

# Natural selection (continued)

Inclusive fitness, reciprocity, sexual selection

# Outline

- The problem of altruism
  - Group Selection
  - Kin Selection - inclusive fitness
  - Reciprocal Altruism
  - Signalling / showing off
- Sexual selection

# The puzzle of altruism

Altruism is very common....

yet natural selection favors genes for traits that help an individual survive and/or reproduce.

Shouldn't a gene for altruistic behavior -- something that costs the altruist and benefits a recipient -- be selected against?

# How does evolutionary theory explain altruism?

Some ideas we will discuss:

- Group selection (only relevant for cultural evolution)
- Kin selection
- Reciprocal altruism
- Signalling / “showing off”

# Group selection?

Darwinian natural selection acts on individuals not groups or species

Wynne-Edwards first proposed an analogous process for groups:

- Groups of altruists would thrive and spread
- Selfish groups would overexploit resources and go extinct.

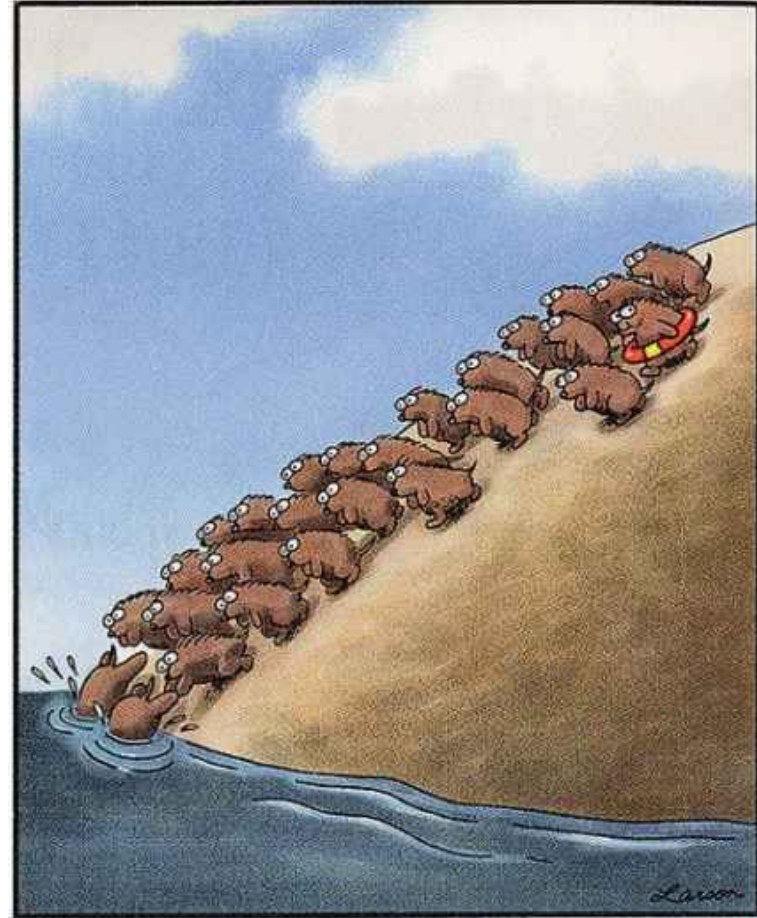
# Group selection's fatal flaw

A mutant non-altruistic gene would spread in the group

Groups divide less often than individuals reproduce

Therefore group selection for altruism is unlikely in genetic evolution

Caveat: may be important in cultural evolution (culturally-transmitted traits)



# Kin Selection

You are altruistic to your family because you love them.

BUT

Why do you love them?

How did that feeling evolve?

# Kin selection

A gene for altruistic behavior can spread, because relatives often carry the same gene.

The benefit to your relative may be enough to outweigh the cost to you, if you are closely related. Example:

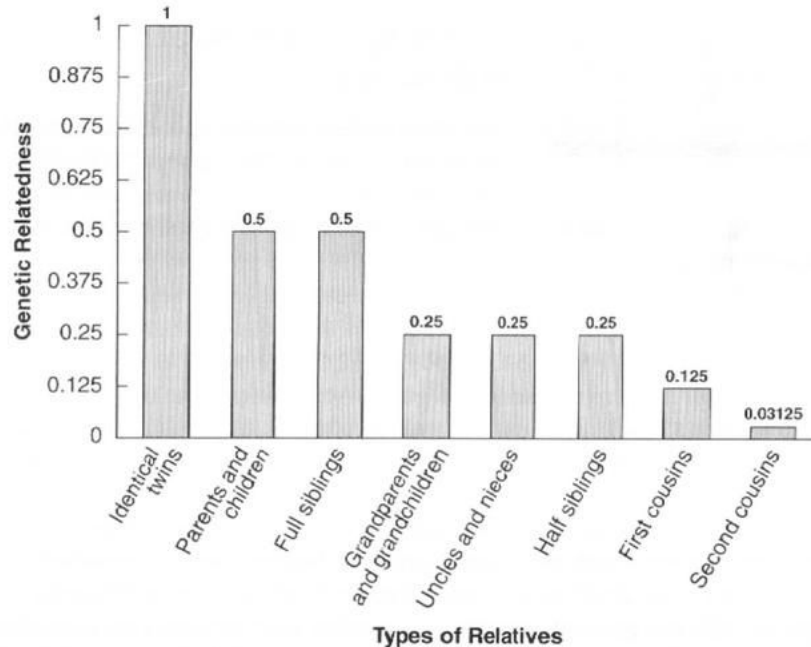
A gene that leads you to increase the fitness of your full sib (who shares half your genes by descent) can spread if the benefit to your sib is more than twice the cost to you.

More on this in the section on kinship!



# Kin selection and inclusive fitness

Probability that you share a gene by descent with: sibs, parents, uncles, cousins:



# Inclusive Fitness

Inclusive fitness includes individual selection + kin selection

Includes your effect on the reproductive success of a relative, and their effect on yours.

The flip side: even close relatives don't have identical genetic interests;

Conflicts of interest within families are natural.

# Altruism to non-kin

We are also altruistic outside the circle of close kin

- We help out our friends
- Leave tips to waiters we will not see again
- Donate to charity

Why? How can evolution favor this?

# Reciprocal altruism

Altruism can be favored if the recipient will return the favor later.

But how to ensure that they will? Ev Psych suggests:

- Cognitive specializations -- “cheater detection” ?
- Social emotions: grudges, resentment, guilt...

More on this in the section on group living (reciprocity & the social brain)

# Showing off -- signalling quality

Some altruism may be explained as showing off

- Signalling quality as a mate
- Signalling resources, status
- Signalling you are helpful, cooperative

More on this in the section on group living (status, prestige, social dominance)

# Sexual Selection

How does natural selection explain a peacock's tail?

Traits that differ between biological females and males (“sexually dimorphic” traits) usually arise from sexual selection -- a kind of natural selection, involving competition for mating partners. Two types:

**“Intra-sexual selection” (“male-male competition”)**: often favors larger size, weapons (e.g., big canines), etc.

**“Inter-sexual selection” (“mate choice”)** -- favors traits that make an individual more attractive as a mate -- peacock's tail, signs of fertility, etc.

Much more on this in the section on mating and sexual strategies

# Summary

Adaptation arises from natural selection, but some traits are puzzling, because they don't look like adaptations.

In order to explain them, we need to understand some nuances of natural selection (kin selection and sexual selection) and additional tools like reciprocal altruism.

This lecture was just a brief introduction to terms and concepts. They will all be discussed at greater length in later sections of the course.