

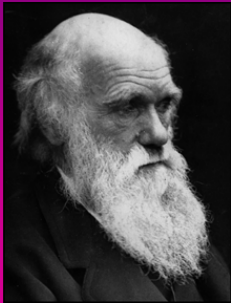
SEXUAL SELECTION



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WHAT DO WE SEE THAT IS STRANGE IN THE WORLD?

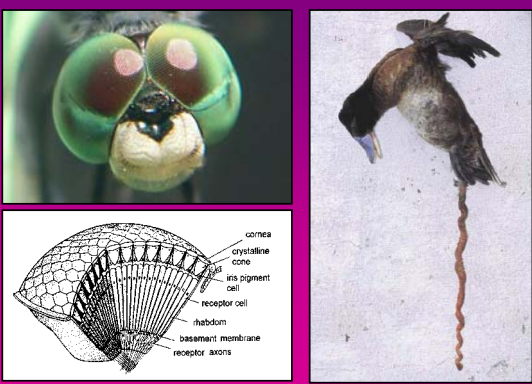
Evolution by natural selection implies that organisms evolve to solve problems and therefore live longer.



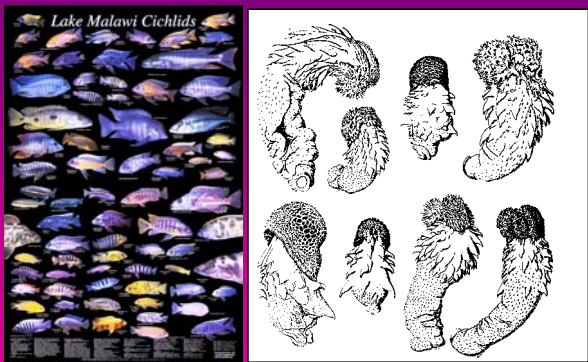
1. Individuals in some species are gaudy not cryptic



2. Some traits are efficient and others seem whimsical




3. Some traits show high among species diversity



4. Some traits show high within species diversity




5. Males & females differ in appearance & size




6. Often one sex provides far more parental care


Females cares



Male cares




7. Males and females often seem to be in conflict



Luc Bussiere (Zurich)


Natural Selection vs Sexual Selection

<ul style="list-style-type: none">• Utilitarian, functional• Solves a problem• Sensible• Economical• Fixed• Constructive• Dull	<ul style="list-style-type: none">• Showy, elaborate• Impresses an audience• Whimsical• Wasteful• Changeable• Destructive• Exciting
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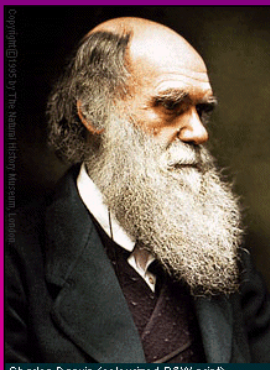
As summarised by Alan Grafen (Oxford)

How could Darwin explain sexual differences?



- Darwin could explain differences in 'primary sexual traits'
- But 'secondary' traits seem costly to make or bear & might increase predation risks
- Can natural selection account for such traits?
- Why do they occur in only one sex?

SEXUAL SELECTION OFFERS AN EXPLANATION



Charles Darwin (colourized B&W print)

Darwin (1871, p256):
"We are, however, here concerned only with that kind of selection, which I have called *sexual selection*. This depends on the advantage which certain individuals have over other individuals of the same sex and species, in exclusive relation to reproduction."

SEXUAL SELECTION OFFERS AN EXPLANATION

Main Distinction Darwin made was between:

- 1. *Intra-sexual selection* for traits that allow an individual to compete with members of the same sex for access to mating opportunities (e.g. sexual selection via male-male competition)
- 2. *Inter-sexual selection* for traits that increase attractiveness and/or induce members of the opposite sex to mate (e.g. sexual selection via female mate choice)

1. INTRA-SEXUAL SELECTION

Weapons, strength/size & mate finding ability



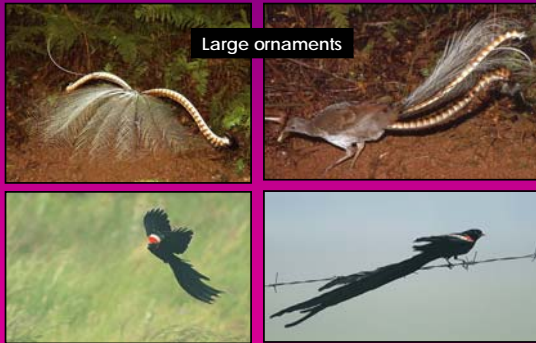
2. INTER-SEXUAL SELECTION

Traits attractive to members of the opposite sex



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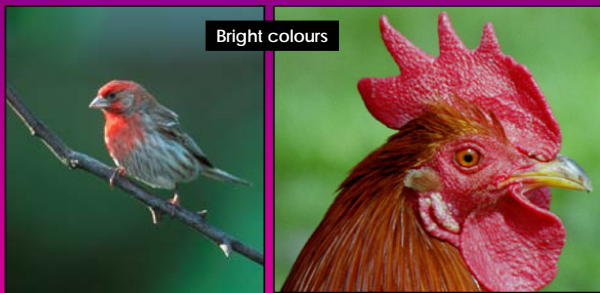
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Traits attractive to members of the opposite sex



MODERN ADDITIONS TO SEXUAL SELECTION

3. Sperm competition
4. Cryptic female choice
5. Sexual conflict
6. Differential allocation

Sexual Conflict
GORMAN ARMISTEAD AND LOCKE HOWE

Female Control:
Sexual Selection by Cryptic Female Choice
William G. Eberhard

Sperm Competition
and its Evolutionary Consequences in the Insects
LEIGH W. SIMMONS

LET'S TALK ABOUT SEX

WHY ARE ALGAE AND FUNGI LESS SEXY?

Yellow-green alga

SEX YES, SEXES NO
Isogamy with + and - Mating Types

WHY TWO SEXES? ANISOGAMY

Geoff Parker

Advantage of small gametes: cheap to produce
Advantage of large gametes: smaller mortality
jack-of-all-trades = master-of-none

WHO IS YOUR DADDY?

Definition
male = the type that produces smaller gametes


THE FAMOUS "TWO-FOLD COST" OF SEX IS DUE TO MALES !

no sex	sex but no males	sex with males
total 10 offspring: 5 for each parent, 100% parent-offspring relatedness	total 10 offspring: 10 for each parent, 50% parent-offspring relatedness	total 5 offspring: 5 for each parent, 50% parent-offspring relatedness

Why are females usually choosy care-givers?

Standard Textbook Argument

Anisogamy = males invest less per reproductive event



TRIVERS (1972) CLASSIC PAPER:
PARENTAL INVESTMENT AND SEXUAL SELECTION

Why are females usually choosy care-givers?

Textbook Argument: FEMALE VERSION


"Since the female already invests more than the male, breeding failure for lack of an additional investment selects more strongly against her than against the male" (Trivers 1972)

THE COST OF LOSING PAST INVESTMENT
(i.e. EGGS COST MORE)

SEE A PROBLEM?

Why are females usually choosy care-givers?

Textbook Argument: FEMALE VERSION



Cognitive illusion
Concorde Fallacy (Dawkins & Carlisle 1976)

Why are females usually choosy care-givers?

Textbook Argument: MALE VERSION


"male-male competition will tend to operate against male parented investment, in that any male investment in one female's young should decrease the male's chances of inseminating another female" (Trivers 1972)

Bateman (1948) *Drosophila*

Why are females usually choosy care-givers?

Textbook Argument: MALE VERSION

"I don't have time to care. It is too costly. I have to compete."



"Caring is creepy" -- The Shins

Why are females usually choosy care-givers?

Textbook Argument: MALE VERSION

Anisogamy = males invest less per reproductive event

↓

Males have a higher potential reproductive rate (PRR)

↓

Males gain more than females from deserting

↓

This amplifies the initial asymmetry in parental investment

↓

Operational Sex ratio (OSR) becomes male-biased

↓

So males compete and females choose (i.e. sexual selection arises due to female-biased care)

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CAUTION THIS ARGUMENT CONTAINS TRACES OF INCONSISTENCY

Why do females care more than males?

David Queller's Argument

PRR is only 'potential'

With a male-biased OSR, many males will not mate

In diploid species each offspring has a mother and father


Males & females produce the same number of offspring

Anisogamy changes the PRR but does not explain female-biased care

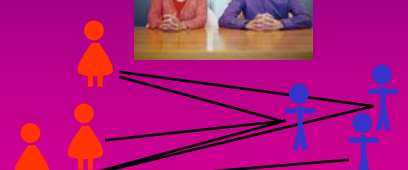
Queller (1997) Proc Roy Soc B

SURVEY: HOW MANY SEXUAL PARTNERS?

Emm... 3



14



If males can't have sex (reproduce) more often than females... why should males care less about each offspring than a female?

