

The background of the slide is a solid pink color, decorated with scattered white confetti. The confetti consists of various shapes: small squares, triangles, and wavy lines, all scattered across the entire surface.

# Ultimate Galentines: The Evolution of Female Relationships in the Animal Kingdom



**What the heck is  
Galentine's Day?**



OH, IT'S ONLY THE BEST DAY  
OF THE YEAR.

# Parks and Recreation





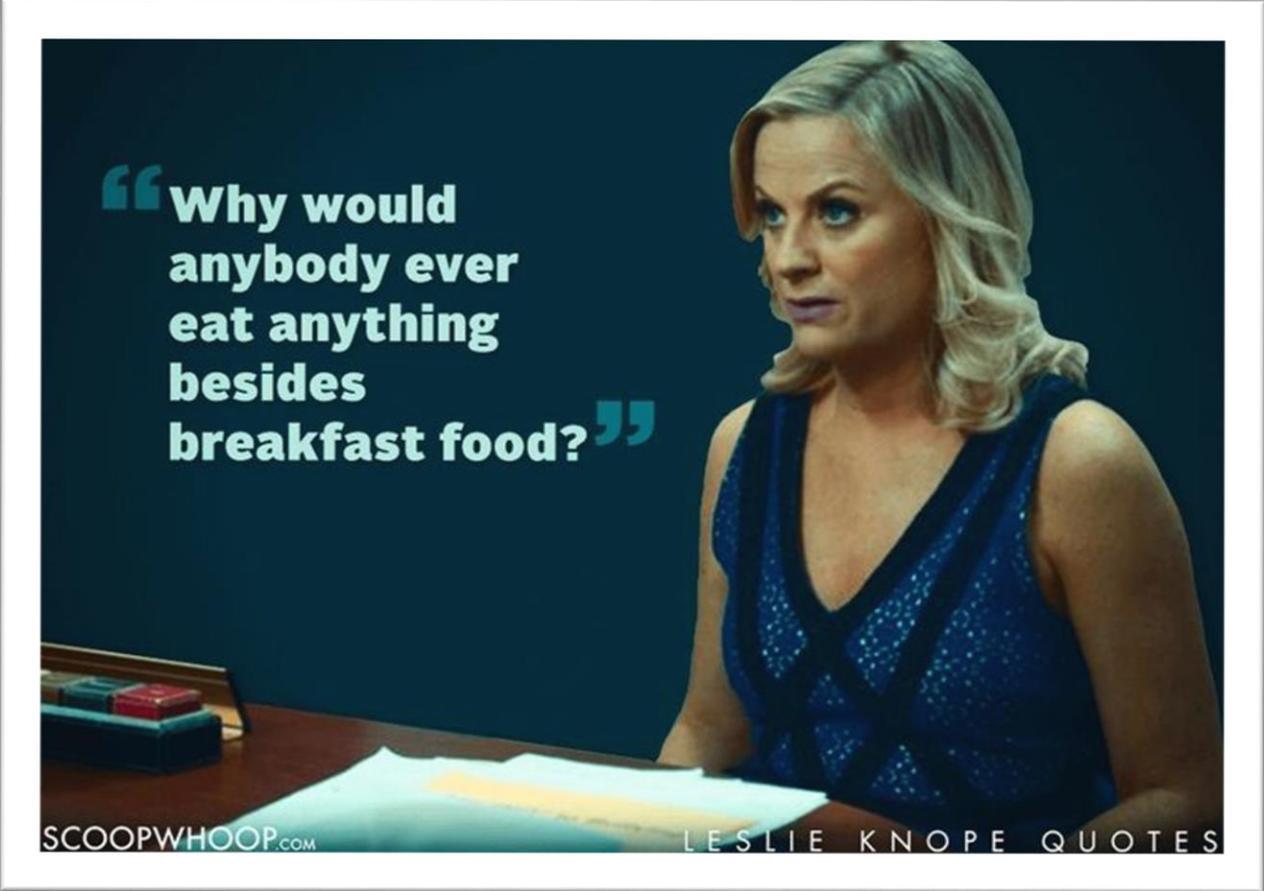
**“There’s nothing we can’t do if we work hard, never sleep, and shirk all other responsibilities in our lives.”**

LESLIE KNOPE QUOTES

SCOOPWHOOOP.COM



**“I am big enough to admit that I am often inspired by myself.”**



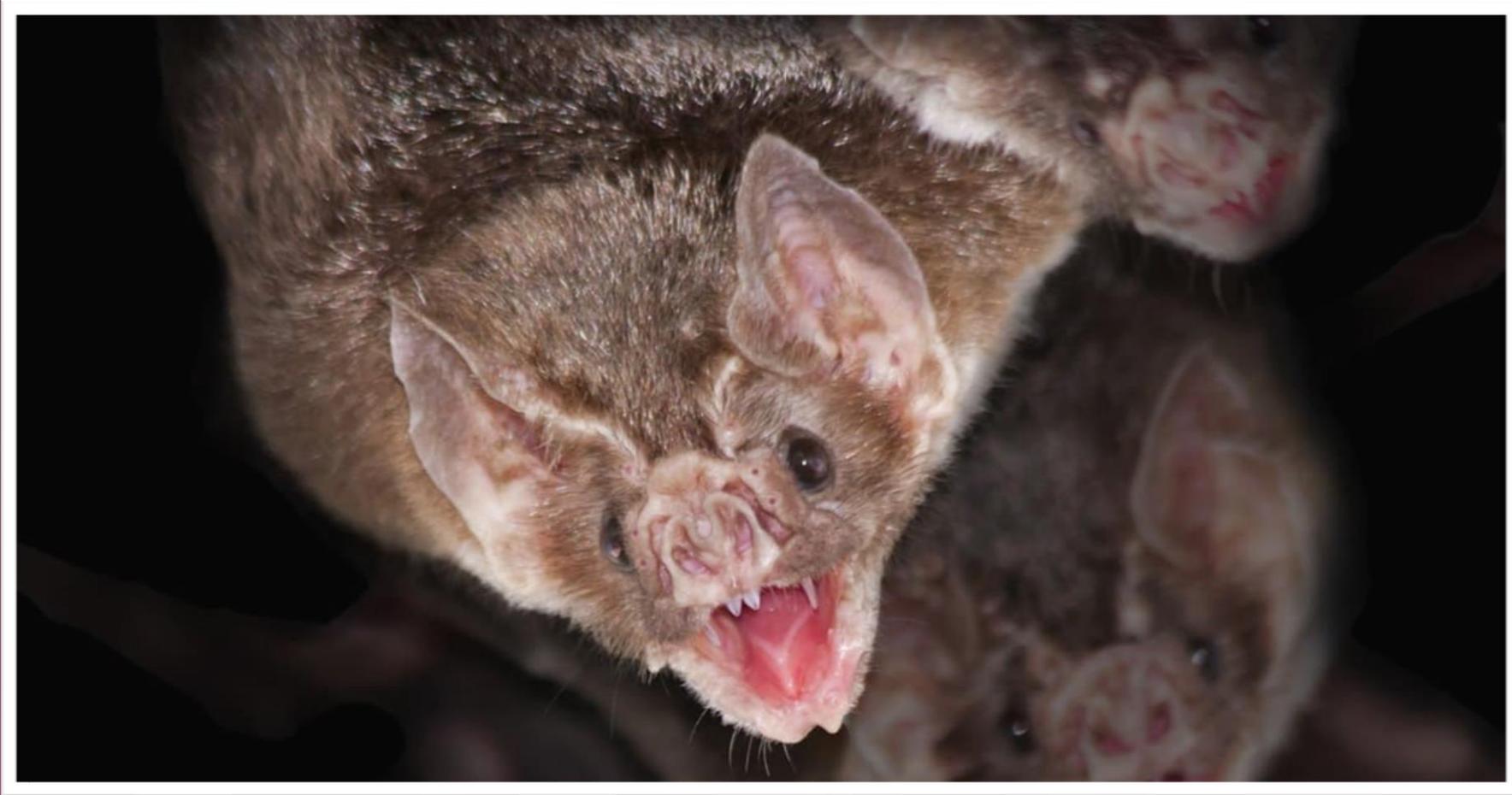
**“Why would anybody ever eat anything besides breakfast food?”**

SCOOPWHOOOP.COM

LESLIE KNOPE QUOTES



Female vampire bats are the **ULTIMATE** Galentine



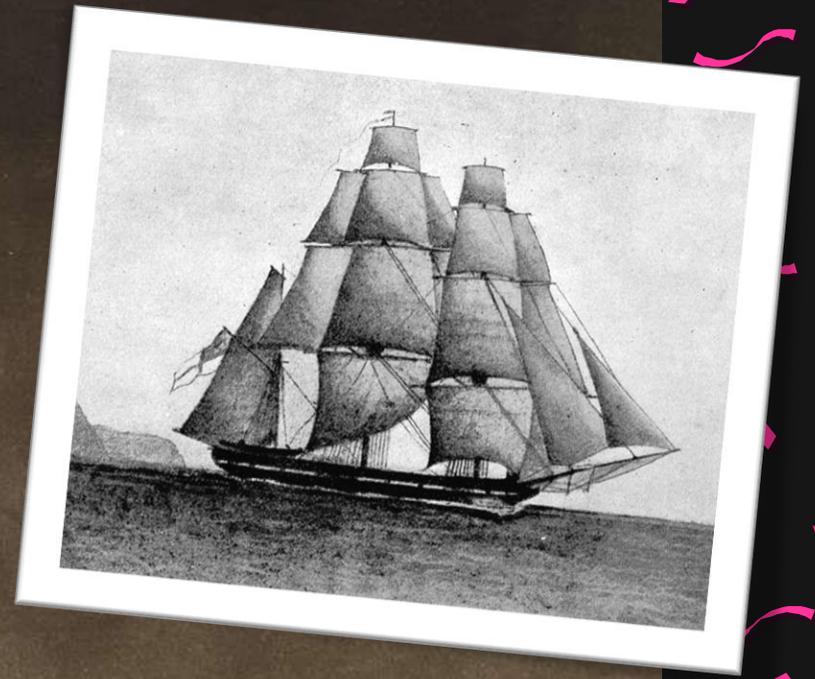
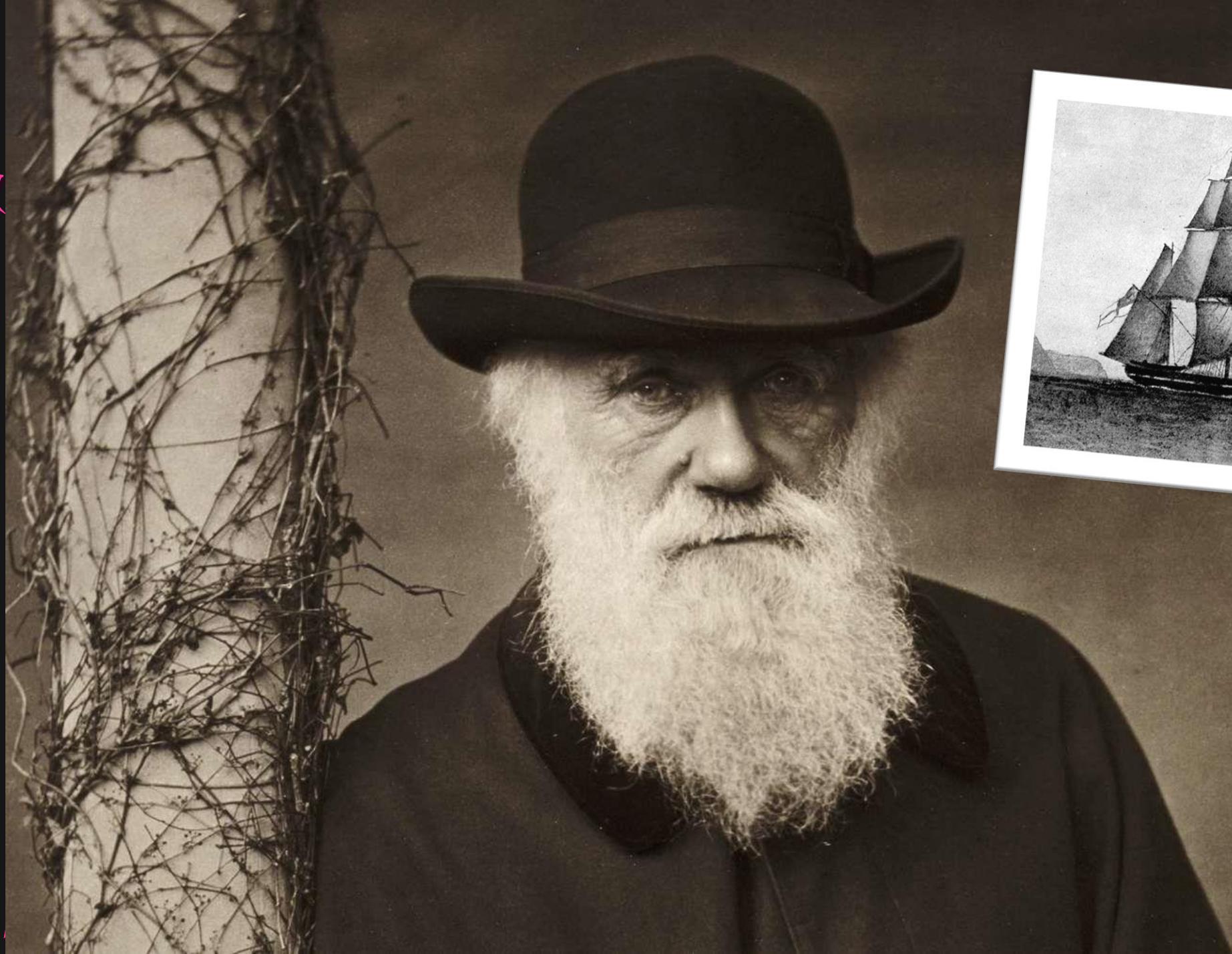
# Outline of Tonight's Talk

- Define evolution and describe natural selection
- Determine how cooperation has evolved
- Discuss the different mechanisms of cooperation
- Give examples of cooperation in females

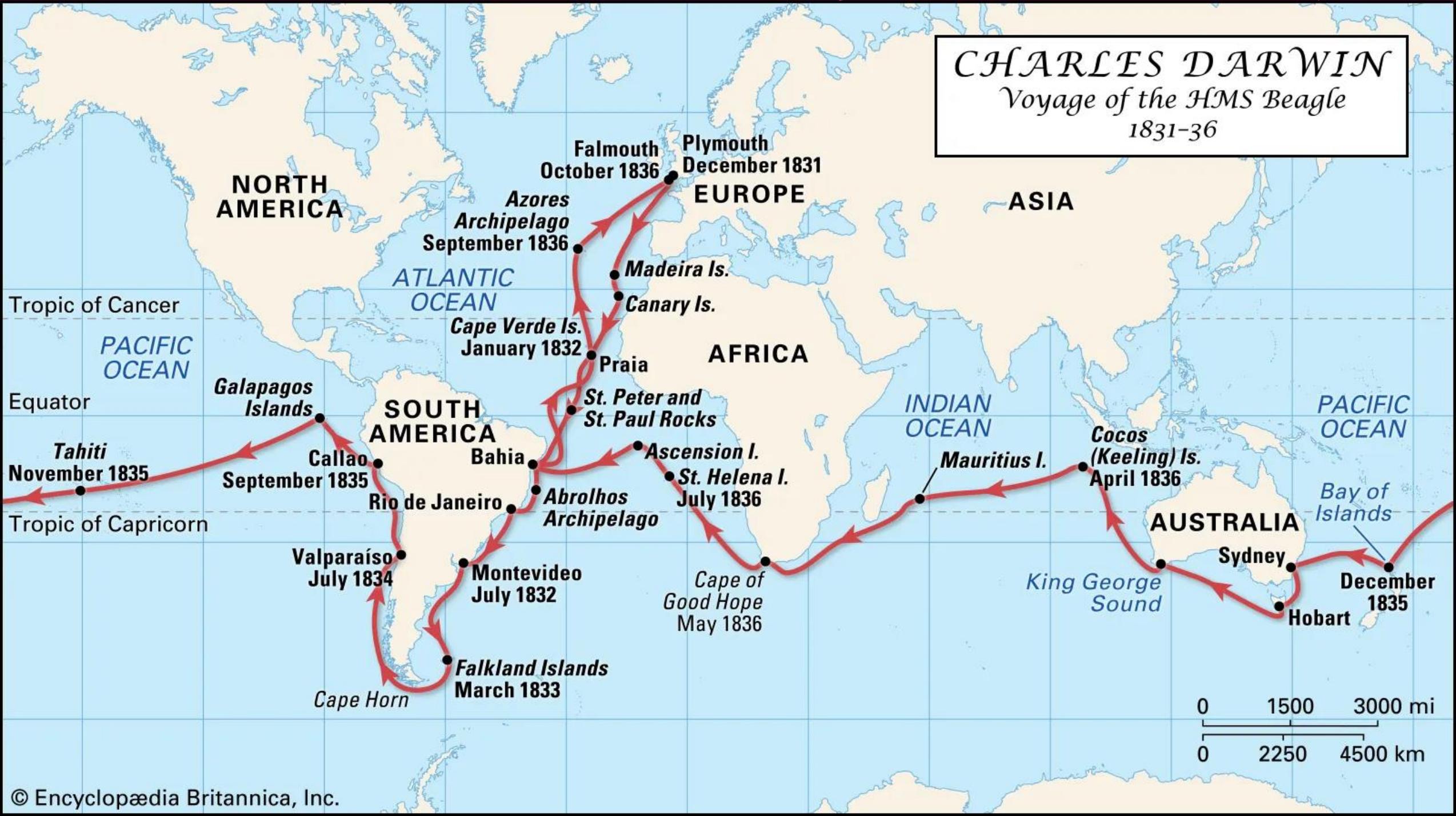


# Evolution vs. Natural Selection

- **[Micro]evolution** is the change of genetic frequency over time → acts on the population
- **Natural selection** is one of the mechanisms that can alter genetic frequencies within a population → acts on the individual



*CHARLES DARWIN*  
*Voyage of the HMS Beagle*  
1831-36



# Five Mechanisms of Evolutionary Change

**Natural Selection**



**Mutation**



**Gene Flow**



**Genetic Drift**



**Non-random mating**

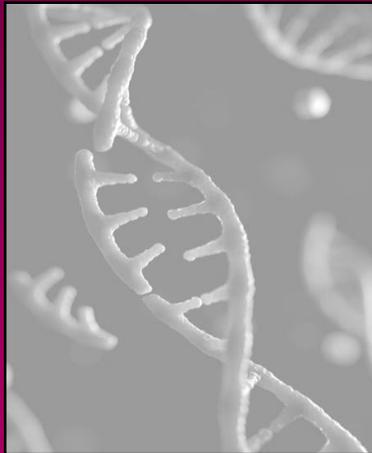


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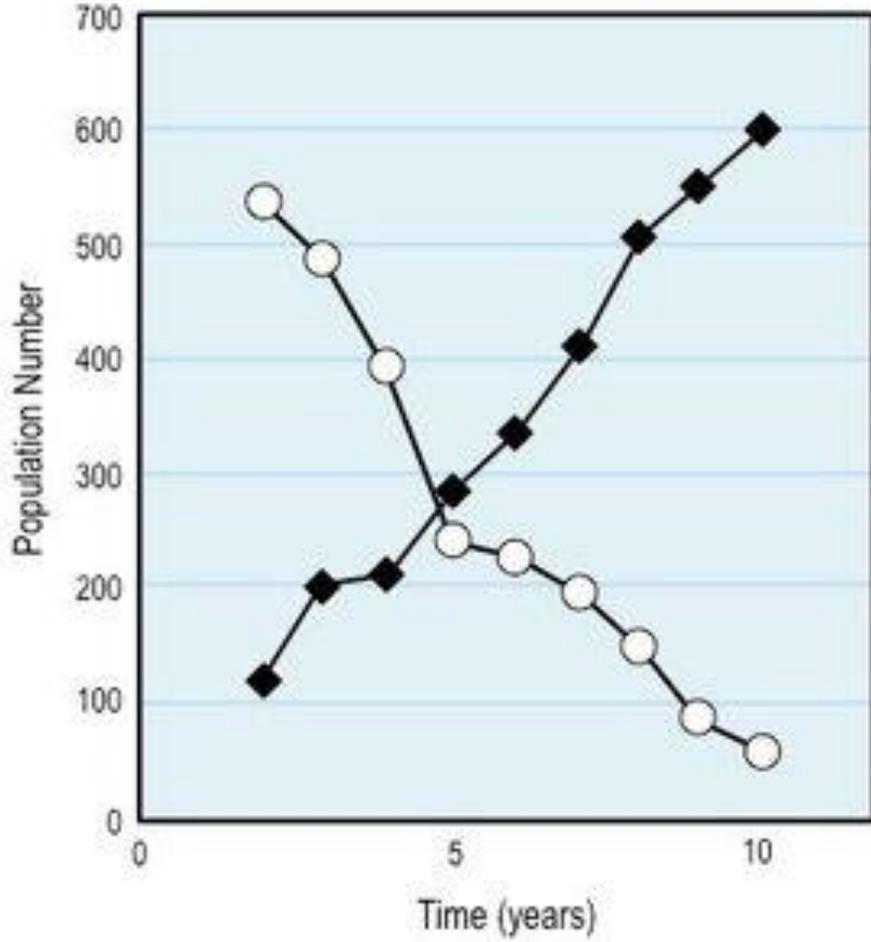
**SUCKS TO  
BE YOU!**



**OH CRAP!**



Pre-Industrial  
Revolution



Post-Industrial  
Revolution

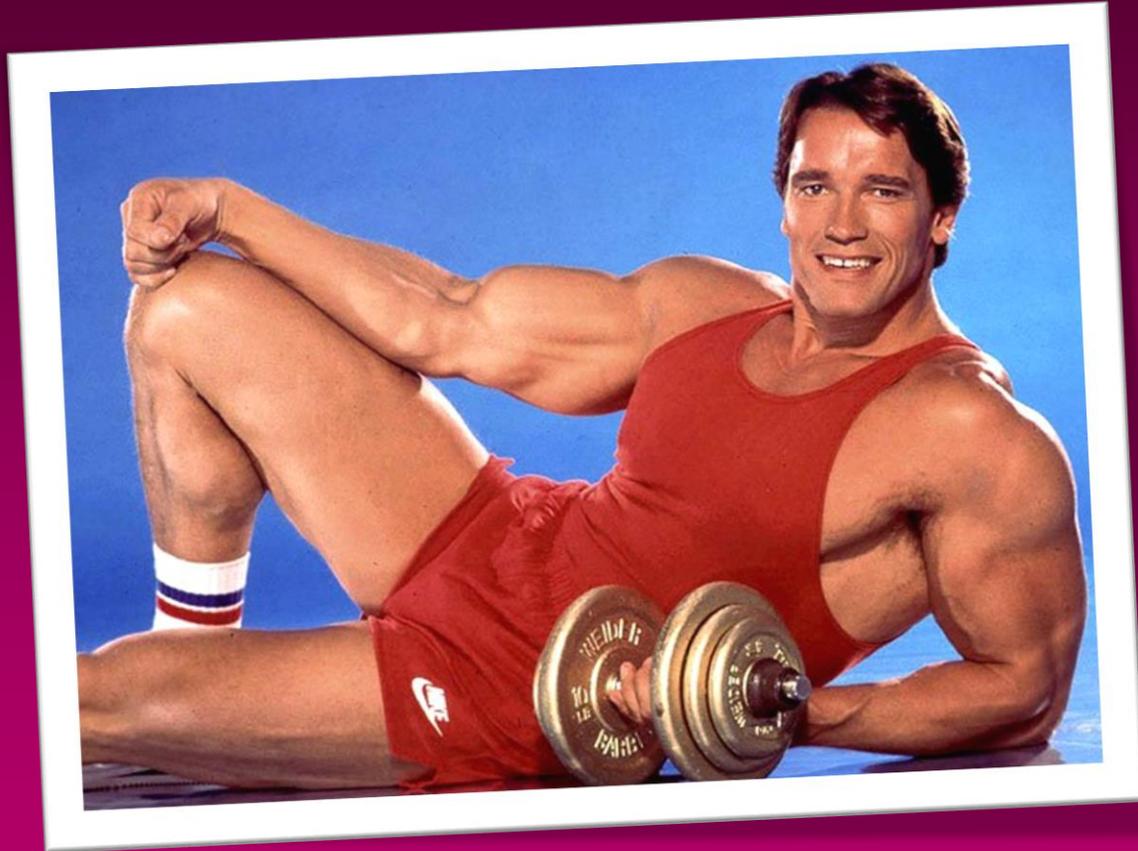
**SURVIVAL OF THE FITTEST**



**I DON'T ADAPT TO MY  
ENVIRONMENT, MY  
ENVIROMENT ADAPTS TO ME.**

quickmeme.com

# How Do We Define “Fitness”?



***Fitness:*** the number of viable left in the next generation that are able to reproduce



Hungry bat

Satiated bat

***Mutualism:***  
*interactions between  
2+ species where  
each species benefits*

***Symbiosis:*** *2 species  
living in proximity*



Ocellaris clownfish (*Amphiprion ocellaris*)

# Evidence of Cooperation

- Co-raising young
- Food sharing
- Cooperative hunting
- Protection from predators or the environment

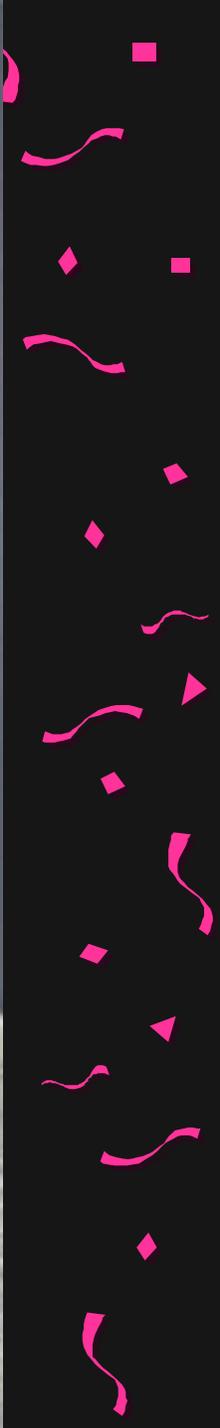


**Cooperation:** where groups of or individual organisms work together for mutual benefits

**Altruism:** a behavior that benefits another individual at a cost to oneself



Meerkat (*Suricata suricatta*)



1. Kin selection
2. Group selection
3. Reciprocity
4. Eusociality



***1. Kin selection***

2. Group selection

3. Reciprocity

4. Eusociality



***Kin selection*** favors the reproductive success of an organism's relatives, even at a cost to the organism's own survival and reproduction

Parent to offspring =  $\frac{1}{2}$

Full sibling =  $\frac{1}{2}$

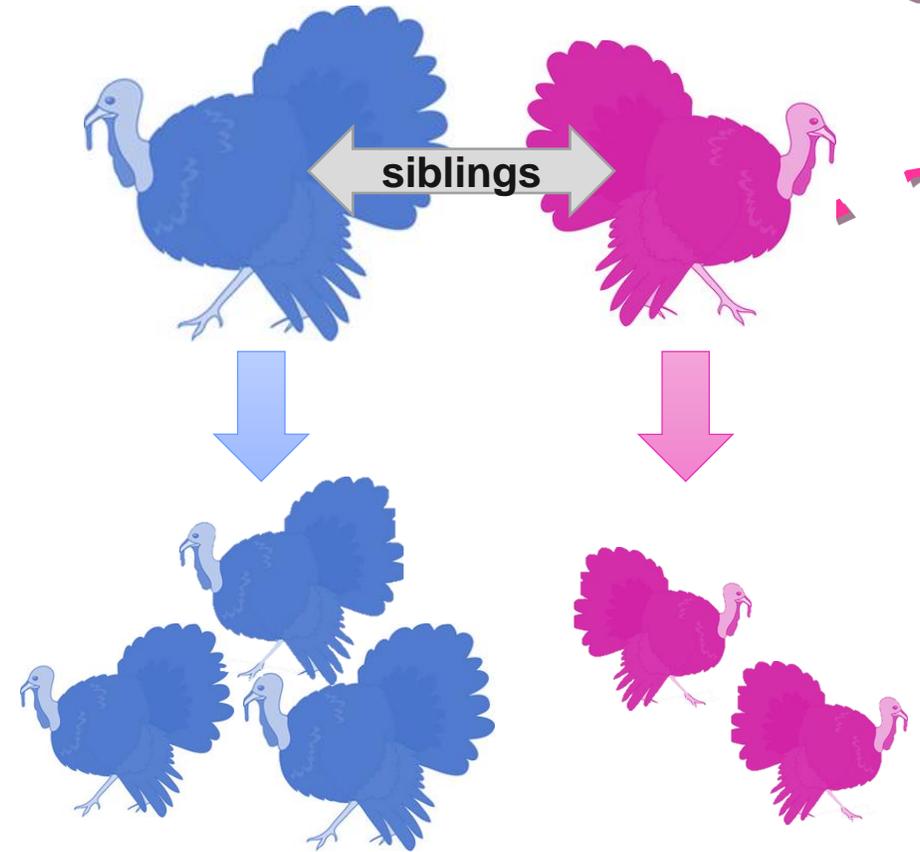
Half sibling =  $\frac{1}{4}$

Grandparent to grandchild =  $\frac{1}{4}$

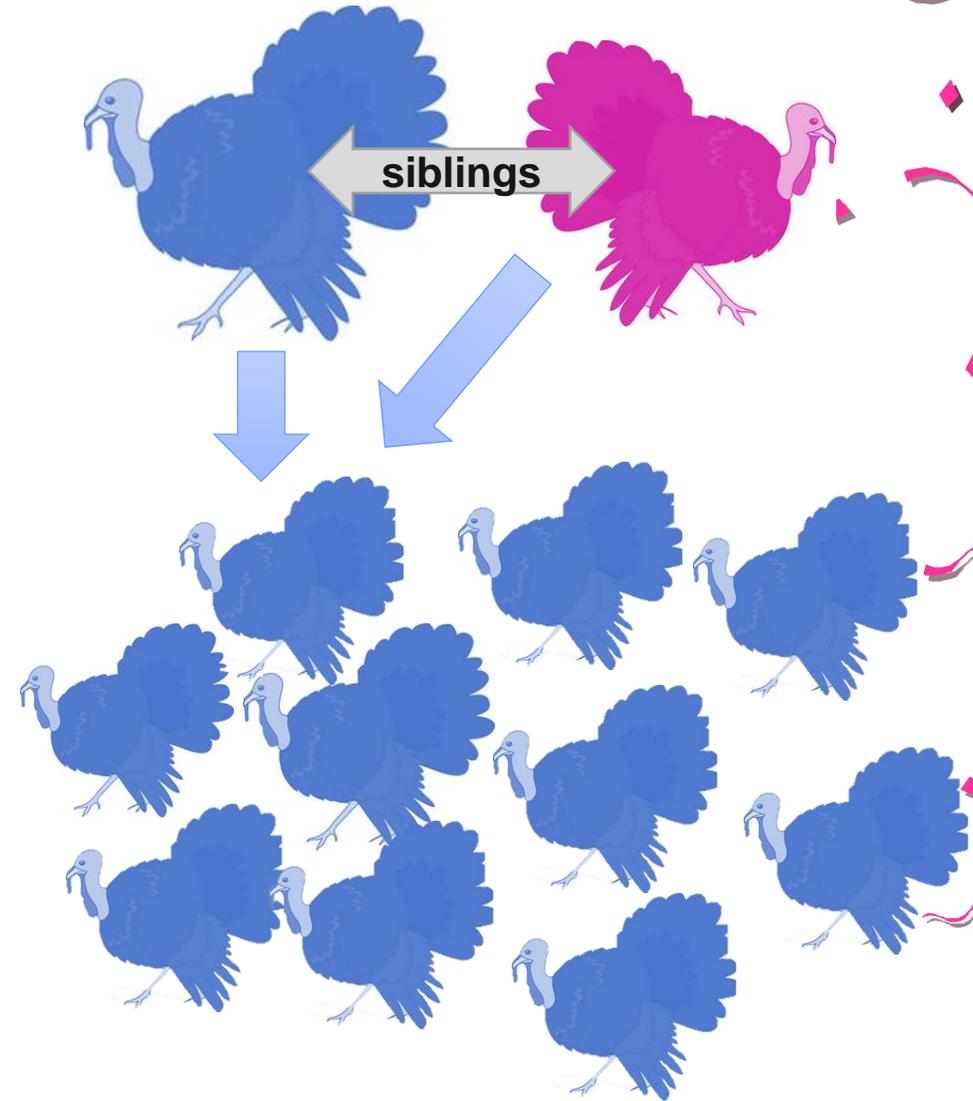
Aunt to nieces =  $\frac{1}{4}$



- **Direct fitness:** individual's reproductive success
- **Indirect fitness:** reproductive success of other individuals who carry the same genes
- **Inclusive fitness:** direct + indirect fitness



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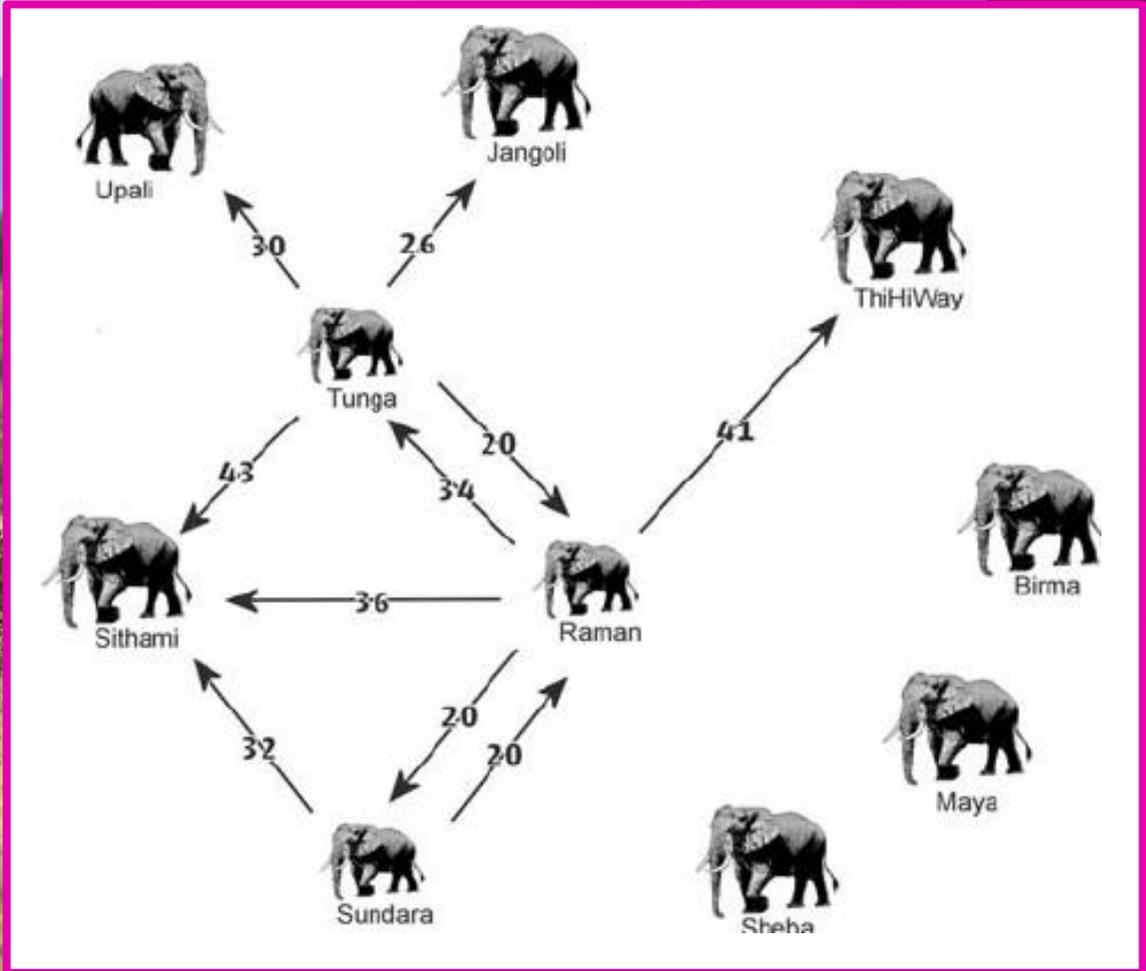
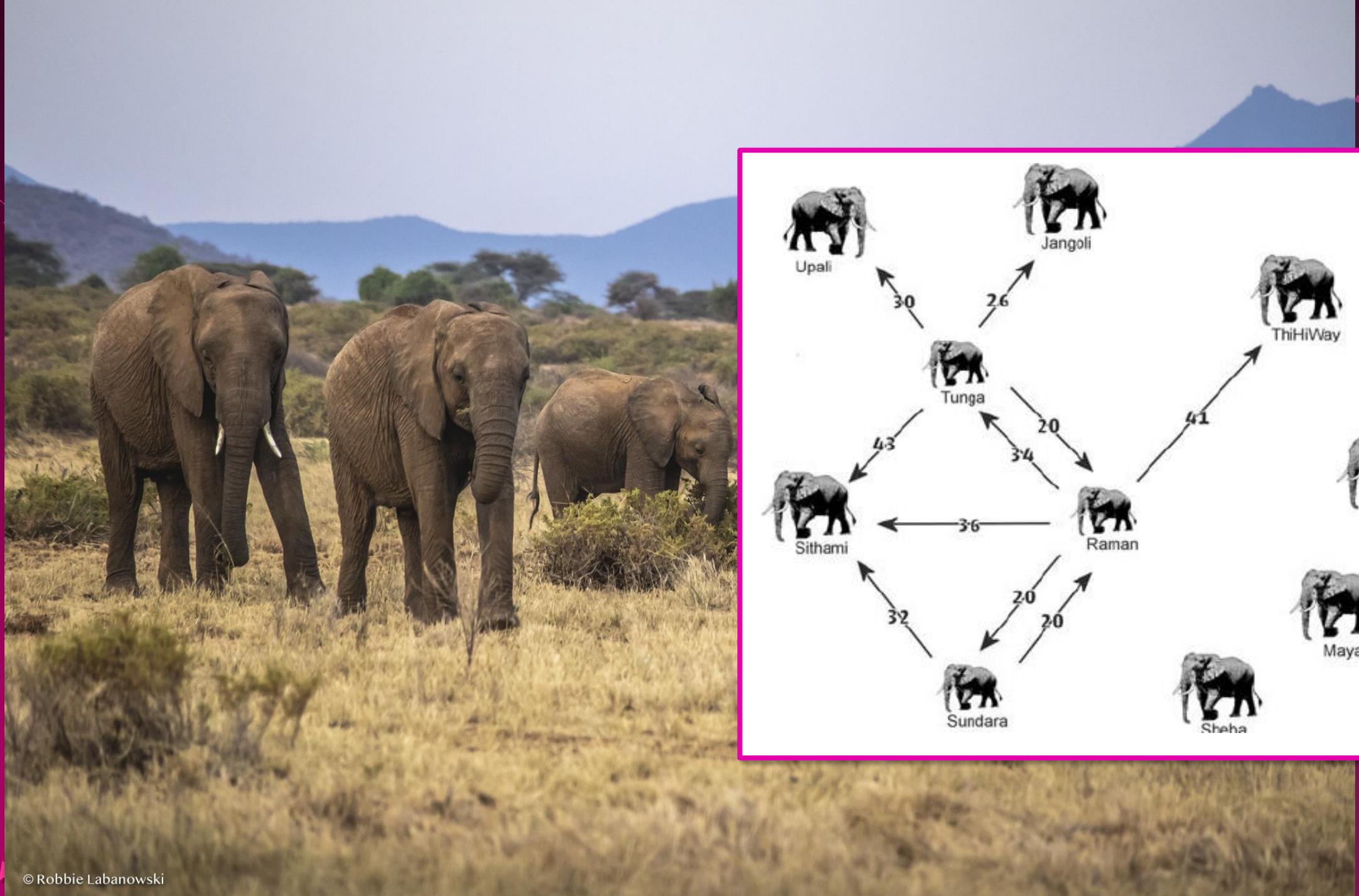


# Elephant Grandmas

- Multi-generational family groups of matriarch's daughters, sisters, and their offspring
- All females care for, feed, and protect young
- Will grieve the loss of family members and provide support



African bush elephant (*Loxodonta africana*)



# Walrus Aunties

Walrus (*Odobenus rosmarus*)



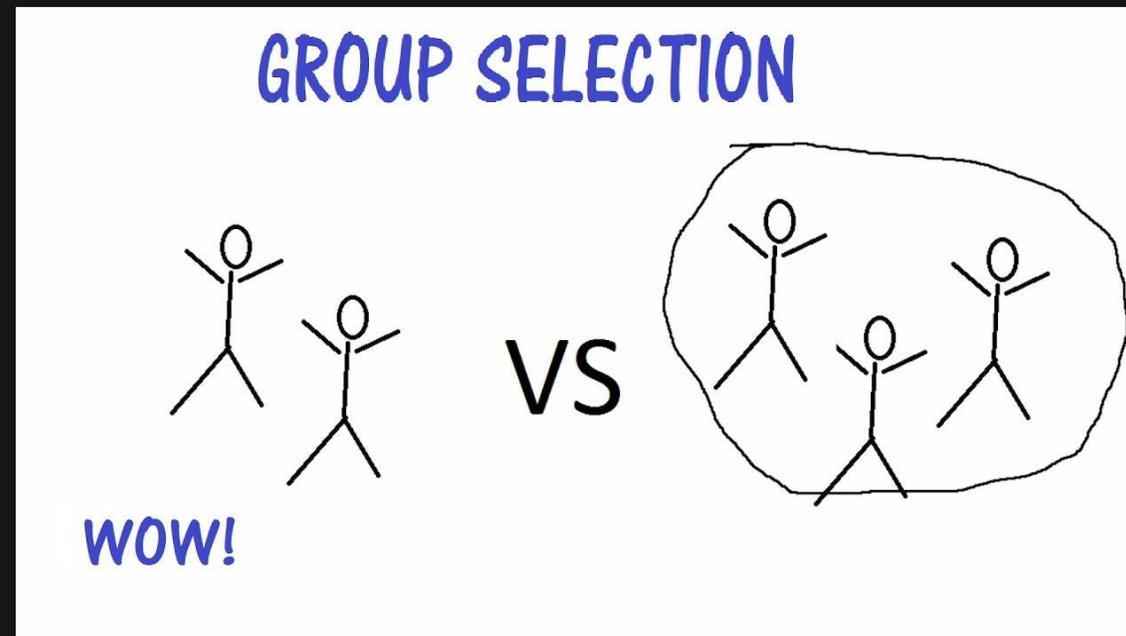
- Found in colonies
- Non-reproductive female “aunties” help raise and protect young in the colony



1. Kin selection
- 2. *Group selection***
3. Reciprocity
4. Eusociality



**Group selection** occurs when the benefits of cooperation or altruism between groups is greater than if the individual's acted selfishly

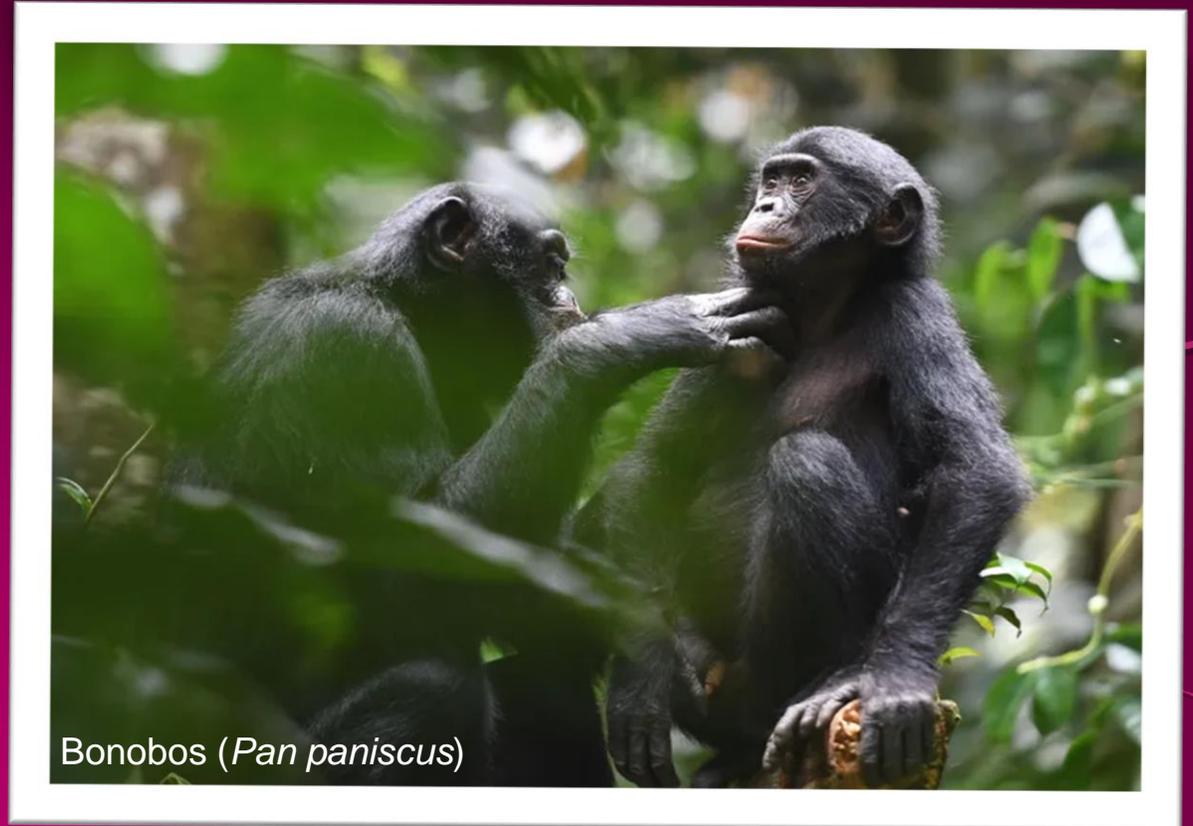


Cooperative hunting or protection from predators offsets increased competition for resources or mates.



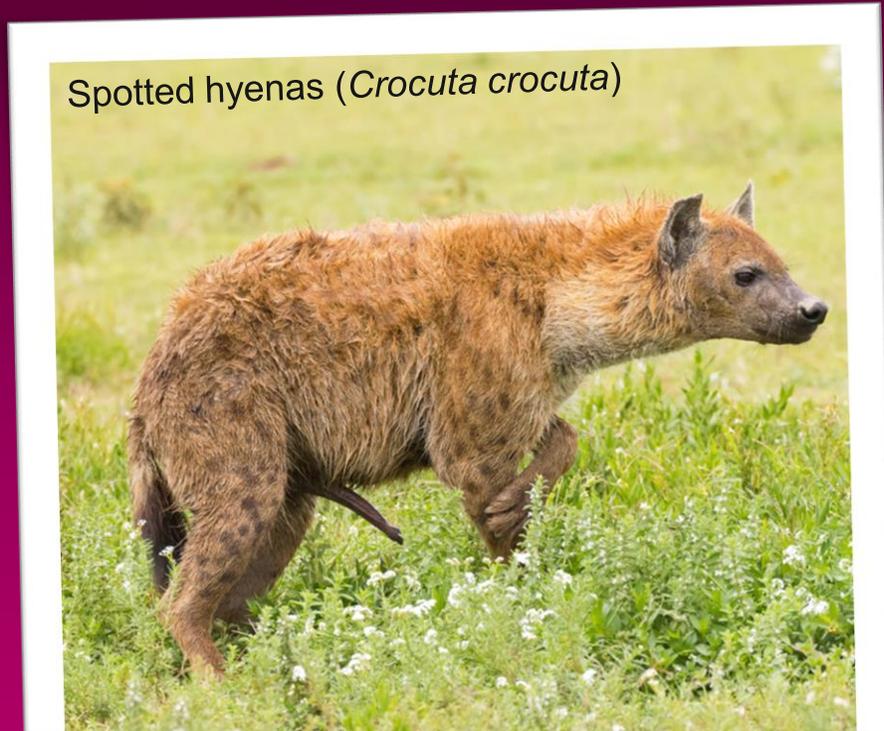
# Bonded Bonobos

- Females are dominant
- Social behaviors, like grooming, strengthens bonds and alliances
- Sociosexual behaviors reduce aggression
- Maternal binds and allomaternal care





# Hyena Hierarchies



- Pseudopenises drive rank
- Matriarchal: females dominate males in the social hierarchy
- Cooperative hunting and raising of young
- Strong female alliances

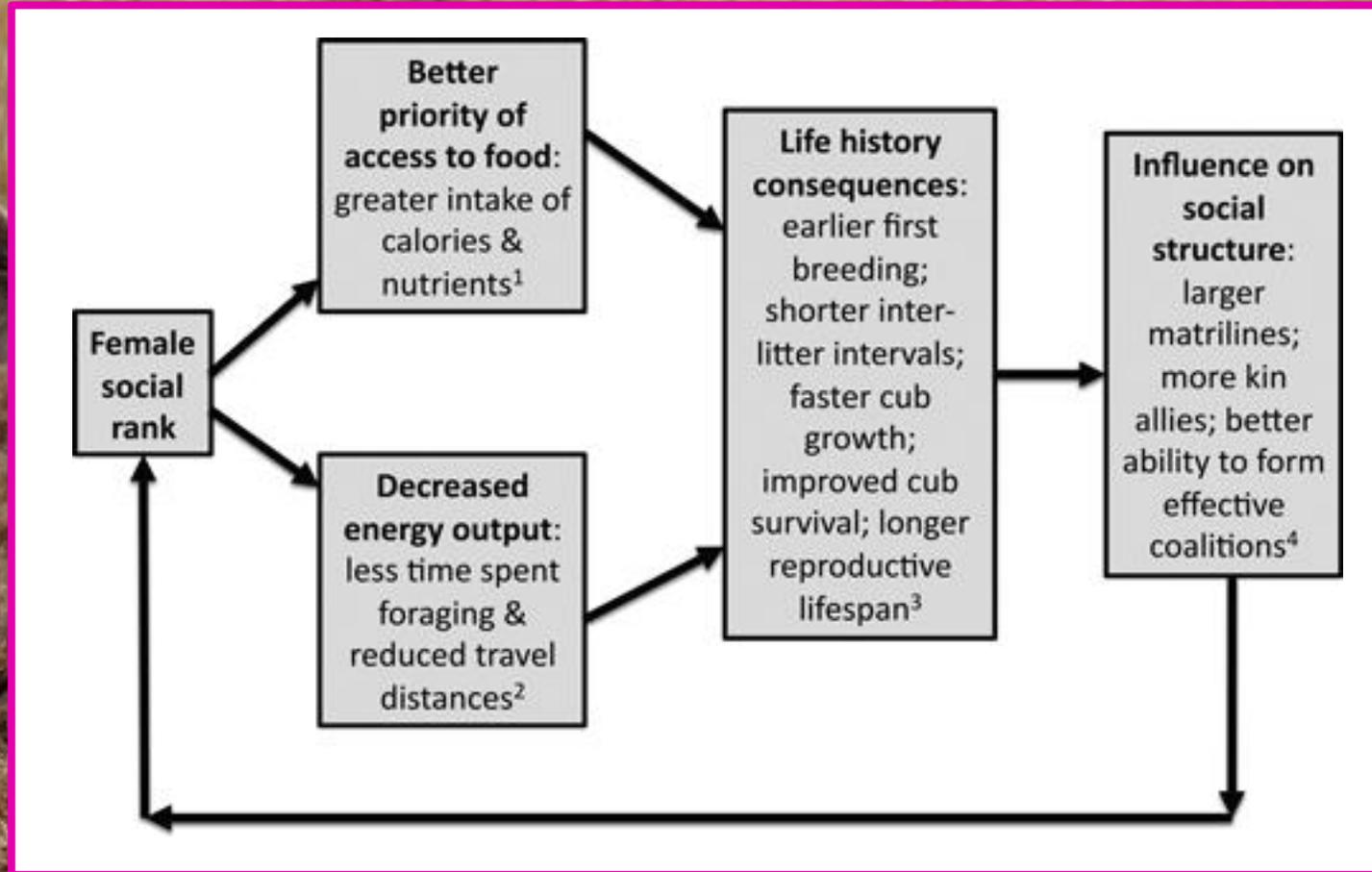
Females remain in their birth clan

Higher ranking hyenas eat more

..and have larger kin groups

..and more social support

# Hyenas Probably Have More Friends Than You:



1. Kin selection
2. Group selection
- 3. *Reciprocity***
4. Eusociality





Common vampire bat (*Desmodus rotundus*)

***Reciprocity:***  
*behavior may be favored by the probability of future mutual interaction*



***Direct reciprocity:***  
you scratch my back,  
I'll scratch yours

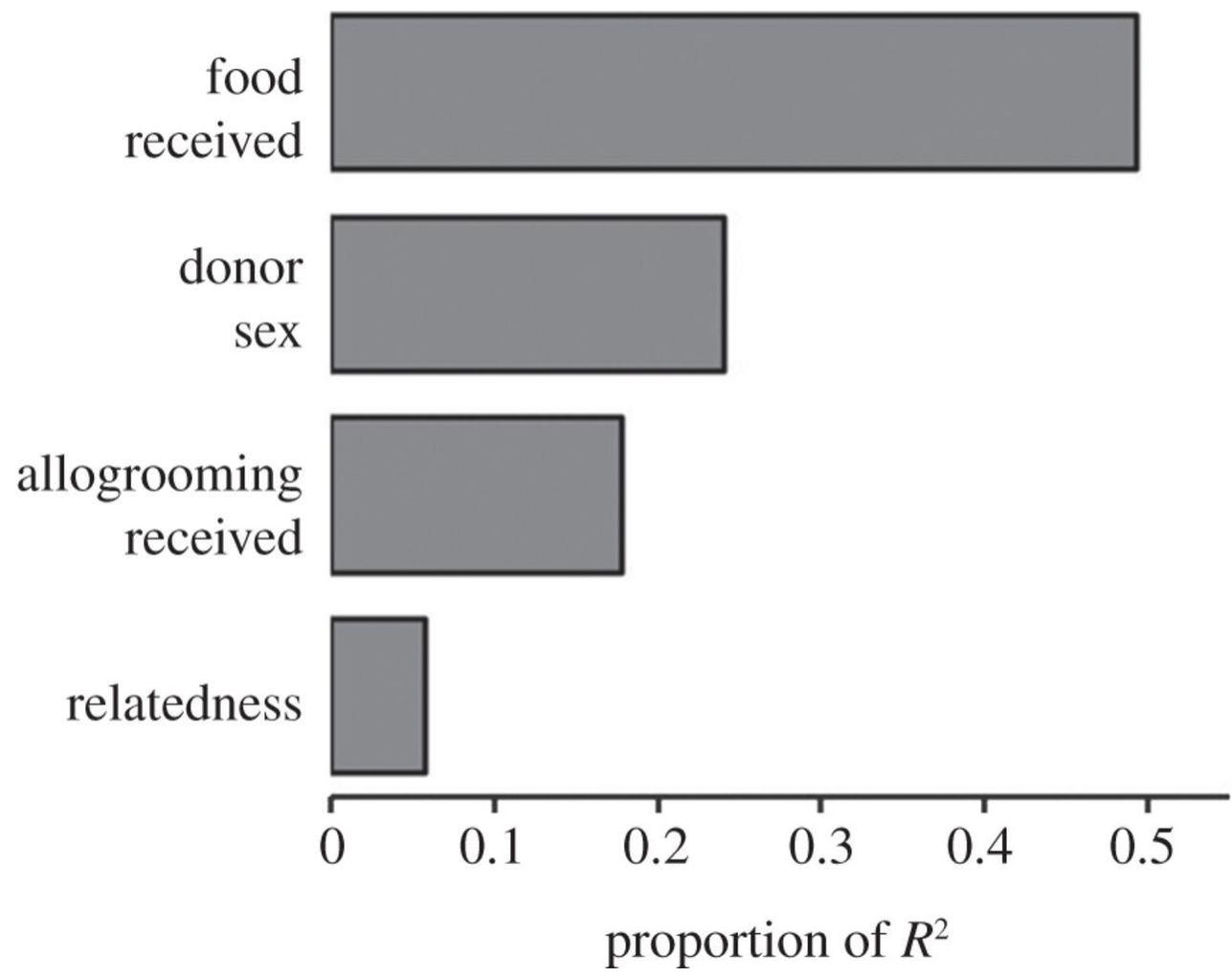
***Indirect reciprocity:*** I saw  
you scratch her back, so I  
will scratch yours knowing  
you will scratch mine later

# Vampire Valentines

- Regurgitative feeding
- Food sharing creates social bonds
- ***Direct reciprocity:*** more likely to share with those who have shared in the past



Common vampire bat (*Desmodus rotundus*)





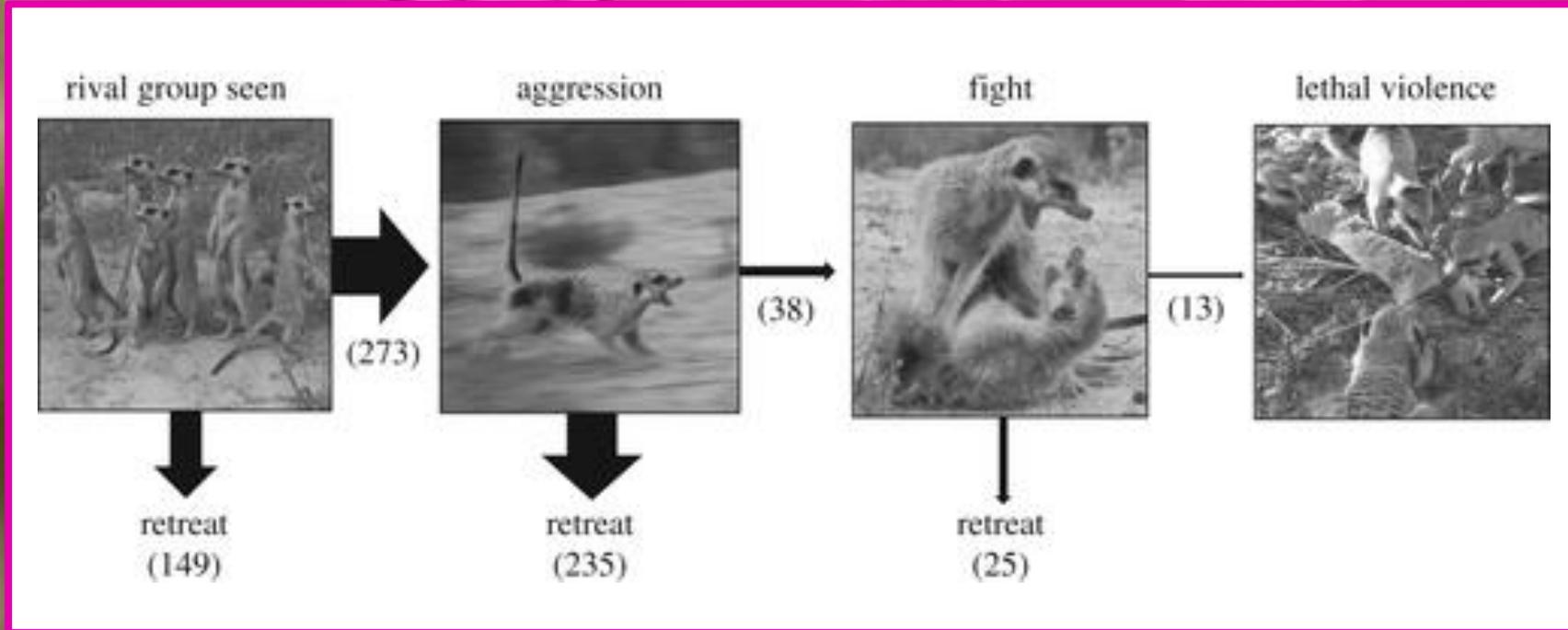


# Mean Girl Meerkats



- Multiple family units, with a dominant female
- Allomaternal care
- Cooperative sentinel behavior when foraging

# MEAN GIRLS



# Lady Albatrosses



- Some females (1/3) will have an extra pair copulation, then raise the young with another female
- Only one chick will survive, but better odds than raising alone



1. Kin selection
2. Group selection
3. Reciprocity
- 4. *Eusociality***





***Eusociality:*** a form of social organization where individuals in a colony are divided into different groups and display cooperative behaviors in caring for offspring and performing tasks

# Queen Naked Mole Rats

- **Eusocial structure:** one reproductive female with hierarchy of other females
- **Kin selection:** females share genetics with queen
- Other females dig colonies, find forage, care for young



Naked mole rat (*Heterocephalus glaber*)



# It's Good to be a Galentine!



# It's Good to be a Galentine!

- Kin selection
- Resource acquisition
- Protection and defense
- Child rearing
- Social structure
- Mating strategies



“Lucy Cooke is brilliant, pedigreed, fearless, and flat-out hilarious. *Bitch* is astonishing, wildly entertaining, and massively important.”

—MARY ROACH



# BITCH

ON THE FEMALE OF THE SPECIES

LUCY COOKE

For more  
information,  
check out  
the book  
*Bitch*



**Thanks!**