Anthro 101:
Human Biological Evolution

Lecture 11: Cooperation, Intelligence, Communication, Culture, & Human Behavior

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Reminders

- Fossil lecture for homework
  - Quiz about material on Wednesday
  - EXAM 2 Tuesday

Many primates behave in ways that benefit others

Coalition formation

Food sharing

Allo-maternal care

Territorial defense

For altruism to evolve, must limit altruism to other altruists

- **Kin Selection**
  - Limit altruism to kin
- **Reciprocal Altruism**
  - Limit altruism to those who help you

S. Alberts

1. Predictions about Kin Altruism

C < rB (Hamilton's Rule)

C = Cost to the giver

B = Benefit to receiver

r = Relatedness (probability receiver carries identical copy of gene)

1. **No altruism toward nonkin (*r* = 0)**

2. **Altruism biased toward close kin**

How do we know who is kin?

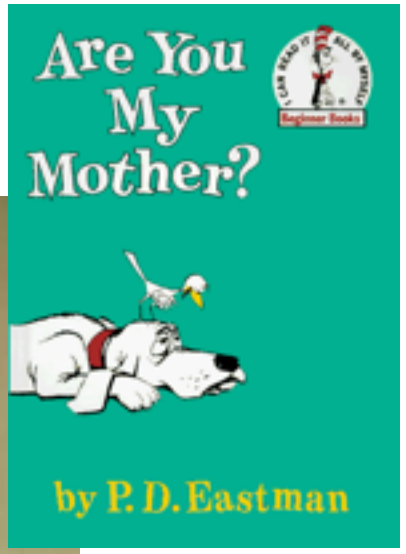
Mothers

-Learn via close contact = familiarity

-Learn about female kin via time with mom

- Siblings, aunts, grandmom

-Fathers?



Can primates recognize paternal kin?

Rules of thumb:

-Did you mate with the mom?

-What other males mated with the mom?

Will vary by type of social group

- Pair-bonded species
- One-male groups
- Multi-male groups

If one male does 100% of mating:

= **father** of all kids conceived during his tenure

= all kids born during his tenure will be **paternal half siblings**

2. Cooperation via Reciprocal Altruism

- Individuals take turns giving and receiving benefits

- Reciprocal altruism requires
  1. Frequent opportunities to interact
  2. Keep track of help given and received by specific individuals
  3. Stop helping if don't receive help in return

✓ Don't get cheated!!
✓ Primates likely to meet requirements

Ted Talk

- http://www.ted.com/talks/frans_de_waal_do_animals_have_morals

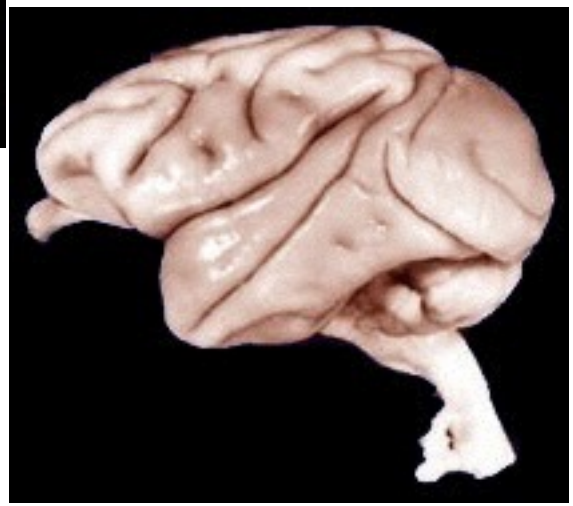
Lets Talk About the Video

- What do you find interesting?
- Can we learn something about studying nonhuman primate altruism?
- Did you think nonhuman primates could understand fairness?
- Do we need to be taught morality?

Monkeys and apes have big & complex brains, particularly neocortex – why?

-Cooperation
-Learning
-Complex behavior
-Problem solving

galago



rhesus

chimpanzee

Learning and problem solving skills may have evolved to function in specific contexts

1. Solving complex **ecological problems**
   - Processing inaccessible food items
     - **Extractive Foraging**
   - Locating and remembering food sources
   - Navigating between food sources
     - **Cognitive Maps**

= **Ecological Intelligence Hypothesis**

Extracted foods especially important to ape diets

Orangutans eat durian fruits

Chimps fish for ants in trees

Neesia fruit covered in spines

Chimps crack nuts with stones

Ecological challenges play a role but are probably not the whole explanation for big brains

- Extractive foragers include:
  - Apes = big brain
  - Capuchins = big brain
  - Aye-ayes = not so big brain
    - Though large for a prosimian…

- Small-brained animals construct cognitive maps, navigate long distances, forage efficiently

Lets Look at One Possible Explanation

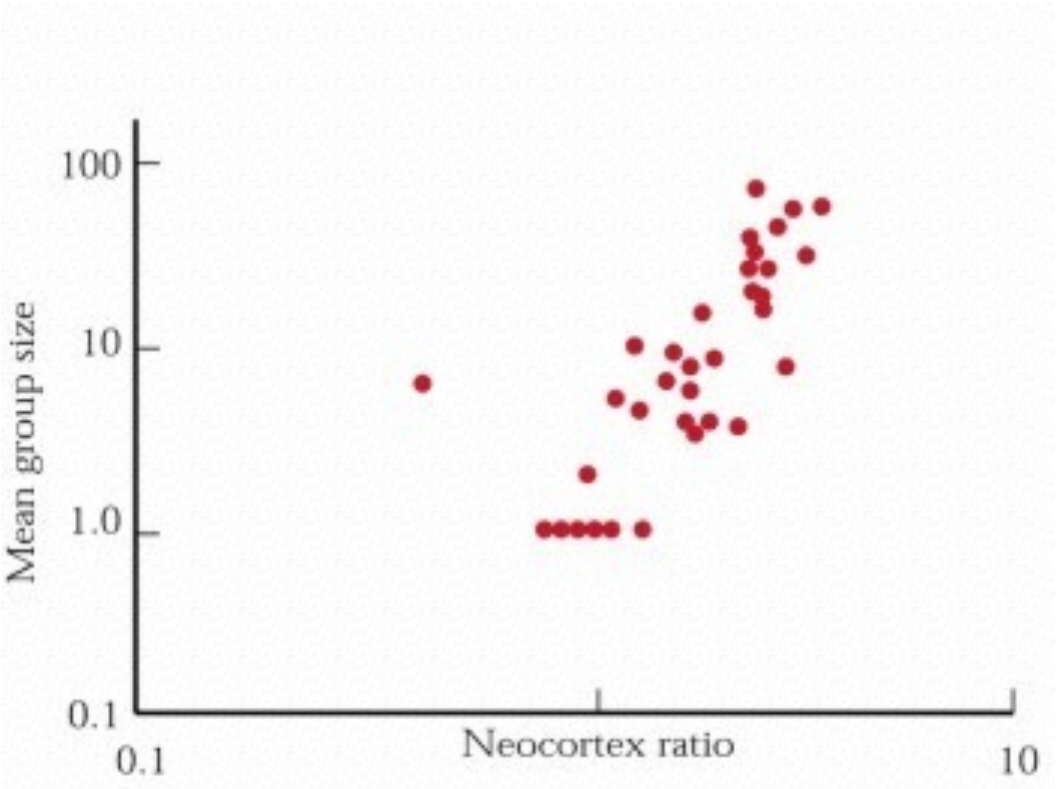
- http://www.ted.com/talks/suzana_herculano_houzel_what_is_so_special_about_the_human_brain

Learning and problem solving skills may have evolved to function in specific contexts

- Solving complex **social problems**
  - Keeping track of kin
  - Keeping track of relative rank
  - Remembering benefits given & received
  - Manipulating rivals
  - Managing coalitions

All the joys of living in a large group!

Comparative data DO link group size to cognitive development



Dunbar 1998

But its not clear exactly what group size is measuring…

So why are primates intelligent?

- Social complexity & group size not the whole story
  - Apes all live in relatively small groups
- Ecological skills quite advanced in apes
  - Apes do use lots of extractive foods
  - Some foraging skills take long time to learn
  - Big brain may be linked to foraging challenges
- Likely both played a role

How do we define culture in humans?

- Learned
- Patterned
  - Nonrandom
  - Inter-related
    - Systematic
- Transmittable
  - Learned
  - Stored
  - Accumulates

- Are humans unique?

How do we define culture (protoculture?) among nonhuman primates?

- Information acquired via social learning

- Not a species typical behavior
- Not genetically inherited
- Presence/absence not only due to ecology
- Different patterns of behavior in different groups

Culture, Behavioral Traditions, Protoculture

- Potato washing in Japanese macaques
- Chimps:
  - Ant fishing
  - nut cracking
  - Hand-clasp groom
- Still, a large difference from humans
  - Single behaviors
  - Limited domains
  - Little accumulation