Social Cognition

Week 9, Lecture #26

joint attention

theory of mind

mirror neurons

the social intelligence hypothesis

the cultural ratchet effect

linguistic relativity

the end

-mk

Frans de Waal

OBITUARY | 10 April 2024

Frans de Waal (1948–2024), primatologist who questioned the uniqueness of human minds

Researcher and prolific science communicator who laid bare the social lives of apes.

Two Monkeys Were Paid Unequally: Excerpt from Frans de Waal's TED Talk

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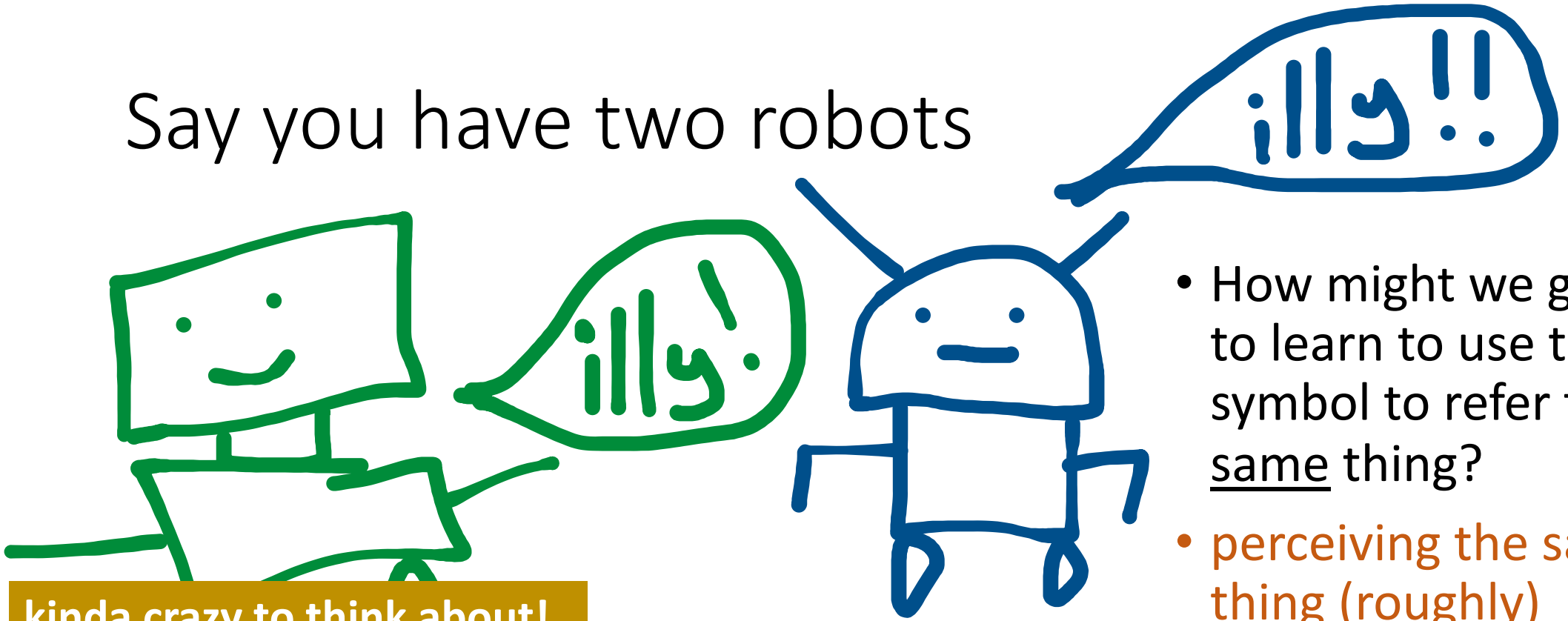
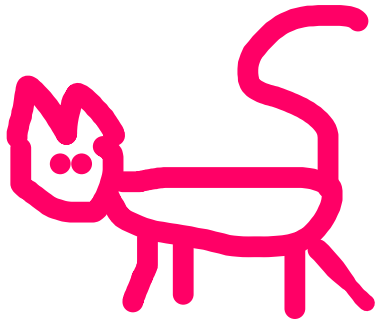
https://www.youtube.com/watch?v=meiU6TxysCg

Say you have two robots



kinda crazy to think about!

- **paying attention to the OTHER agent...**
- **to identify when THEY are paying attention...**
- **to the thing that YOU are paying attention to!**



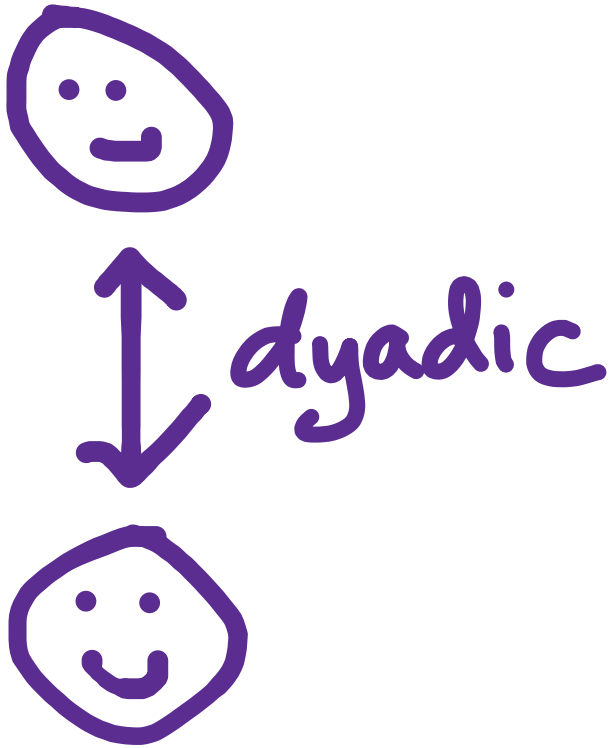
- How might we get them to learn to use the <u>same</u> symbol to refer to the <u>same</u> thing?
- perceiving the same thing (roughly)
- generating a symbol and able to hear it
- but when to say "illy"??
- **when the other is paying attention!**

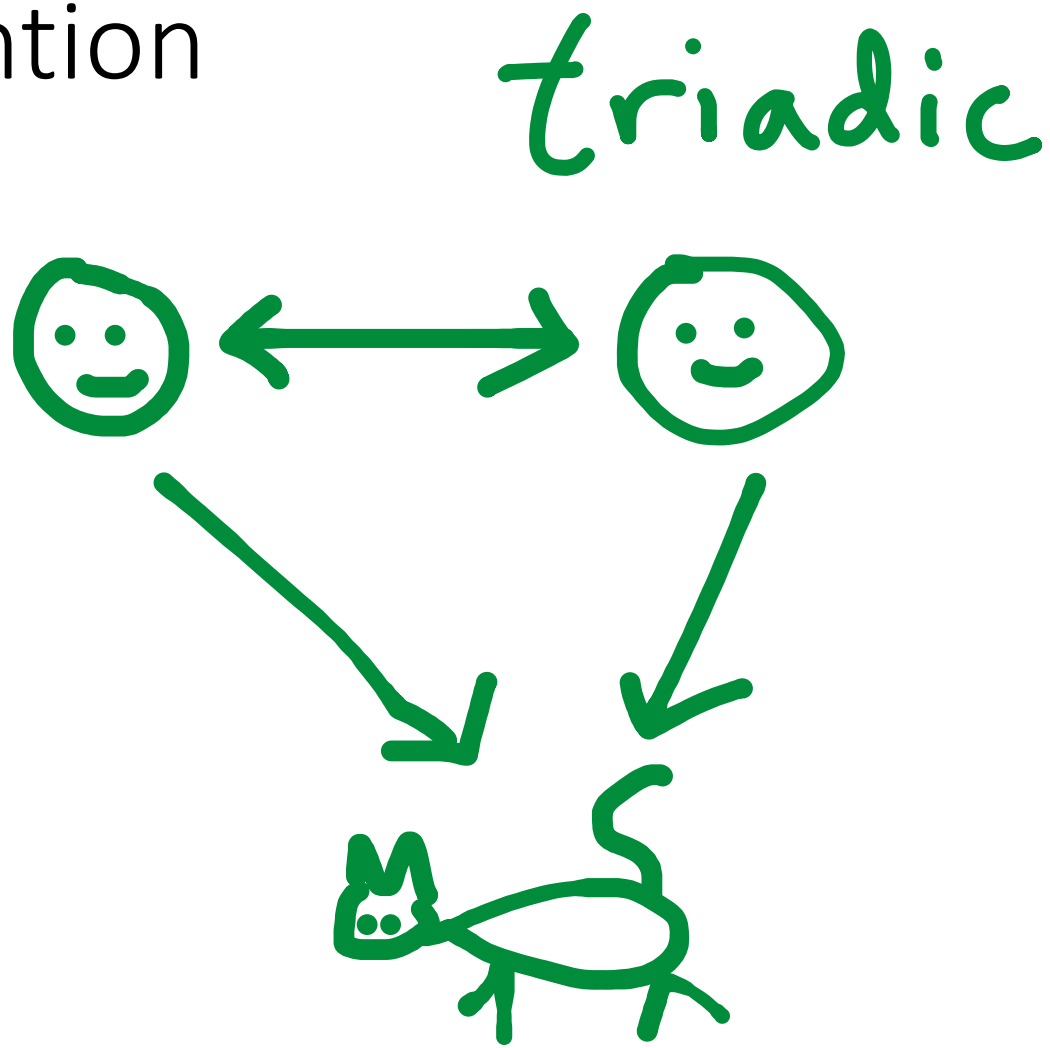
Joint Attention

- When two agents (people, animals, etc.) are paying attention to the same thing...
- WHILE being aware of the other's attention!

- Very fundamental to human interaction
- And learning
- And language
- And and and and.....

Arrangements of attention





More examples of joint attention

- Monitoring – when someone is looking back and forth between an object and the other person
- Any conversation – both talking about a thing!
- Pointing – directing the other person's attention to initiate joint attention to a thing
  - Very few nonhuman animals understanding pointing! But some do...
- Gaze following (kindof a precursor)

- **All of these are behavioral cues of a hidden internal state**

Autism...

- Often comes with challenges in joint attention
- ... but how do we know?

- Story about reading Harry Potter to their children
- Story about smiling and parents and rewards...

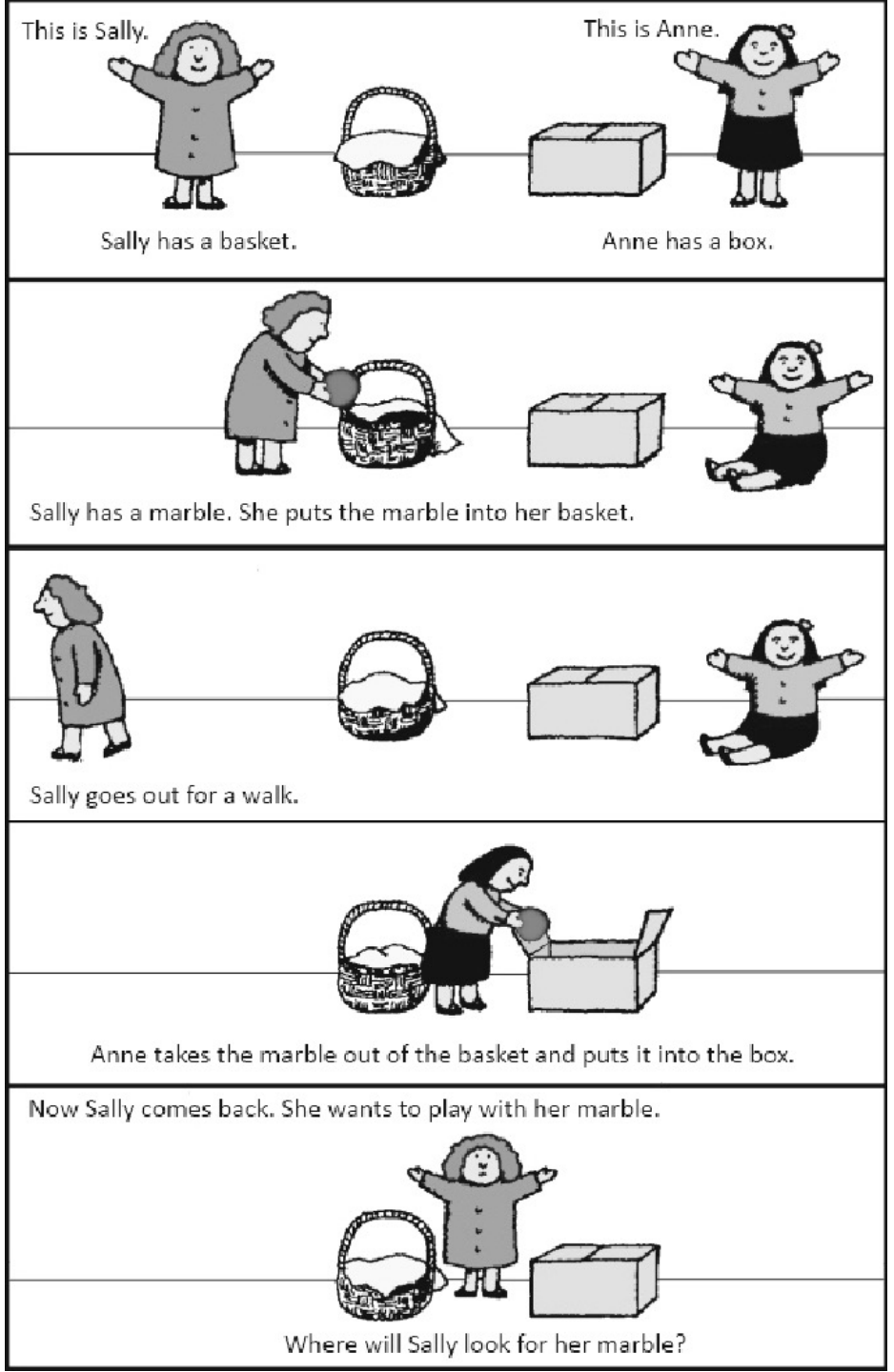
- All of this stuff is incredible... so delicately balanced. All these intricate feedback loops... evolution and development and culture all twined together

From joint attention to more sophisticated things…

- How do we think about other people?

Sally-Anne Test

- “False belief task”
- Sally believes that the marble is in the basket. WE know that this belief is false.
- Sally-Anne tests OUR ability to represent and reason about OTHER people having beliefs that WE know are false.



”Theory of mind” (ToM)

- A broad constellation of cognitive abilities that have to do with:
- An agent’s ability to represent and reason about the internal mental states of other people
  - Beliefs
  - Emotions
  - Desires
  - Goals
  - Perspective taking (i.e., what can the other agent see?)
  - Etc.
- Humans have very sophisticated ToM abilities compared to other species
- (But it’s also hard to measure)

ToM enables things like...
empathy
compassion
lies
deception

Original Articles

Avian Theory of Mind and counter espionage by food-caching western scrub-jays (*Aphelocoma californica*)

Joanna M. Dally, Nathan J. Emery & **Nicola S. Clayton**

Pages 17-37 | Published online: 13 Aug 2009

Cite this article https://doi.org/10.1080/17405620802571711

- Food-caching scrub-jays hide food for future consumption and rely on memory to recover their caches at a later date.
- These caches are susceptible to pilfering by other individuals, however.
- Consequently, jays engage in a number of counter-strategies to protect their hidden items, caching most of them behind barriers, or using shade and distance as a way of reducing what the potential pilferer might see.
- Furthermore, after being observed by a potential pilferer at the time of caching, jays re-hide food in new places.
- Importantly, however, jays only re-cache food if they have been observed during caching and only if they have stolen another bird's caches in the past.
- Naïve birds that have no thieving experience do not do so.
- The inference is that jays with prior experience of stealing others' caches engage in experience projection, relating information about their previous experience as a pilferer to the possibility of future cache theft by another bird.
- These results raise the intriguing possibility that re-caching is based on a form of mental attribution, namely the simulation of another bird's viewpoint.

Perspectives on ToM are evolving...

- Used to be considered a “standard” thing in humans
- Many studies showing ToM difficulties in autism
- BUT... isn’t it a two-way problem???
- Newer ideas include the “double empathy” model

Exp Brain Res (2010) 200:223–237
DOI 10.1007/s00221-009-2002-3

REVIEW

Mirror neurons: from discovery to autism

Giacomo Rizzolatti · Maddalena Fabbri-Destro

- In the winter of 1991 I (GR) sent to *Nature* a report on a surprising set of neurons that we (Giuseppe Di Pellegrino, Luciano Fadiga, Leonardo Fogassi, Vittorio Gallese) had found in the ventral premotor cortex of the monkey.
- The fundamental characteristic of these neurons was that they discharged both..
- when the monkey performed a certain motor act (e.g., grasping an object)
- **and when it observed another individual (monkey or human) performing that or a similar motor act (Di Pellegrino et al. 1992).**
- These neurons are now known as mirror neurons (Fig. 1).

Mapping me to you is very sophisticated!

- How do we know what to map???
- How is it implemented in the brain?
- How is it learned?
- This example from monkeys was ACROSS SPECIES!
- Important for:
- Imitation learning
- Inferring intentions (different than predicting actions!)
- Theory of mind

Mirror neurons mostly studied in monkeys… why?

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Single-Neuron Responses in Humans during Execution and Observation of Actions

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Patients

We recorded extracellular single and multiunit activity from 21 patients with pharmacologically intractable epilepsy. Patients were implanted with intracranial depth electrodes to identify seizure foci for potential surgical treatment. Electrode location was based solely on clinical criteria and the patients provided written informed consent to participate in the experiments. The study conformed to the guidelines and was approved by the Medical Institutional Review Board at UCLA.

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Mirror neurons 30 years later: implications and applications

Luca Bonini · Cristina Rotunno · Edoardo Arcuri · Vittorio Gallese

- Mirror neurons (MNs) were first described in a seminal paper in 1992 as a class of monkey premotor cells discharging during both action execution and observation.
- Despite their debated origin and function, recent studies in several species, from birds to humans, revealed that beyond MNs properly so called,
- a variety of cell types distributed among multiple motor, sensory, and emotional brain areas form a ‘mirror mechanism’ more complex and flexible than originally thought,
- which has an evolutionarily conserved role in social interaction.