Social Cognition

9.012, April 13, 2006

presentation by Nat Twarog

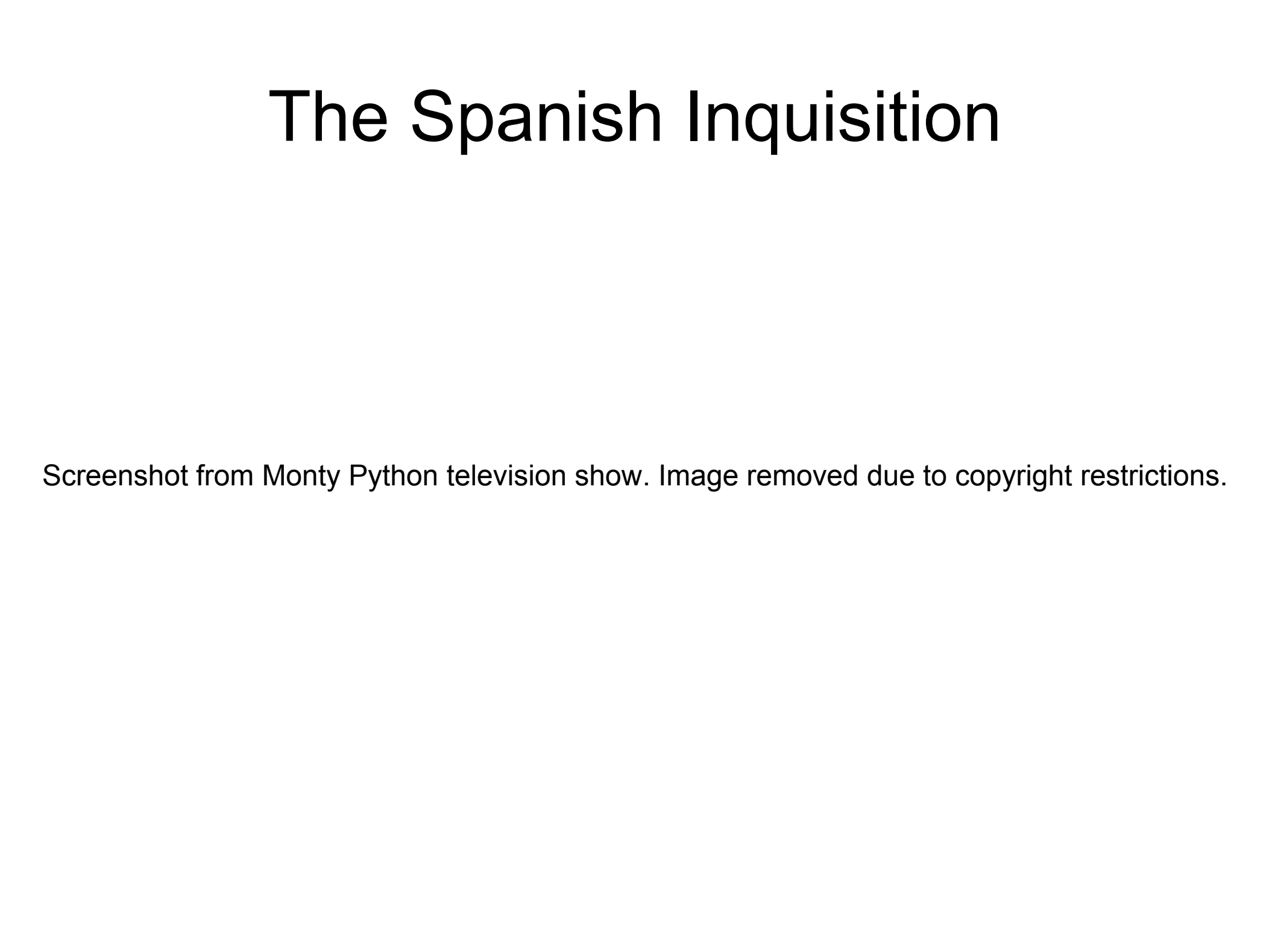
But first...

A brief lesson in Monty Python, and his Flying Circus

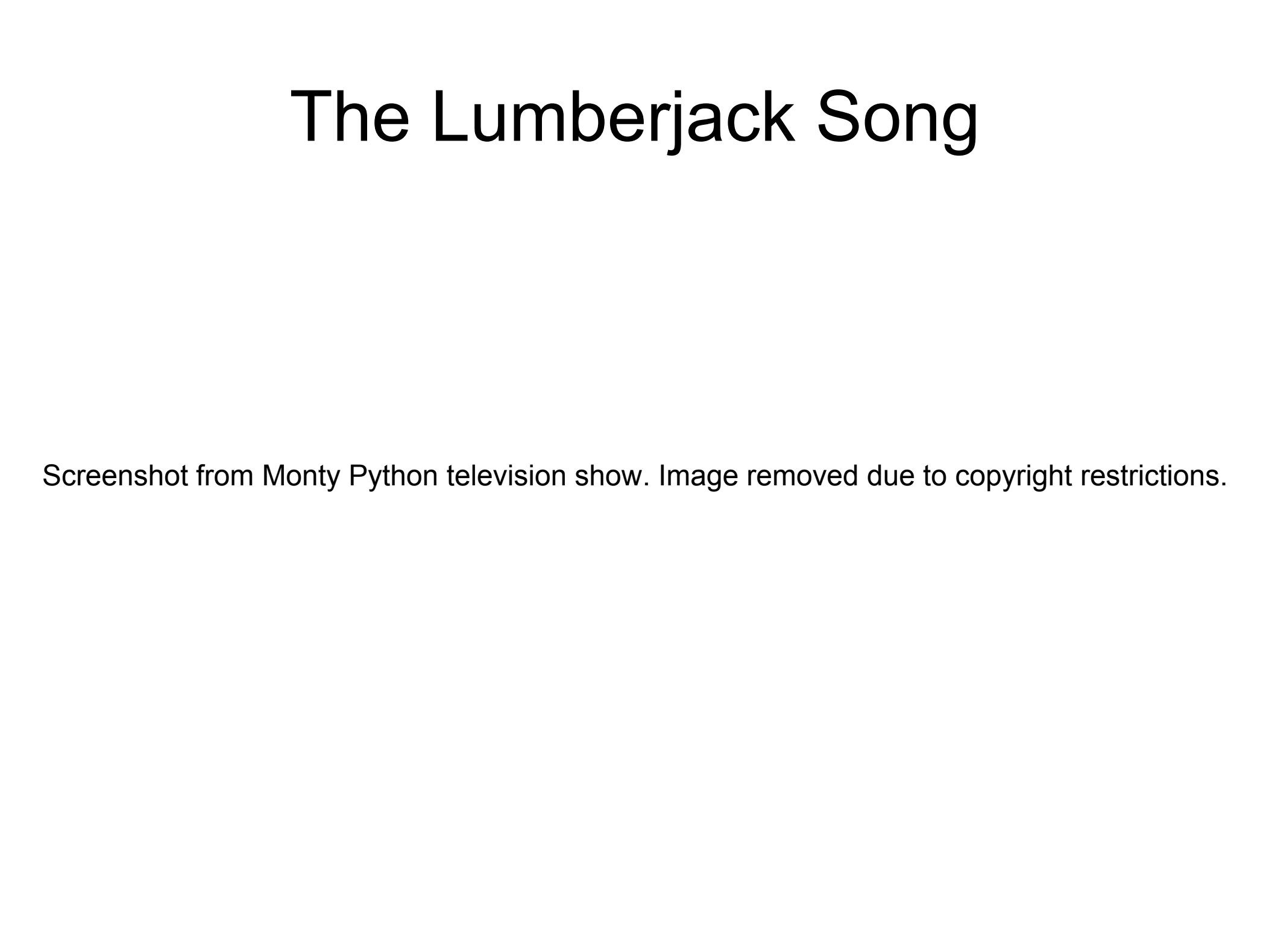
The “Dead Parrot” Sketch

Screenshot from Monty Python television show. Image removed due to copyright restrictions.

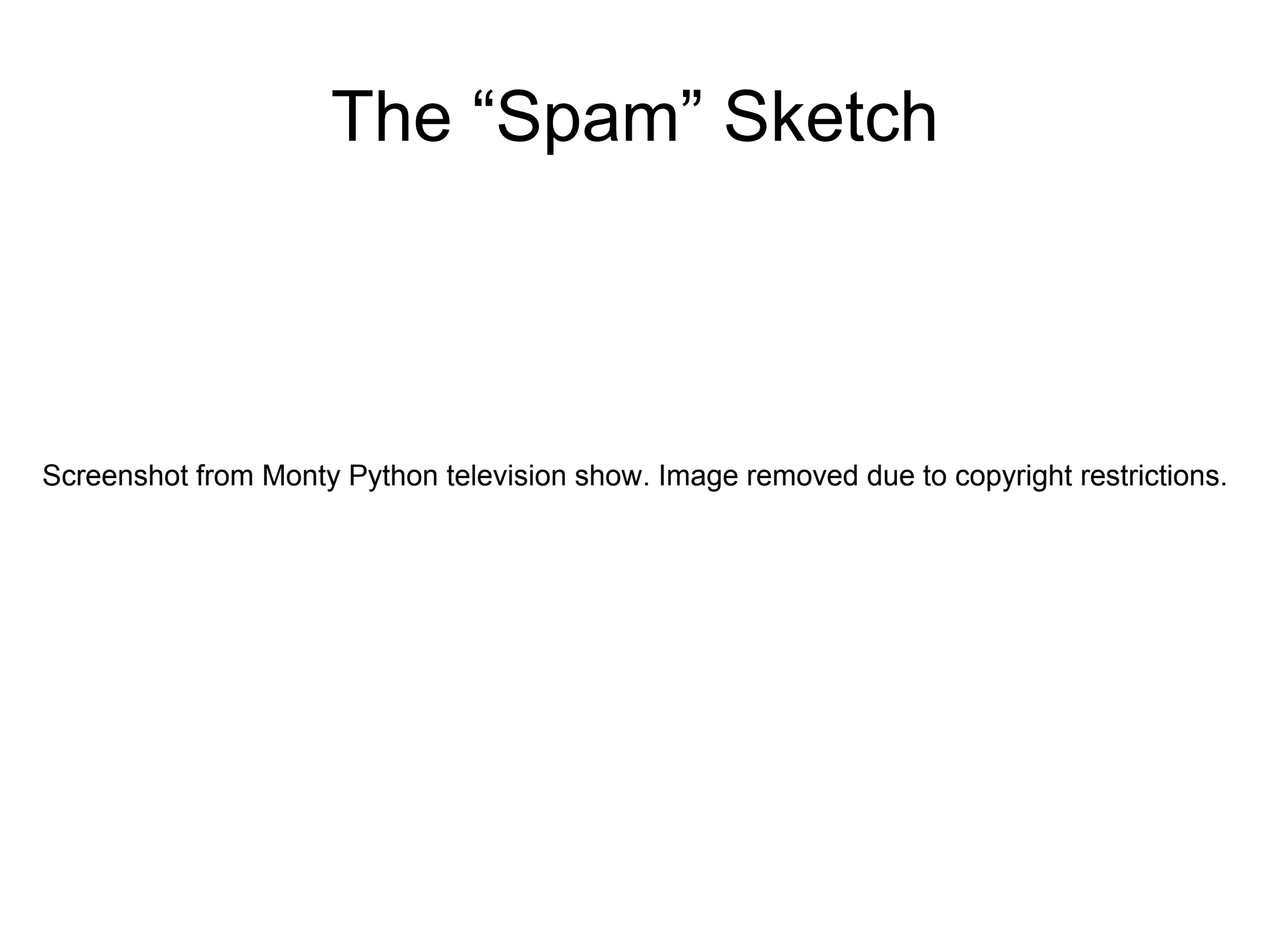
The Spanish Inquisition


Screenshot from Monty Python television show. Image removed due to copyright restrictions.

The Lumberjack Song


Screenshot from Monty Python television show. Image removed due to copyright restrictions.

The “Spam” Sketch



... and the Ministry of Silly Walks

Screenshot from Monty Python television show. Image removed due to copyright restrictions.

Other Less-Well Known, but Equally Funny Sketches

- The World's Funniest Joke
- Crunchy Frog
- Restaurant Sketch
- The Golden Age of Ballooning
- and any of Terry Gilliam's animations

And now, for something completely different...

Presentation Roadmap

- What is social cognition and why is it important?
- How has it been treated in the past?
- How do we approach it computationally?
- Specific areas of study
  - Development and Representation
  - Altruism
  - Mate Choice
  - Neurological and mental disorders

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  - In simple terms, it's the study of how the mind deals with other members of the same species

Who cares?

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- What about this problem warrants a full hour-and-a-half lecture, much less it's own two-word phrase?

“Man is a Social Creature”

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- Interaction with other minds, most commonly other people, is an ***ENORMOUS part of human life***
- ***This fact stretches back through and beyond hominid evolutionary history***
- ***Because in our evolutionary setting, cooperation with other humans was integral to survival, our mind has to be very capable of processing and dealing with other minds***

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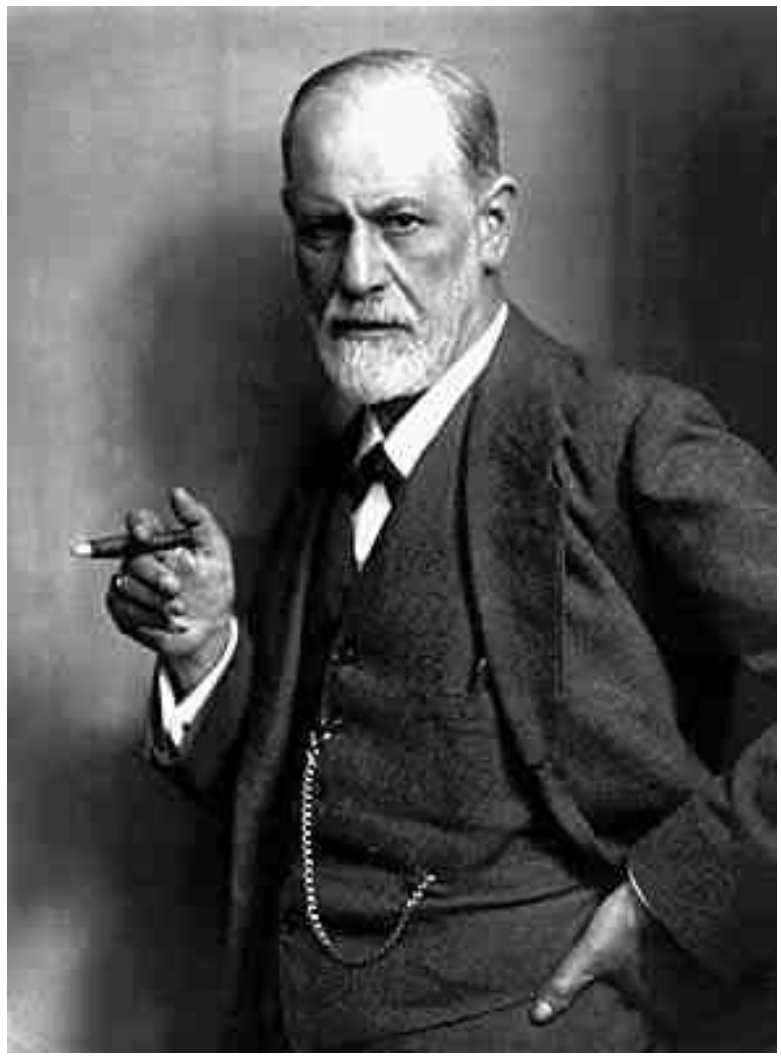
The Obligatory Freud Slide



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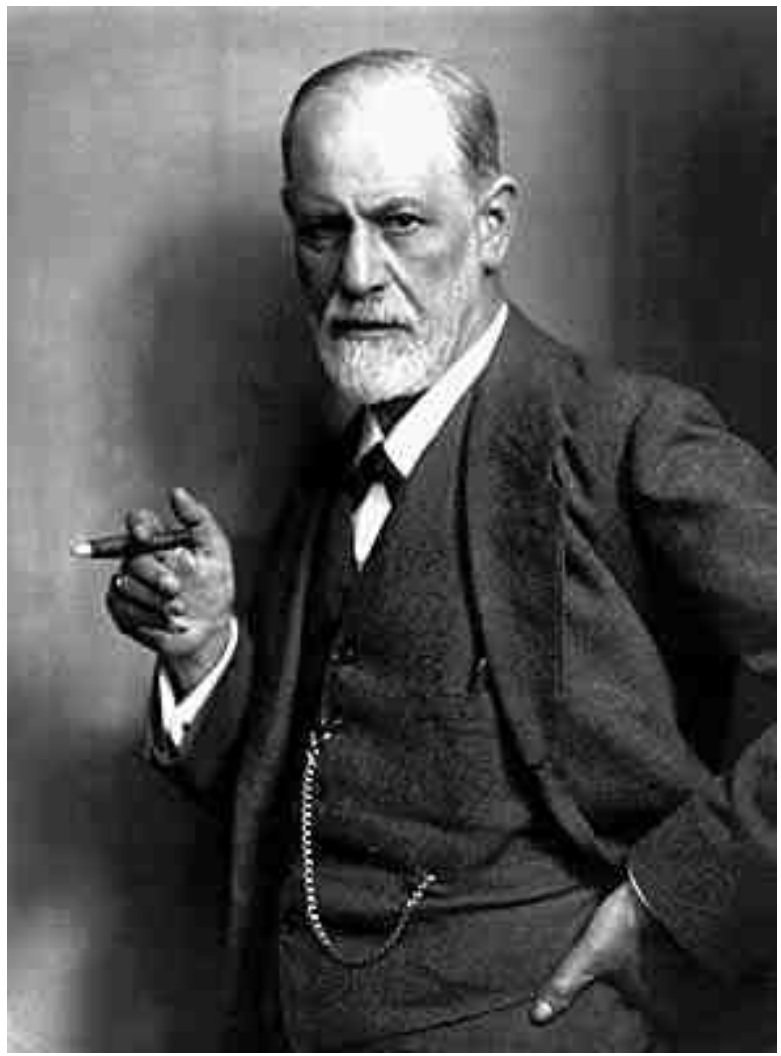
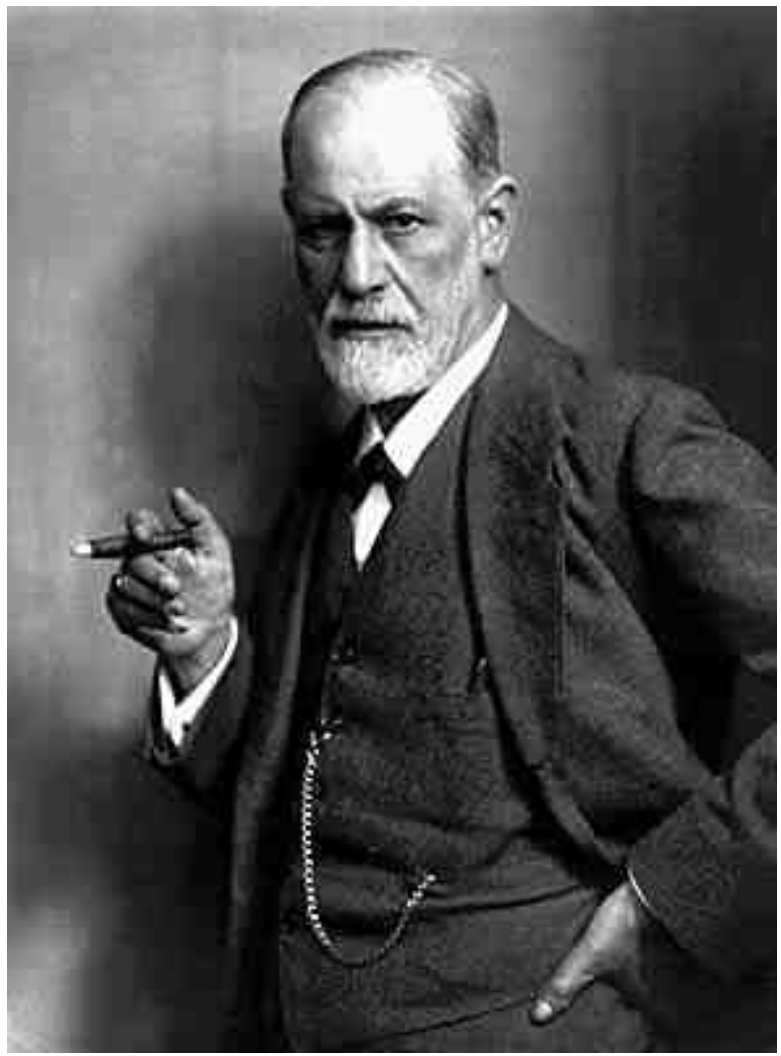
- Approach to social cognition similar to approach to other topics
  - Adaptive solution to a goal



The Obligatory Freud Slide

- Approach to social cognition similar to approach to other topics
  - Adaptive solution to a goal
- Actual theories on social cognition pertained mostly to specific cases
  - How a person relates to their father, mother, relatives



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- As with many of his theories, those relating to the father and mother seemed unlikely and turned out to be false
- Made no attempt to explain how the brain recognizes other minds and is able to predict and understand their actions
  - Seems unlikely that this could develop in infancy as a means to a goal

The Even-More-Obligatory Behaviorism slide

Image from Sonoma State University Public Domain library of famous psychologists: http://www.sonoma.edu/psychology/psychart.htm

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- Behaviorists: not too much to say

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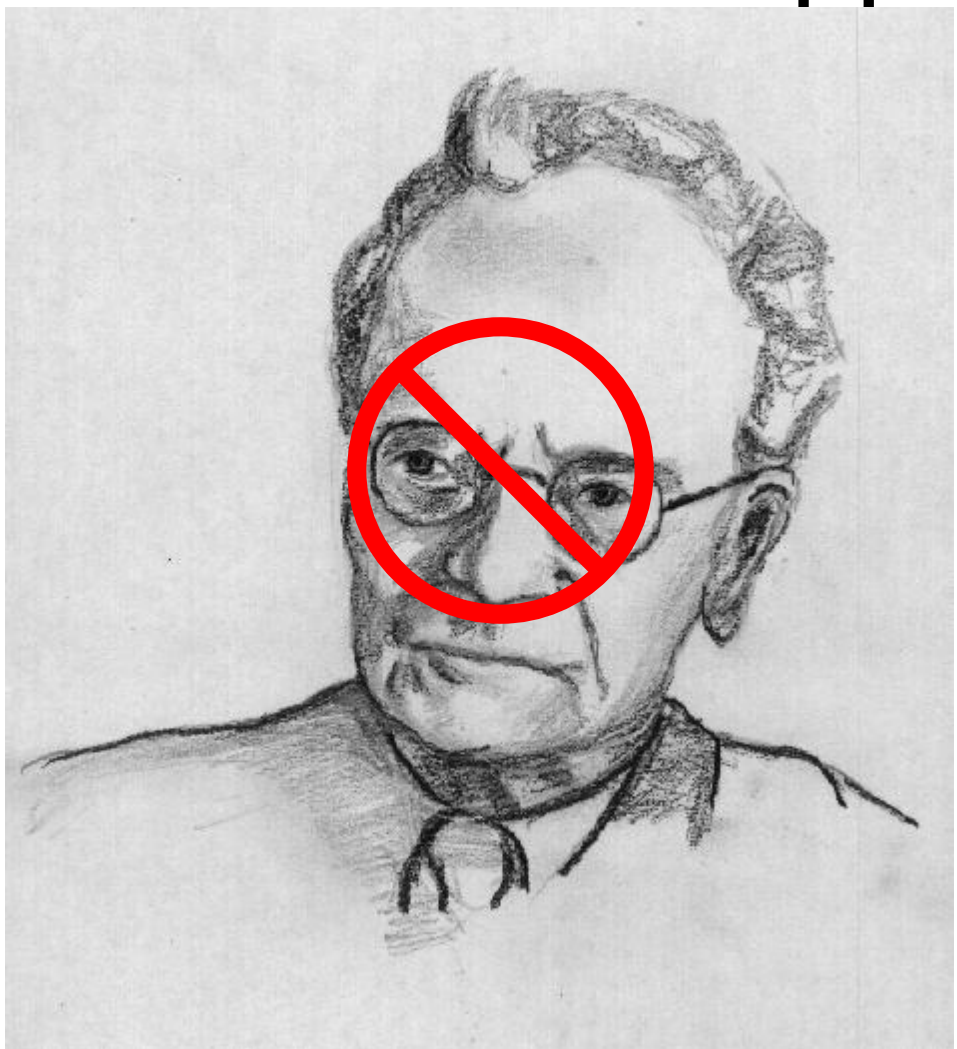
- Behaviorists: not too much to say
- Social cognition problem is just another association problem
  - Certain behaviors in other people should elicit certain responses, and that's that

Problems with the Behaviorist Approach



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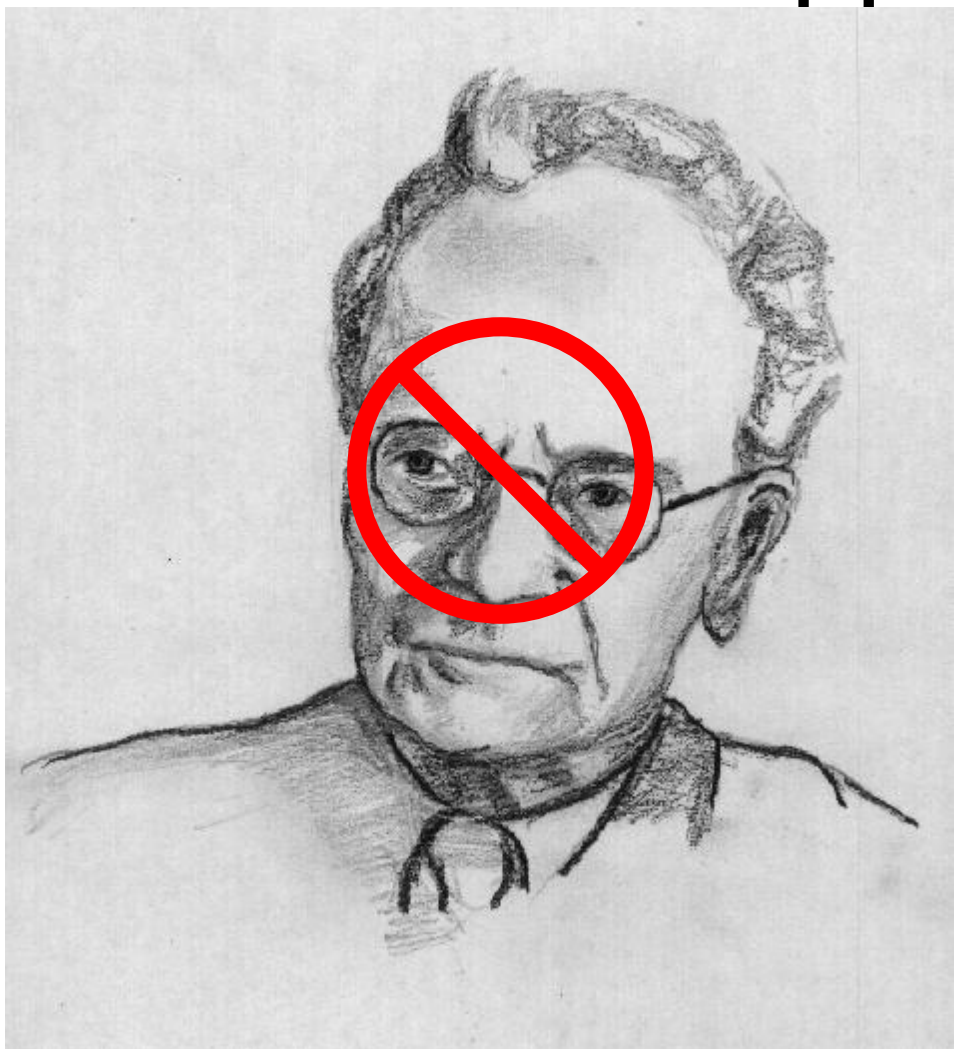

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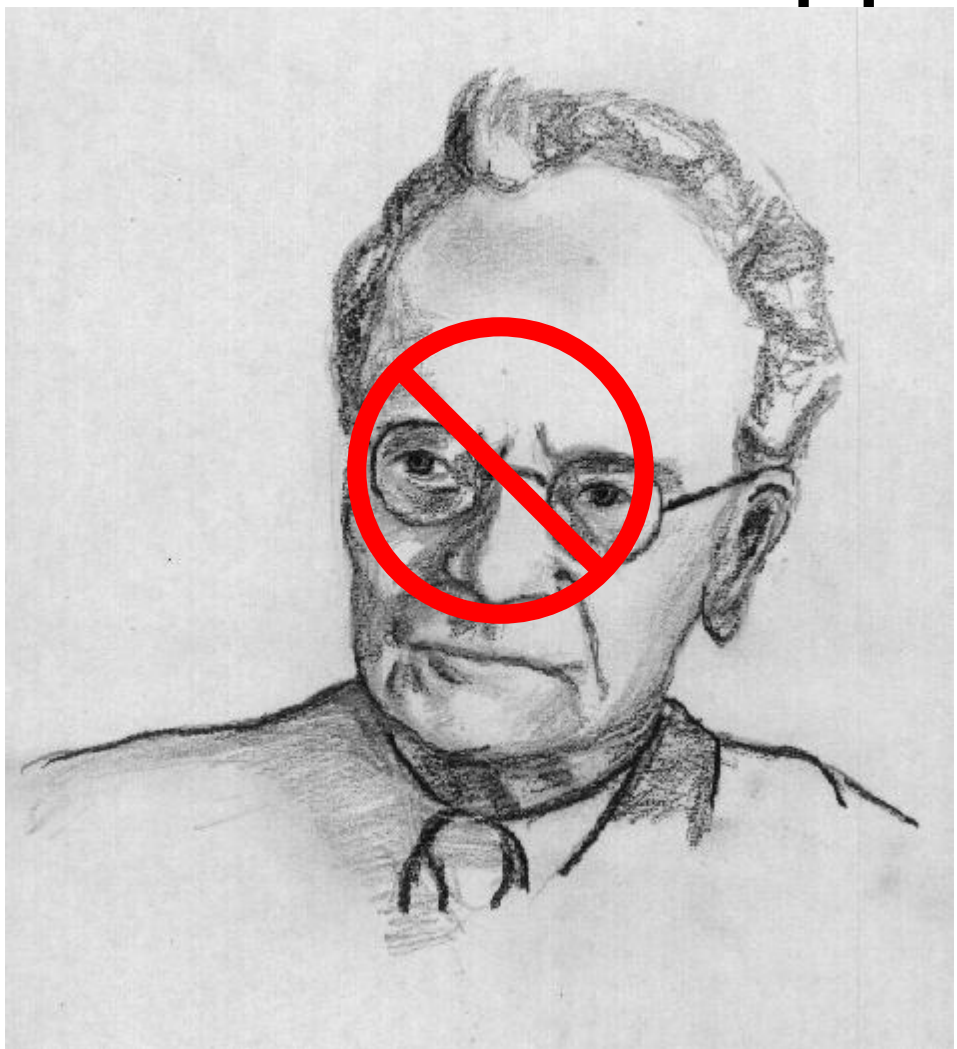

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- Allows no discussion of beliefs or desires; the mind does not consider the internal mental state of other minds
  - Without these, the connections between observed behavior and the correct response are incredibly difficult to see, if not random

And then, Social Psychology

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- Produced a number of interesting results
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- But still didn't really address the issue of *cognition*

Cognitive Science!

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- In 1977, Meltzoff and Moore found that three-week-old infants not only reacted to faces, but could imitate them
  - This result suggested that there was an innate, or very early developed, mechanism which recognized the face as analogous to the baby's own, and prompted the baby to react by imitating

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- Since then, many other results in the area of social cognition have come to light, some of which we will discuss later
- Other valuable insights into the nature and origin of social interactions and processing came from ...

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  - Specifically, subjects such as mate choice, altruism, and familial interactions have all been better understood through an evolutionary approach

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Marr's three levels of analysis

- Level 1: Computational theory
  - What is the goal of the computation, and what is the logic by which it is carried out?
- Level 2: Representation and algorithm
  - How is information represented and processed to achieve the computational goal?
- Level 3: Hardware implementation
  - How is the computation realized in physical or biological hardware?

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- Answers come in large part from evolutionary psychology and game theory

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- Some answers from research in cognitive development, but many questions still unanswered

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- Some results from studies of patients with brain damage, and from the effects of some mental disorders, but many answers remain elusive

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- Despite this...

Altruism in the Natural World

Image courtesy of Ucumari

Altruism in the Natural World

- Vampire Bats will give up blood they have gathered in a night to others who have little or none

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Image courtesy of goatsfoot

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- Worker and soldier ants sacrifice all ability to reproduce, and sometimes their lives for their sister
- And of course, there's Bill and Bono...

Image of Bill Gates and Bono.
Image removed due to copyright restrictions.

What's Going On?

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- *Kin Selection explained many of the altruistic phenomena in nature*
  - *The genetics of ants is such that they share more genes with their sister than they would with a child*
  - *Vampire bats are more likely to help a relation, and the likelihood is dependent on the closeness of the relation*

But There's More...

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- Humans engage in a wide range of altruistic, generous behavior, most of it with non-relatives, even strangers
- There must be an alternative explanation for these behaviors

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- A result from economic game theory suggested that a strategy which engaged a particular kind of altruistic behavior could in fact flourish in an evolutionary environment
- Result came from study of the game theory problem called The Prisoner's Dilemma
- The theory was adapted for evolutionary psychology and became...

Reciprocal Altruism

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- “You scratch my back, I'll scratch yours”
  - “But if you end up not scratching my back, I won't scratch yours anymore”
- Theory successfully many other examples of altruism in nature
  - Vampire bats were found to be more likely to share with those who had shared with them, and less with those who had not

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- Fehr & Gachter (2002) demonstrated that humans engage in “altruistic punishment,” which cannot be explained by kin selection or reciprocal altruism
- Altruistic punishment, according to game theory, is a losing strategy
- Further research is needed to rectify this

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- Picking a healthy, fit, individual with high status and intelligence increases the chances that the genes you do pass on will end up in a fit child
- But, many important traits (health, status, intelligence, fertility, fidelity) are not easily observable
- How do we find the best mate?

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- Certain physical and personal cues suggest desirable mating traits
  - Ex: Devendra Singh's hip-to-waist ratio studies
- So, answer is: various cues to physiological and psychological fitness are combined, in some way, unconsciously, to result in some degree of attraction
- Sounds good, right?

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- As you might expect, things are much more complicated
- How do you combine attractiveness cues?
- What about differences between men and women?
- What's the difference between a sex partner and a marriage partner?

Combining the Cues

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- Simplest method: Linear combination – Whichever cues are the best predictors get the most weight
- But, some traits do not combine linearly (Jensen-Campbell, agreeableness and dominance)
- Traits become observable at different points in interaction
  - Physical attractiveness is easily accessible, but fidelity takes a long time to judge

Men and Women

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- So, if evolutionary psychology is correct, women should be more discriminating and cautious about sexual partners than men
  - David Buss' sexual questionnaire

Sex Partner, Marriage Partner

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- For men, best strategy is to mate wherever possible and help raise the most promising children
- For women, however, a better strategy is to get the best genes for sex, but the best husband for marriage
- So, women should look for fidelity, reliability, and kindness in a husband, and attractiveness, intelligence and status in an affair
  - Survey says ... yes

Other Areas

- Familial relations
  - Parent-child, sibling-sibling, stepparent-stepchild
- Emotions
  - Purpose, expression, faking, extreme examples
- Violence
  - Jealousy, war, societal opinion

Cognitive Representation

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- Not much is known, but some insight has come from studies of infants, and their ability to process social information

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- Infants of the same age also could recognize and process “referential” actions
- These results suggest that at least some mechanisms for processing social information are innate, or develop very early in life

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- Even earlier research has found that humans recognize seemingly mind-driven behavior, even in abstract shapes, like circles and triangles
- Simple explanation is that humans have abstracted motion patterns from human behavior they have observed over long periods of human interaction
- So babies can't do it, right?

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- He pointed out that the infants need not have a “theory of mind” but simply an innate understanding of the teleological structure of goal-directed action
- This innate structure, he theorized, could later be integrated with higher-level social information, like knowledge about the beliefs and desires of others

Neurological Studies, briefly

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- After accident, personality and social interactions were highly affected
- Suggested that mechanisms governing social behavior are present in the frontal lobe
- Since then, however, social processing mechanisms have been found all across the brain

Autism

- Affects about 0.1% of children
- Causes still poorly understood
- Some researchers have suggested that many problems in autism can be traced to an inability to recognized or think about other minds (Baron-Cohen, Frith, Leslie)
- Autistic children perform on numerous tasks which require social cognition
  - But they perform often above average on other logical tasks

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  - But they perform often above average on other logical tasks

The End

(Applause)

Image of people applauding.
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