

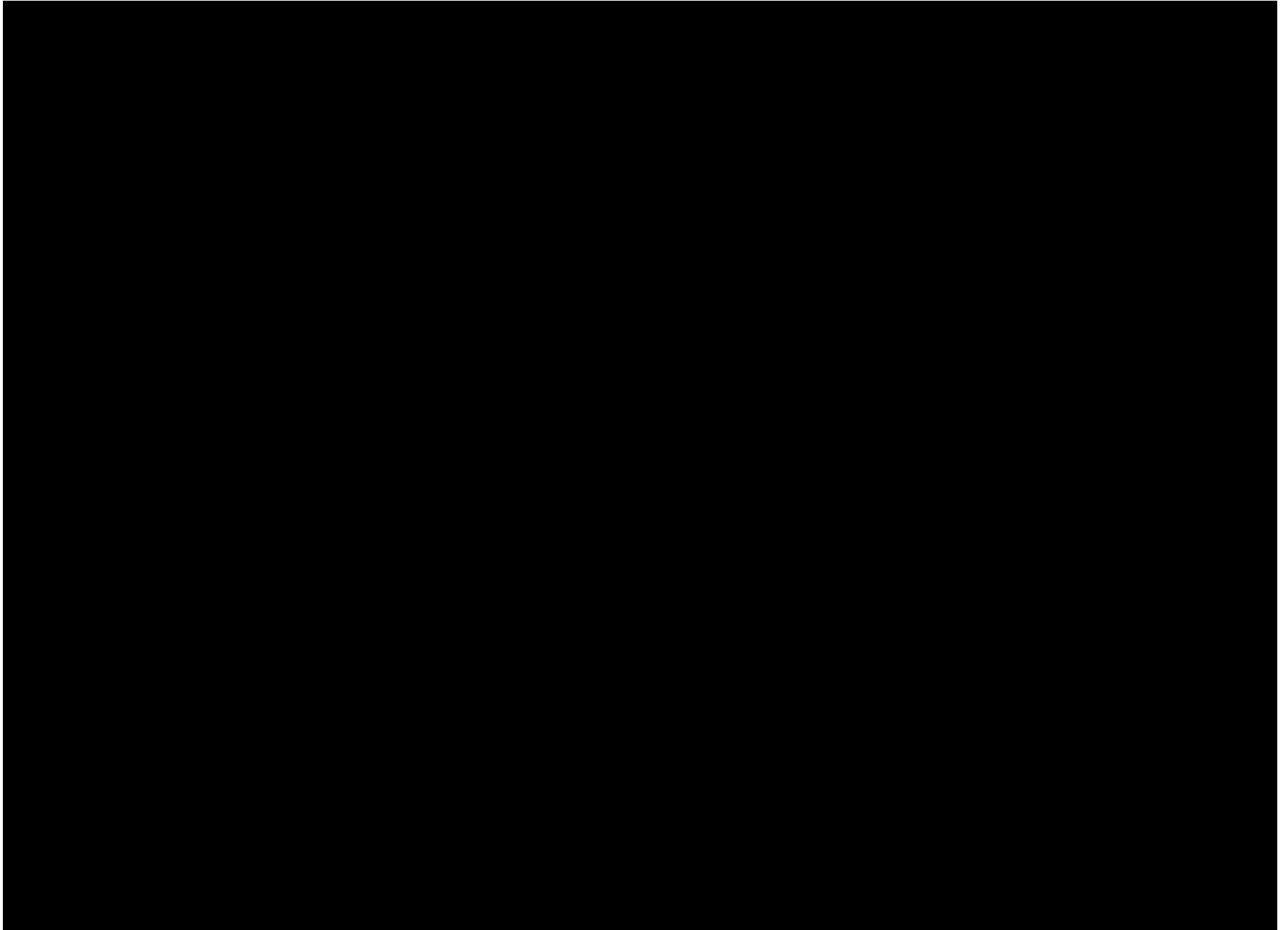
# Animal Minds





# Peanut Task

Mendes, Hanus & Call (2007)



Do monkeys have a sense of fairness?



**What is going on in their minds?**



Nut-cracking at Bossou, Guinea (Video by Kyoto University researchers)



# Today's Game Plan

Why study animal minds?

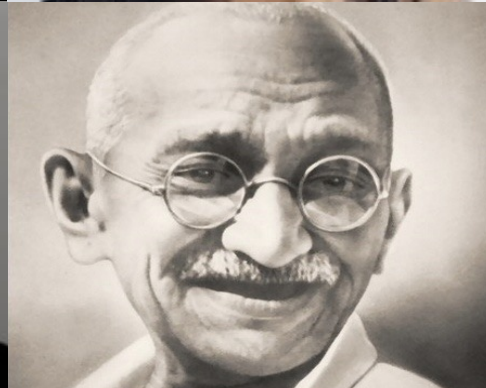
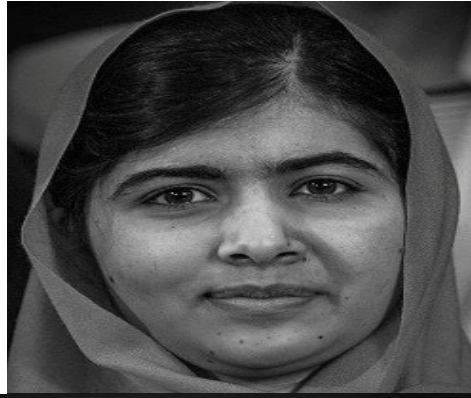
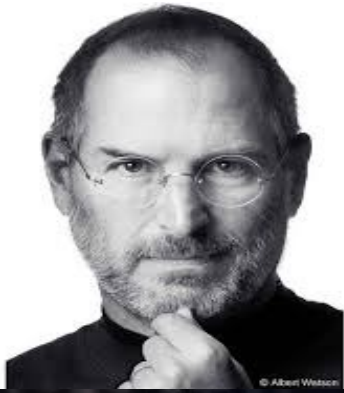
How to study animal minds?

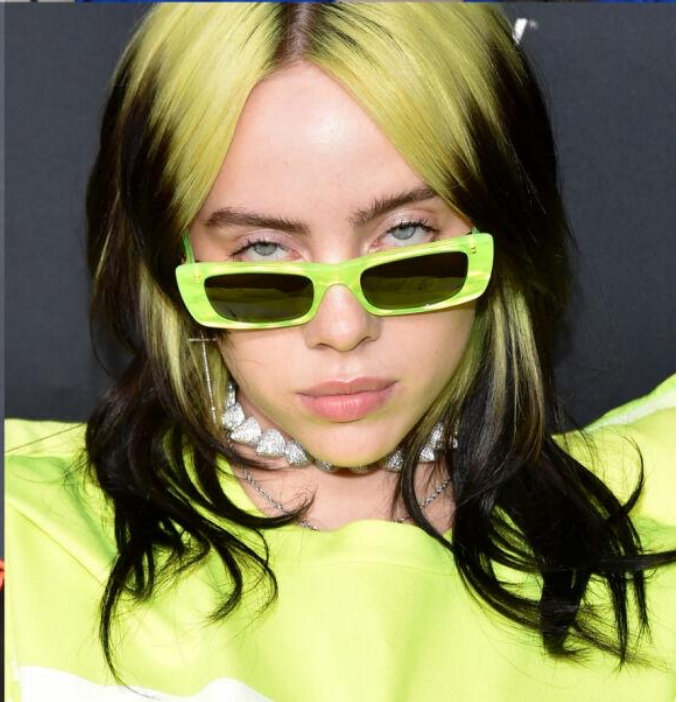
Feats of animal cognition

# Why study animal minds?

- To understand animals
  - Curiosity: Animals are cool! How clever are they?
  - Ethics: Do other animals have consciousness or moral status?
  - Psychology and Behavioral Biology: Which cognitive mechanisms support complex behavior, like alliance-building or navigation?
  - Evolution: How does cognition evolve?
  - Conservation: How does cognition influence adaptability?
- To understand ourselves
  - Psychology & Anthropology: What makes us unique?
  - Human evolution: How did our psychology evolve?
  - Psychology & Philosophy: How does the mind represent the world around it? What is the role of language and culture in human cognition?







Which species is smarter?



Which is a better tool?



# The Cognitive Approach

Old view:



Cognitive Approach:

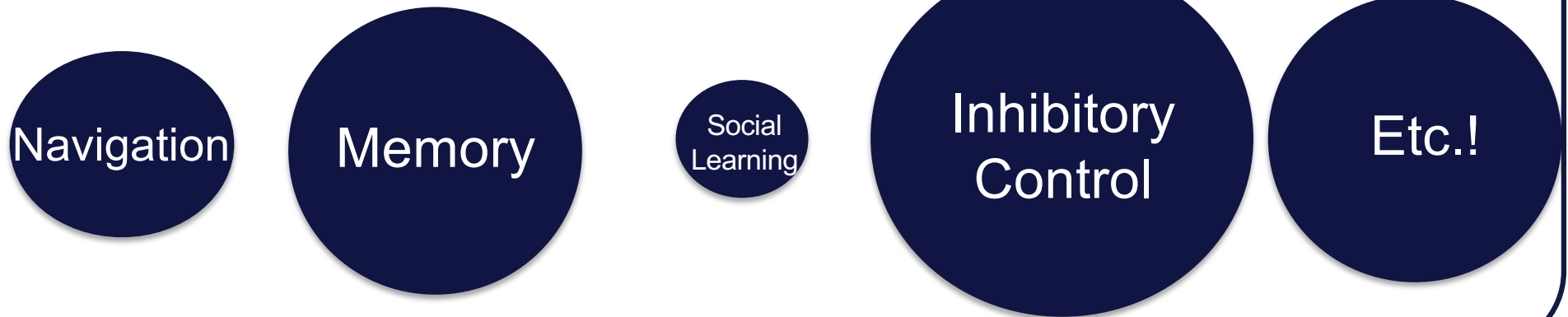


# The Cognitive Approach

Old view:



Cognitive Approach:



# The Cognitive Approach

Old view:



Cognitive Approach:



**The challenge is NOT in determining whether or not a species or individual is smart, but rather to understand their cognitive profile**



# Today's Game Plan

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# Central Tenet: Experimental Psychology

All behavior can potentially be explained by multiple psychological mechanisms.

Just because behavior of two species or even people look identical – it does **not** mean the behaviors are controlled by the same psychological or cognitive mechanism

**Observations:** generate hypotheses

**Experiments:** test hypotheses, controlling for alternatives



Nut-cracking at Bossou, Guinea (Video by Kyoto University researchers)

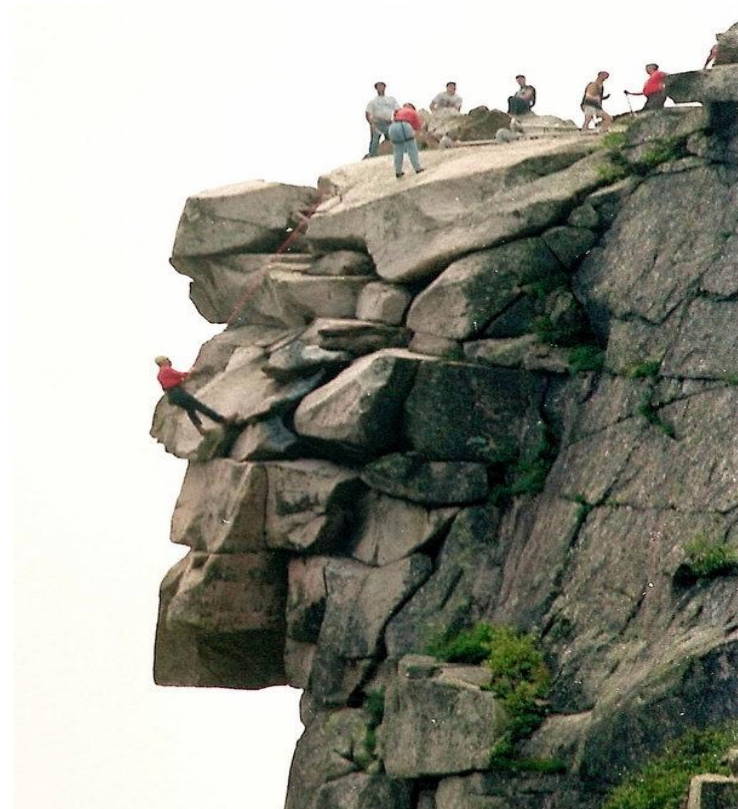
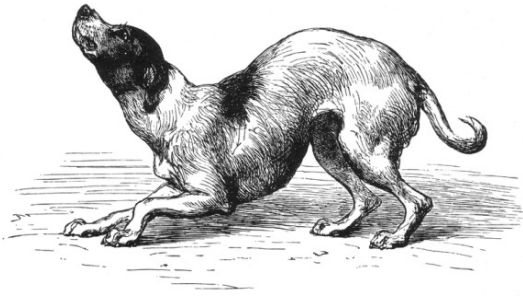
# Clever Hans



*A horse is a horse, of course: Wilhelm von Osten and Clever Hans.*

George Romanes *Animal Intelligence* (1881)

# Anthropomorphism to Anecdotes



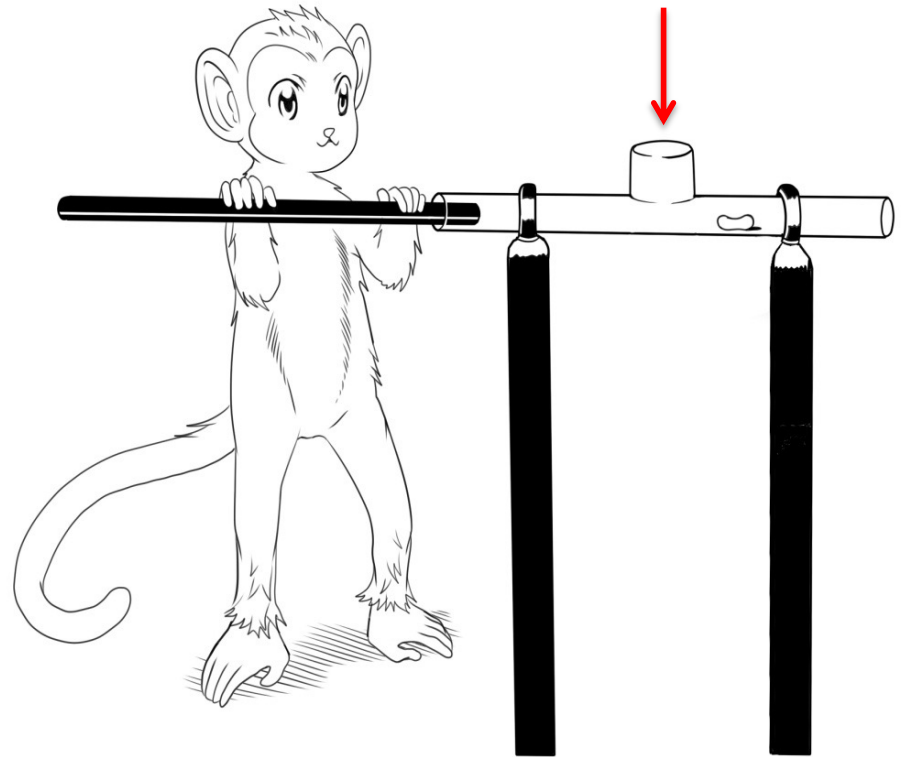
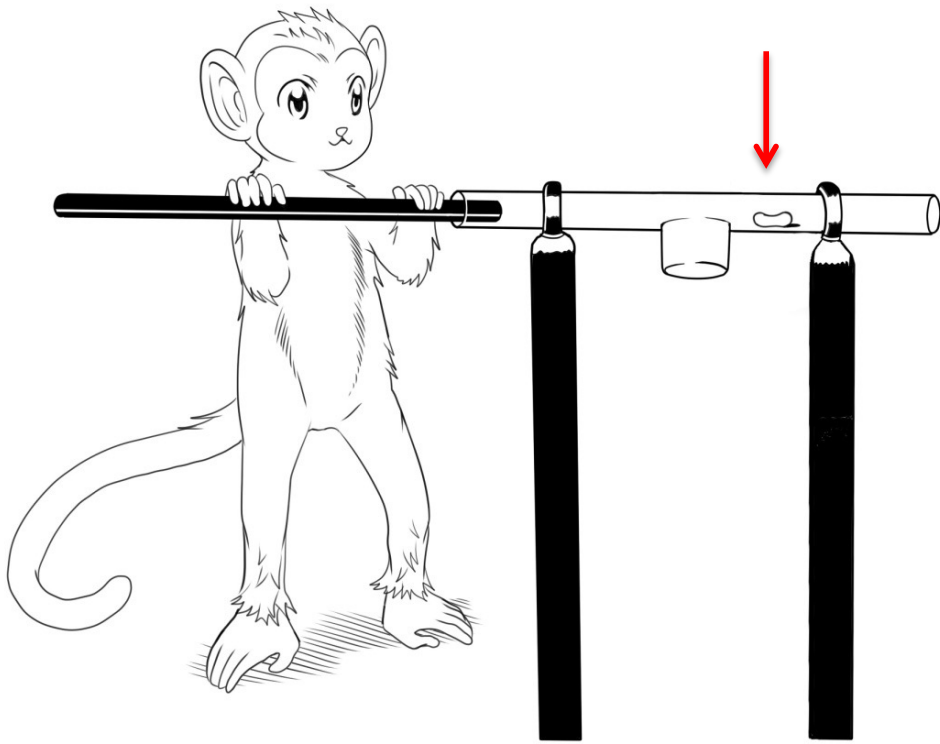


## Morgan's Canon

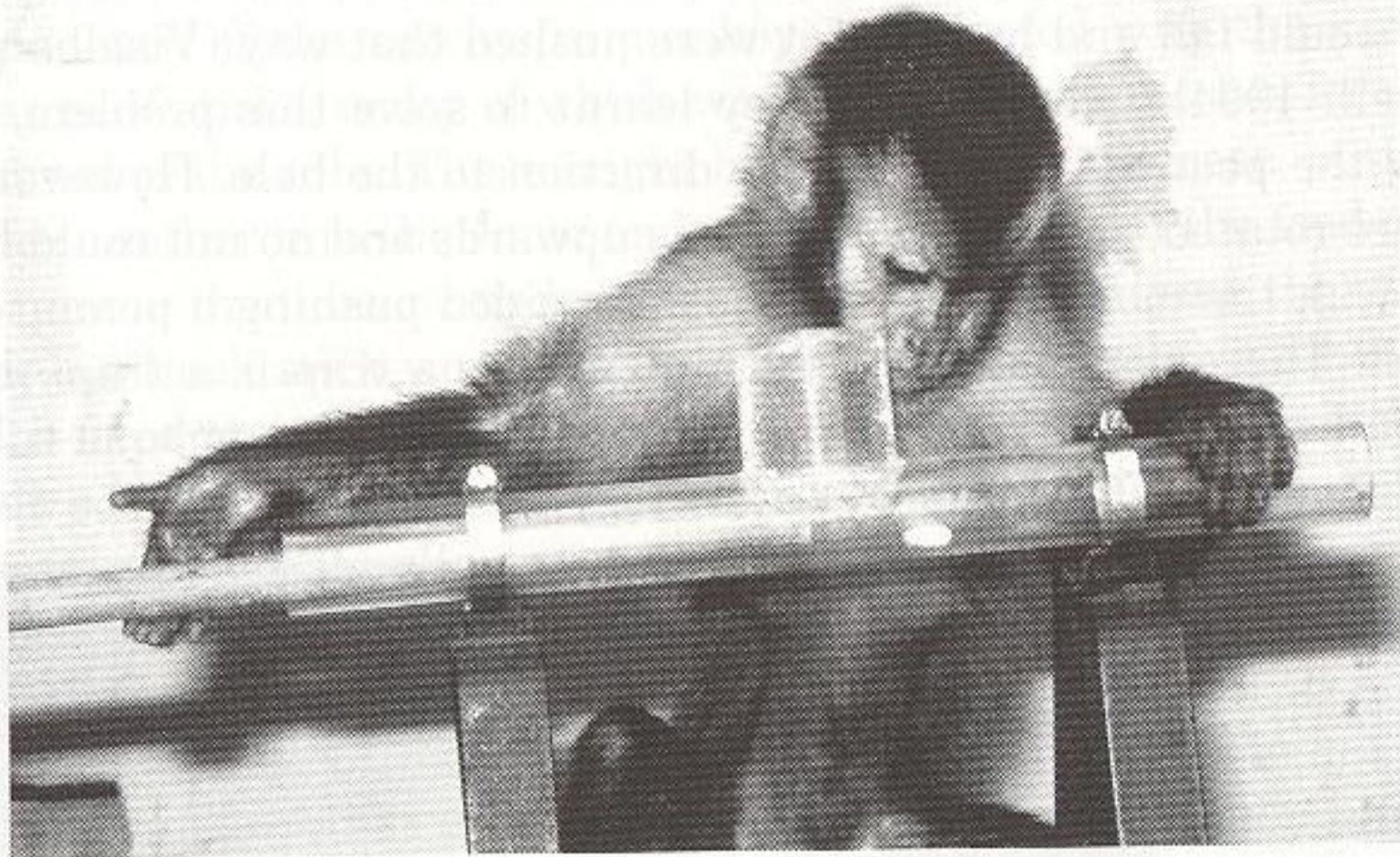
*"In no case may we interpret an action as the outcome of the exercise of a higher psychological faculty, if it can be interpreted as the outcome of the exercise of one which stands lower in the psychological scale"*

(Morgan, An Introduction to Comparative Psychology 1894, p. 53).





Visalberghi & Limongelli, 1994



(b)

**Figure 7.2** When Visalberghi changed the task in various ways, capuchins showed that their learnt skill was not based on any real understanding of the situation. (a) The monkeys do eventually learn to deal with a 'trap' in the horizontal tube, by pushing from the side opposite to the peanut (this one is making an error); but when the tube is inverted (b), so the trap cannot function, they persist 'superstitiously' in their old strategy. (Photos by E. Visalberghi.)



# Central Tenet: Ecological Validity

There are many reasons for animals to fail an experiment

- Do they lack the cognition in question?
- Do they lack an ancillary mechanism (e.g., memory, self control)?
- Were the stimuli perceptible to them?
- Did they understand what they had to do?
- Were they motivated to solve the task?

**Ecological validity:** testing animals on tasks that mimic the problems they naturally face in the wild, problems their cognition evolved to solve



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A scenic landscape photograph featuring a large, deep blue lake in the center. The lake is surrounded by rugged mountains with patches of snow and dense evergreen forests. In the foreground, a large, grey rock formation is visible, with a single nutcracker perched on its edge. The sky is filled with soft, white clouds. The text is overlaid on the left side of the image.

Clark's nutcrackers recover  
nuts from 6,000 locations after  
6 months delay.

# Semantic Memory

A photograph of a Border Collie dog lying on a lush green lawn. The dog has white fur with a prominent black patch on its face and ears. It is looking directly at the camera with a happy expression, its mouth open showing its teeth. The background is a dense field of green grass.

**Large semantic memory capacity** Border Collie can remember hundreds of labels and verbal commands

# Semantic Memory



**Chaser knows labels for all these items**

# Semantic Memory



**Massive semantic memory in a dog**

Strepsirrhines

Haplorhines

Platyrrhines

Catarrhines

Cercopithecoids

Hominoids (Great Apes)

lemur

capuchin

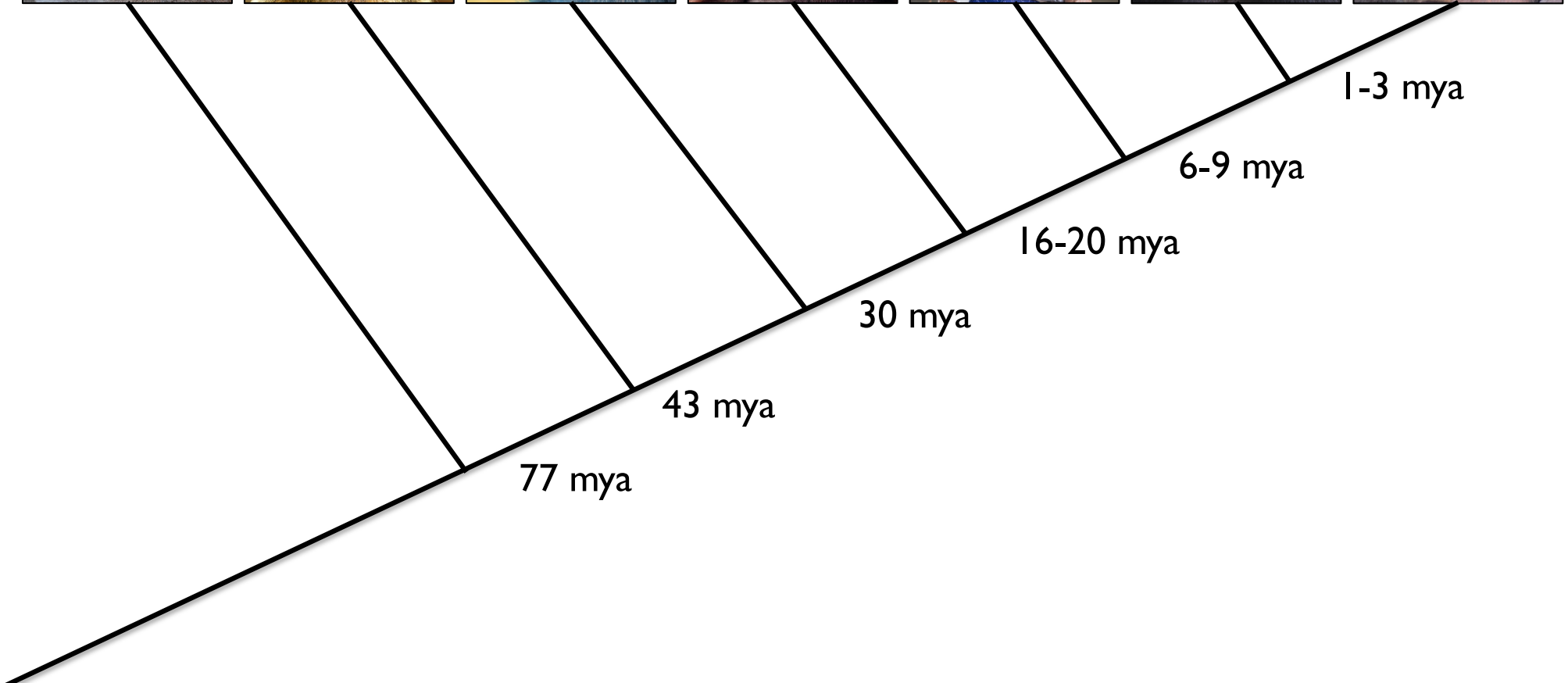
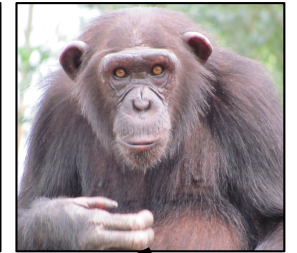
macaque

orangutan

human

bonobo

chimpanzee



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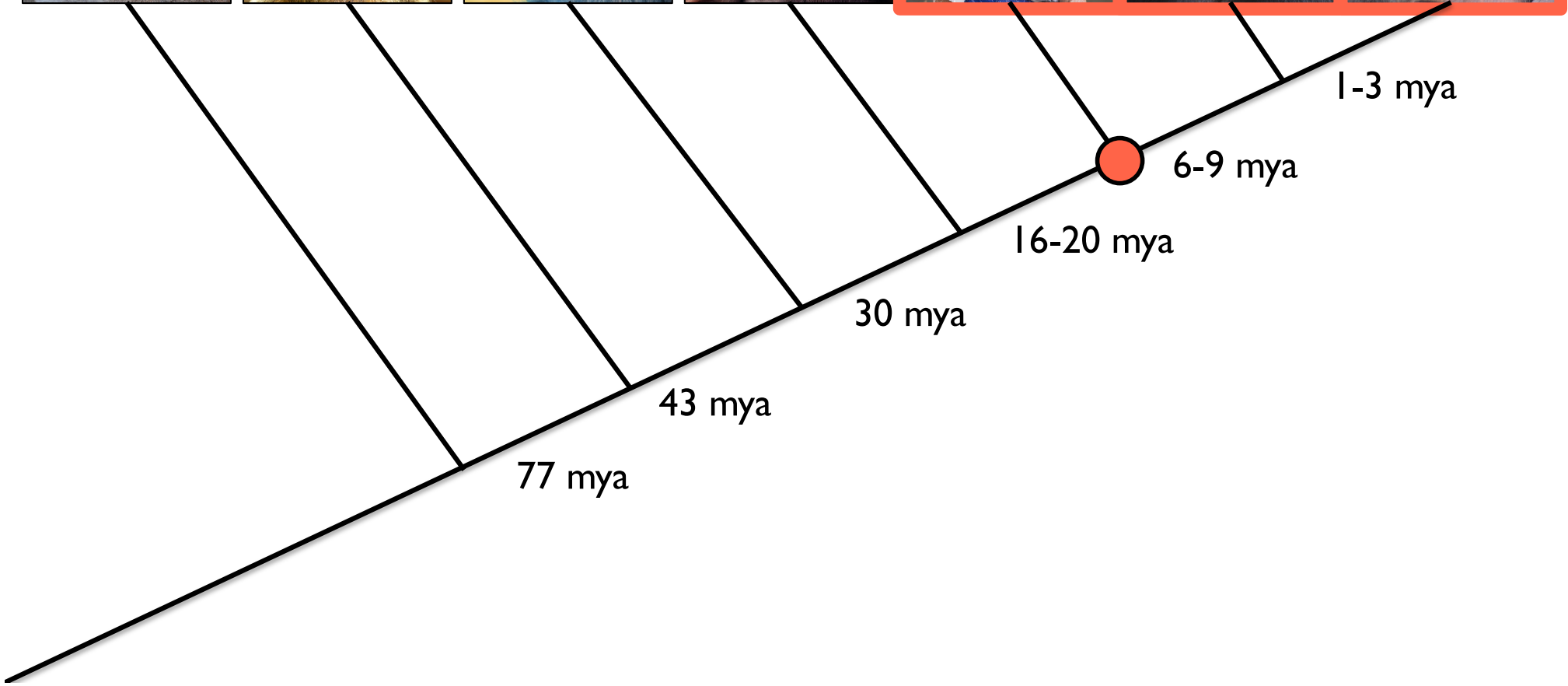
macaque

orangutan

human

bonobo

chimpanzee



1-3 mya

6-9 mya

16-20 mya

30 mya

43 mya

77 mya



Strepsirrhines

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Catarrhines

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Hominoids (Great Apes)

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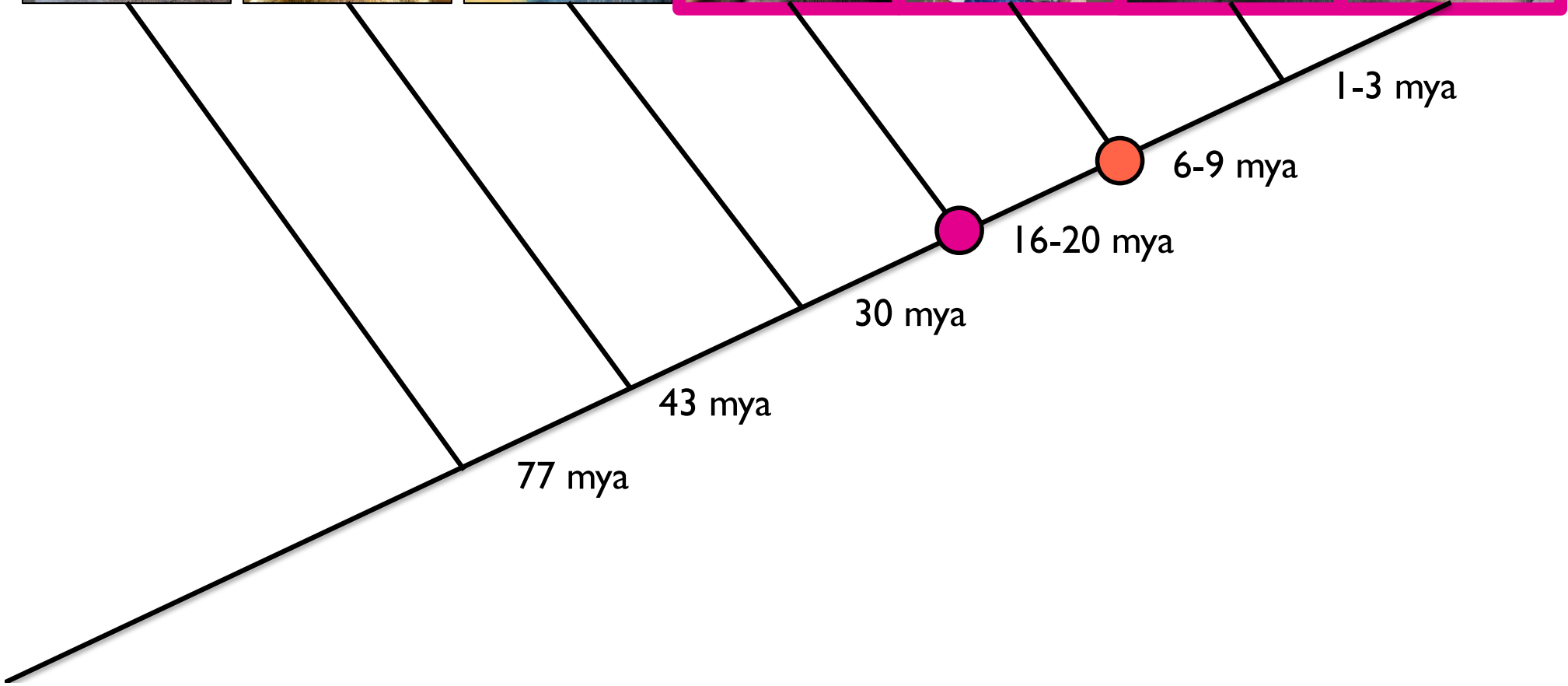
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77 mya

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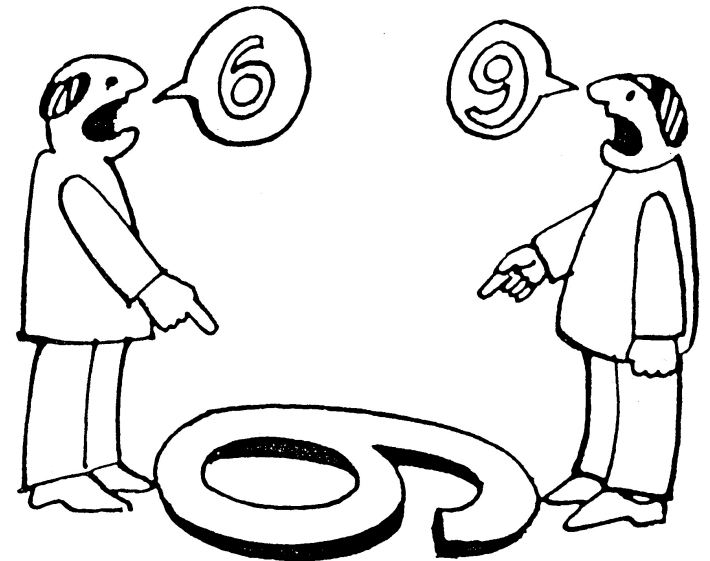
1-3 mya

# Theory of Mind

- The ability to infer others' unobservable mental states
  - Motivational mental states: goals, desires, and emotions
  - Epistemic mental states: perception, knowledge, and beliefs
- Synonyms: mind-reading, mental state attribution

**Motivational state:** goal to communicate

**Epistemic state:** failure to understand how things look from their partner's perspective

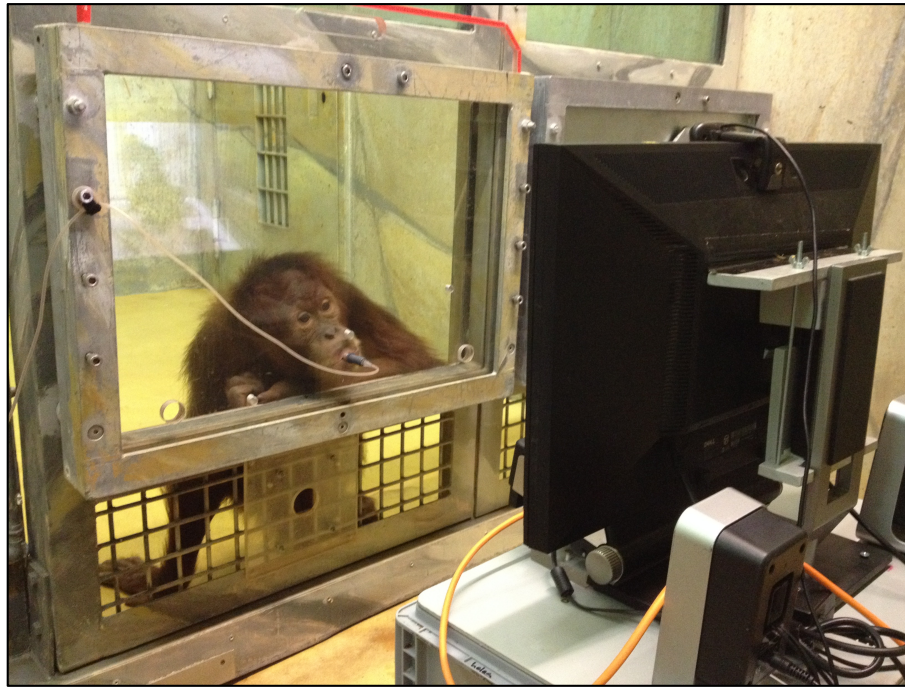


# False Belief Understanding

- False beliefs: beliefs about the world that are not true
- Special emphasis on false belief understanding:
  - Hallmark of a representational, or full-blown, theory of mind
  - May depend on language







Fumihiko Kano



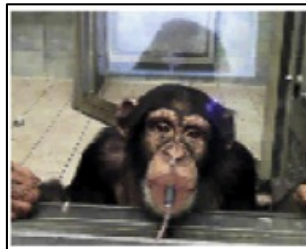
Satoshi Hirata



Josep Call



Mike Tomasello



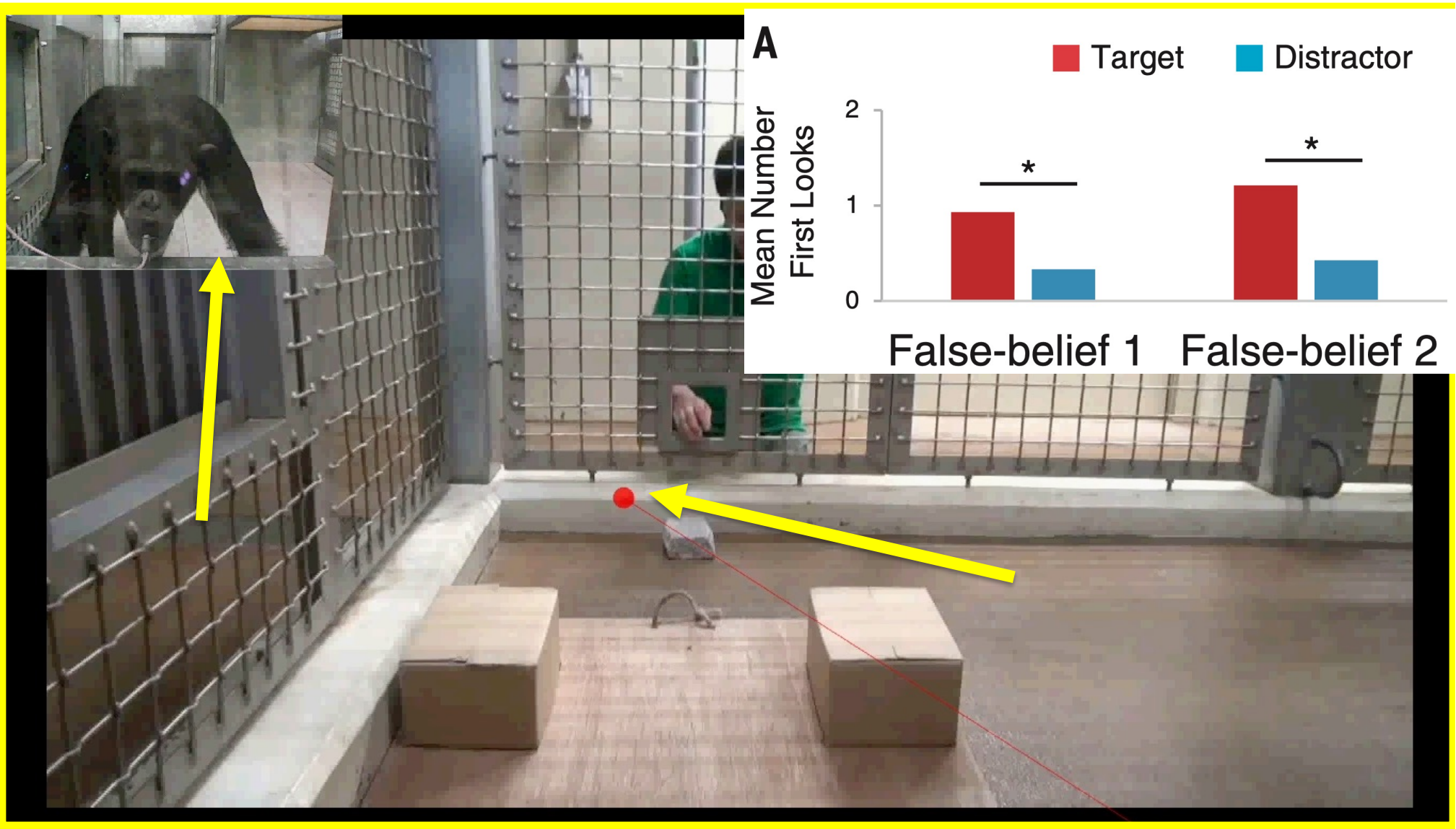
chimpanzees



bonobos



orangutans



Krupenye, Kano, Hirata, Call, & Tomasello (2016). *Science*



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Questions?