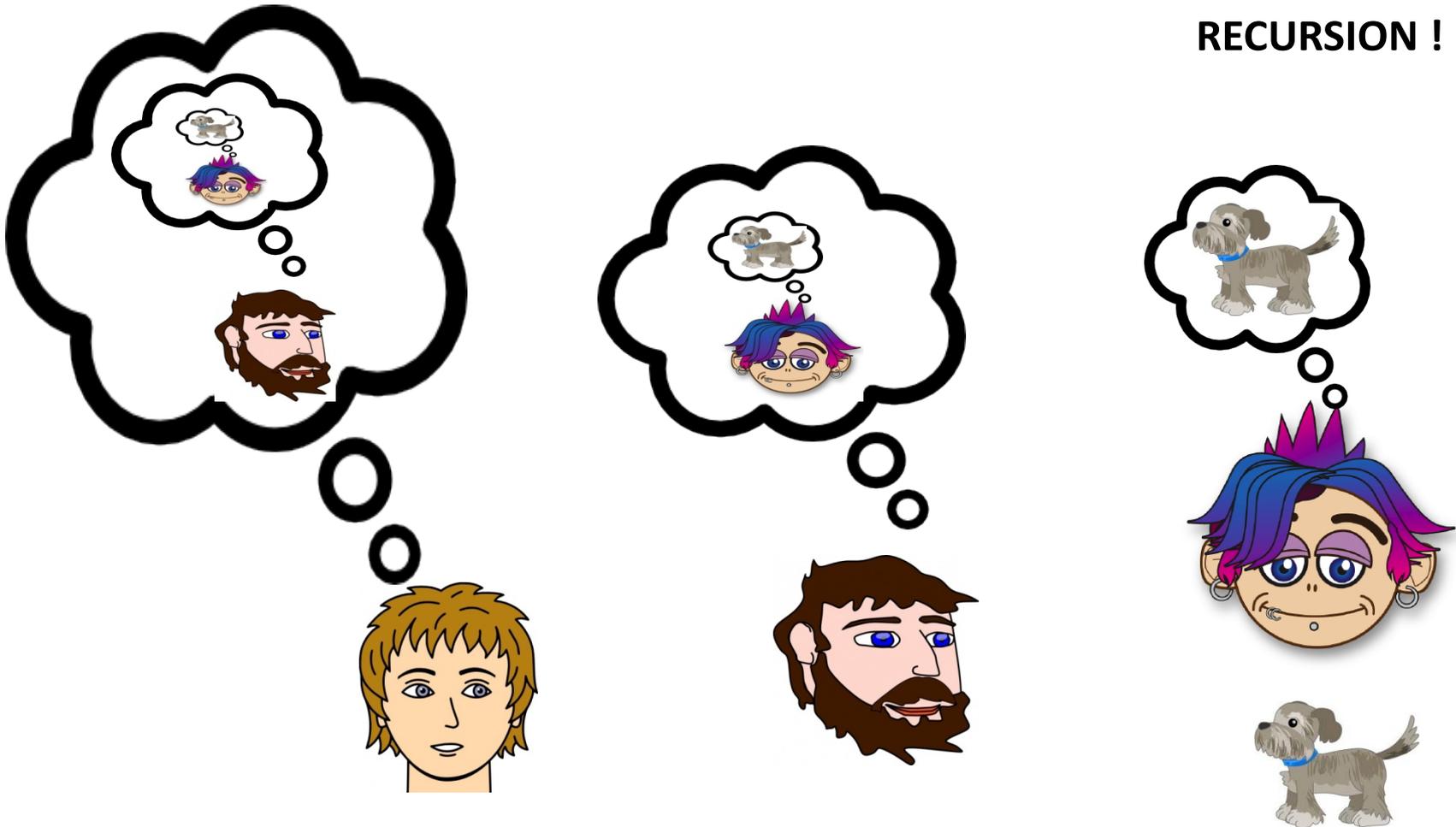
- Can counter by manipulating how you appear to others
 - Audience Effects: Individual alters own behavior, to accommodate particular audience



Recursion & Theory of Mind

- ToM is often presumed to require “embedded” representations
 - She sees – that he sees – that you see a dog
 - She thinks -- that he thinks -- that you are thinking dog. . .

RECURSION !



Recursion & Theory of Mind

- Humans capable of multiple embeddings of ToM
 - “I know
 - that she wants
 - him to think
 - that she likes him,
 - but I don’t believe
 - that she does”



- Note: Making linguistic (but not mimetic??) reference can include referring to **mental** experiences . . . !

Hierarchical Embedding

As we've seen in . . .

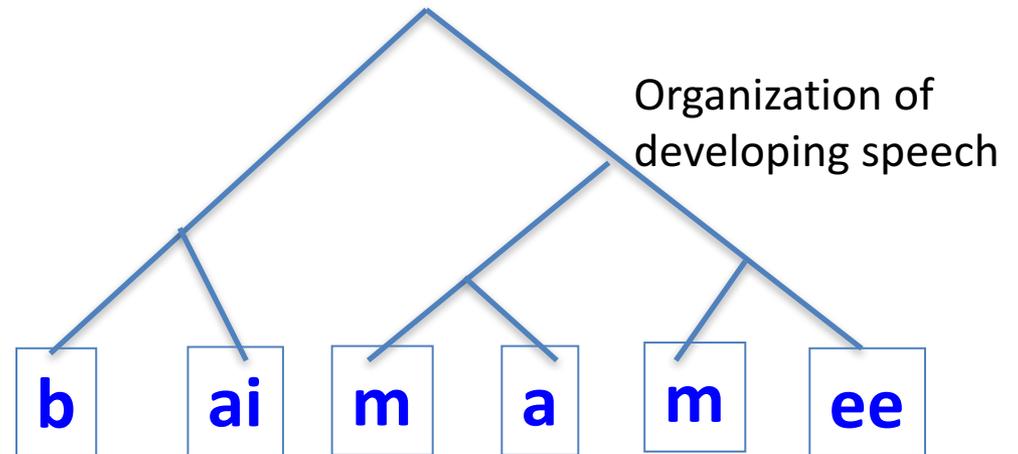
Mousterian Tools



Tertiary object use in infants



So clearly RECURSION is a key development...



Intentionality

- We view humans as “intentional”
 - Behavior is presumed to be planned, with specific goals in mind
 - e.g. In court, pre-meditated murder can carry a heavier penalty than accidental manslaughter
- **“Fundamental Attribution Error”**
 - Biased to default to assumption that behavioral outcome intended
 - vs. Caused by external factors
- Recall “The Co-operative Primate” (Lec 3) on sharing & emergence of ethics
 - Humans care about what they SHOULD do
 - esp when “should” is not necessarily = self interest
 - Further, they care about what others should do
 - So care, about others’ intent (*WHY they do it*)



Epistemics

What is it to “know” something?

- **Self Knowledge**: Humans have subjective “access” to some
 - (altho not all!) of their own mental processes
- **Allo-Epistemics**: Assessing the “knowledge” of others,
 - In part, thru mapping to own mental experience
 - Also includes “Epistemic Territory” assumptions re: who has “rights” to authority over which information
 - Individual’s authority varies per type of info:
 - 1) my body, thoughts;
 - 2) what I do in the world;
 - 3) the (sub) culture I inhabit;
 - 4) general knowledge
 - e.g. It can be offensive if I tell you how you are feeling...

Allo-Epistemics

- We actively negotiate our “Common Ground” during conversation (Clark 1996; Goodwin 2013)



- We display our “Epistemic Status”
 - e.g. If I say “I ride bikes”, you now attribute knowledge of bike-riding to me, w/o seeing me ride
 - e.g. Using syntactical universals like “wwwwww”
 - Which also gains us information



Allo-Epistemics

“Where is the
closest gas station?”



Ignorant asks, Informed provides
Conversation stabilizes when both informed.

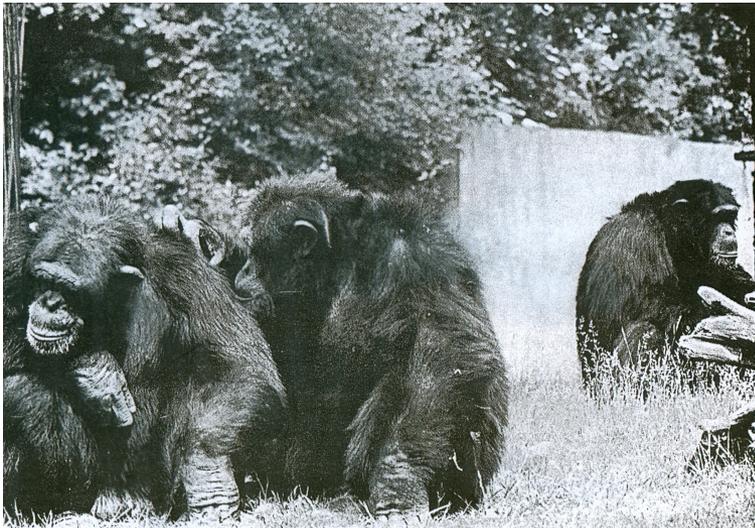
Such an “information differential” is what
Heritage (2012) calls the “**Epistemic Engine**” of conversation

So, how might all this have evolved -- ?

Differential Access to Information

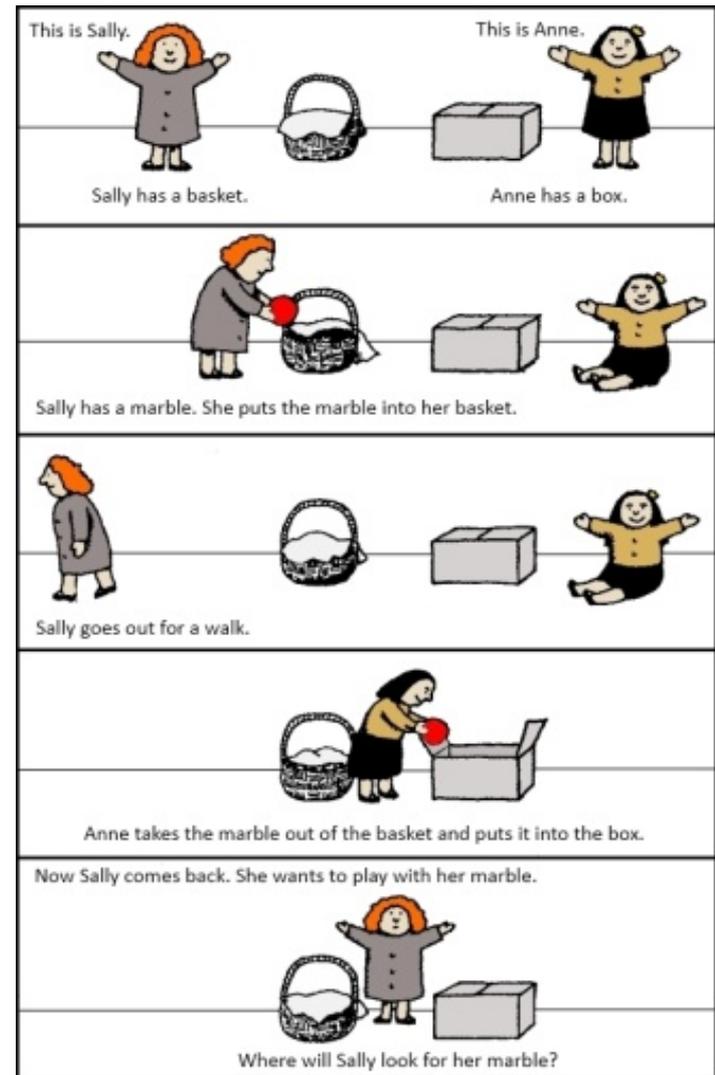
- **Fission/Fusion** >> **differential access to information**
 - As subgroup membership changes, individuals' access to each other changes

Found in some NHPs (e.g. chimps)



Presumed for hominids since
at least *Homo erectus*

Fission/Fusion



NO COINCIDENCE!!

- Conditions of “False belief Task” mimic those of **Fission/Fusion**
- i.e. Parties involved have differential access to info!

Differential Access

- **Hunters/Gatherers w/shared Basecamp**



- Spend signif periods apart, but increasingly inter-dependent
- Separated members can miss important info
 - About foraging conditions, others' relationships, etc which can increase importance of such info

REMINDER: In "complex" societies, individuals must monitor the relationships of others.

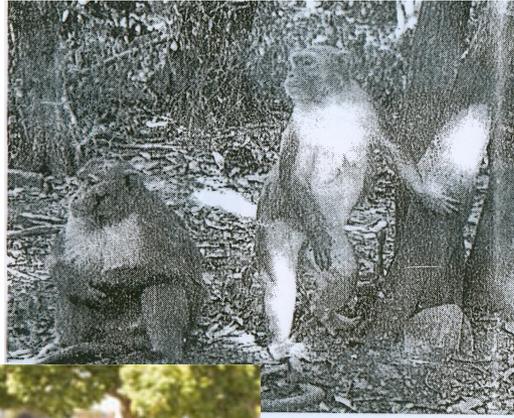


HYPOTHESIS: This combination of "**need to know**" under "**differential access**" generates selective pressure

Tracking what others see / know enables. . .

- **EXPLOITING**

differential access



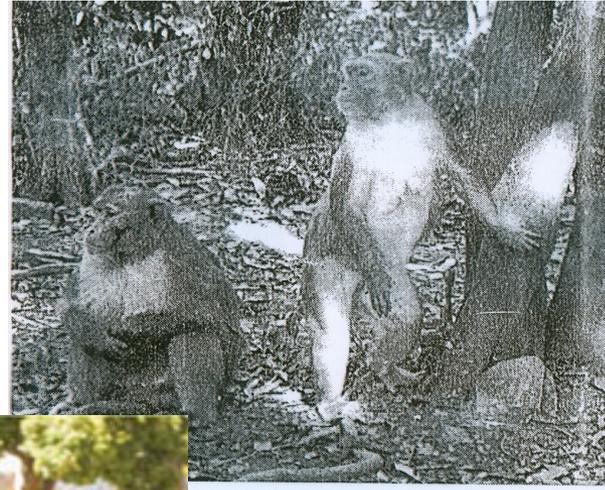
- **INFORMING**

To redress differential access



HYPOTHESIS: This combination of "need to know" under "differential access" generates selective pressure

- **EXPLOITING**
differential access



Exploiting Differential Access

After all, Allo-Epistemics
not just about what other knows,
but also about what they DON'T know!



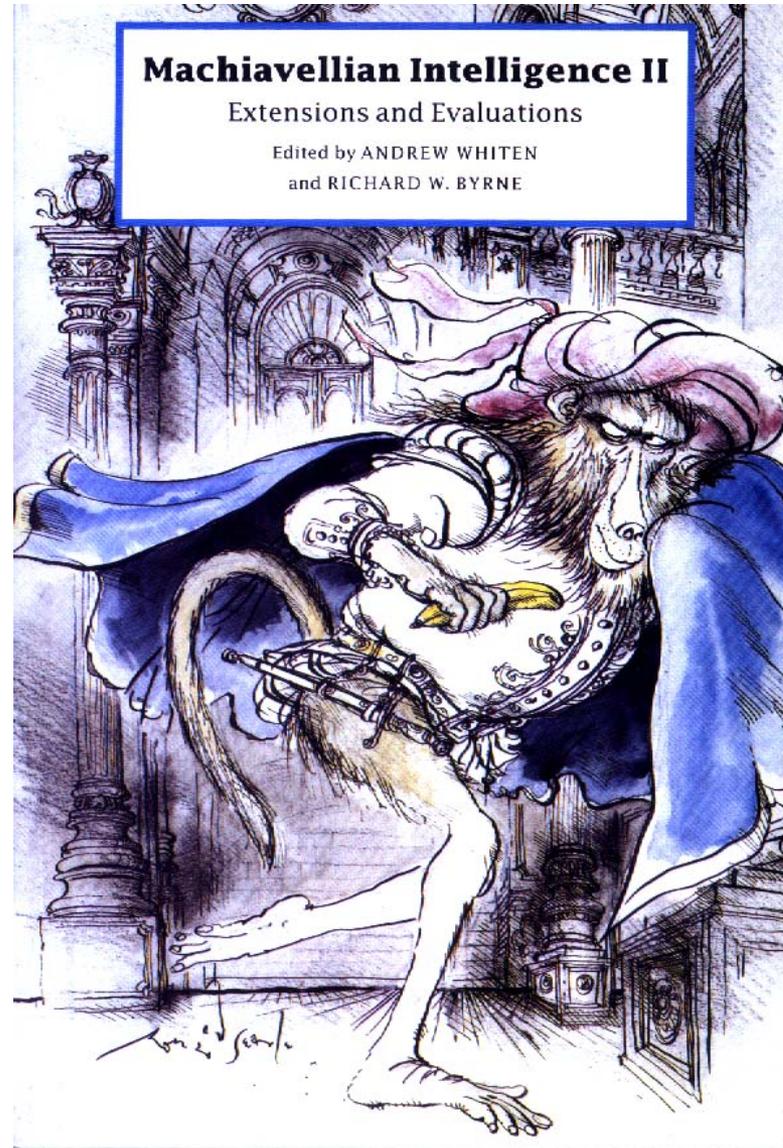
I attribute knowledge
based on what I see you do --
-- and what I see you **NOT** do!

I see that you do not see the dog . . .

I believe that you do not know about the dog



Exploiting Differential Access



Exploiting Differential Access

- **Deception** creates or makes use of differential access
- e.g. Look/move away from object of interest to distract competitor, hide intentions
- e.g. Act out of sight of one who might interfere
- e.g. “Feign” indifference to reduce competition, or display false interest to mislead



Exploiting Differential Access

- We humans are the masters at deception, pretense, audience-specific behavior, etc!
- Increased **self control** over facial expression, and ability to form coherent whole-body signal useful
- This, then, is another context where **Mimesis (act as if)** could have major payoffs!
 - Linked to Pretending - Creating counter-factuals, possible (and impossible) worlds...
- Deception selects, in turn, for Counter-Deception, including perhaps Self-Deception
 - So, became not only better at deceiving, but also at detecting, thwarting deception

HYPOTHESIS: This combination of "need to know" under "differential access" generates selective pressure

- **INFORMING**

To redress differential access



Collaborators benefit from shared information

Point, Show, & Tell



Only Humans direct
the attention of others

Unless ape is human enculturated



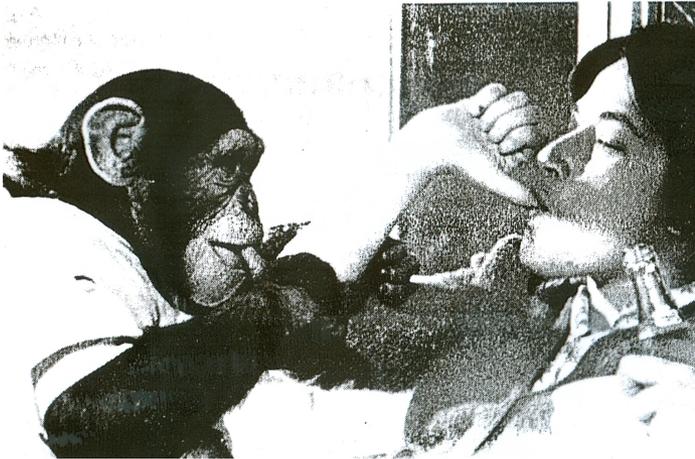
Not only does ignorant use the informed,
but the informed shows the ignorant

NOTE: All humans are also
human enculturated!

Unlike humans, "Language Trained" apes produce Imperatives, but not Declaratives

IMPERATIVE:

Requests, Commands



Communicate to get other to
DO something

DECLARATIVE:

Offer commentary, Express attitudes



Communicate to get other to
KNOW something

Inform: Teaching



Provide information



Expert takes into account
what Novice
knows / does not know

Hearsay



Shift from "knowing" based on personal experience to "knowing" based on what you have been told by others...

In fact,
we often believe hearsay
as much as we do our own eyes!



Information as a Commodity

WHO do you tell? Who do you cc? Who do you “befriend”? Etc. etc.



Becomes a social commodity (like grooming) that can be traded, given, withheld, etc.

Co-Evolution &
Cultural Evolution

Co-Attention to the Details

- Becoming “tool dependent” exerts pressure to improve, both to compete & to coordinate efforts
- Perhaps shift from emulation to imitation = a shift to attending to particulars of objects & actions
- Plus, directing attention, esp during apprenticeship, may also help differentiate discrimination
 - Focus on particular tool making/using procedures,
 - Foragers discriminate plants & their parts,
 - Hunters point out tell-tale scat & tracks, etc.
- Note that speech, too, is about directing attention
 - Word highlights object, aspect, etc
- Contributes to/conventionalizes not only to what/how we do, but *how we see* (“Professional Vision”)

Cognitive Niche Construction

“Niche Construction” (see Laland et al 2000 reading)

- When behavior changes environment,
 - and then that environment exerts selective pressure
 - e.g. Beaver dams change landscape, impact on selection for many species



Cognitive Niche Construction

Cognitive Niche Construction – a hominid specialization

- We create the changes (e.g. tool dependence)
 - which then select for cognitive adaptations
- e.g. Tools – including cognitive artifacts like tally marks (| | | |) vs. Numerals (4)
 - as conventionalized solutions to common problems
 - also then constrain the type of cognition they require (*Hutchins 2005; 2010*)
- e.g. The more deception is a part of our shared environment
 - the more selective pressure for counter-deception
- e.g. The more fission/fusion and inter-dependence,
 - the greater selection for ToM --- etc. etc.
- So involves integration of both cultural and biological evolution

The “Information” Age

Perhaps it is 150,000 years old...?



Only 6,000 generations...