

Homework due today

EXAM: opportunity to make up missed points

- Point-recapture done via Blackboard
- You will have 1:15 to write answers
- Can do it between noon Thursday and 8pm Friday.
- Points will be added to your current exam score
- You get exam back Thurs., give it back Tue.
- Only answer questions you want more points on
- Your work must be your own.

Quiz due Thursday

RESEARCH SHOWCASE THURSDAY

Posters on display 9-5:30 in Firstenberg Commons

Awards Ceremony & Reception 4:00 pm in the FSC

- Chancellor's Faculty Research Excellence Award
- Undergraduate Research and Scholarship in Arts and Humanities
- Best Undergraduate and Graduate Student Posters/Displays

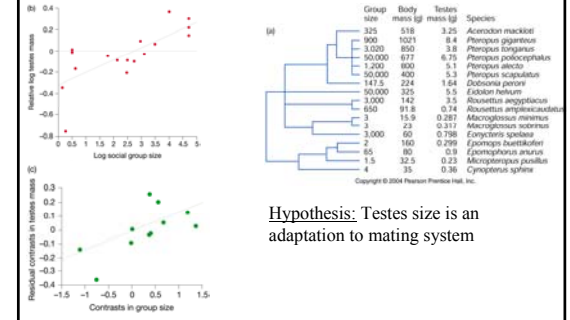
Dr. Tom Tripp

"Getting Even: The truth about workplace revenge -- and how to stop it"
12:00 - 1:00 pm, MMC 6

Keynote: **Bonnie J. Dunbar** at 7pm in Adm 110

How do we test hypotheses about adaptation?

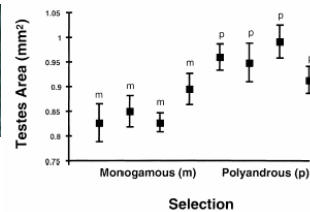
1. Comparative method



Hypothesis: Testes size is an adaptation to mating system

2. Experimental Manipulation

Example: Yellow dung flies experimentally divided into polyandrous and monogamous groups for 10 generations.



Hypothesis: Testes size is an adaptation to mating system

From: Hoskin and Ward, Ecology letters 2001

What are females choosing?

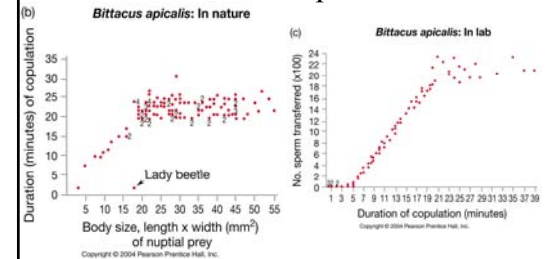
DIRECT BENEFITS

- *Good Genes Hypothesis*
- *Resource acquisition*

ARBITRARY PROCESS MODELS

- *Pre-existing sensory bias*
- *Arbitrary runaway process*

Resource acquisition



Females gain two ways:

- 1) Improved nutrition
- 2) Avoid dangerous activity: Hunting

In some insects, males provide resources: Courtship feeding in katydids



A Mormon cricket female eats her spermatophore meal (*spermatophylax*)

Why should females choose the "long-callers"??

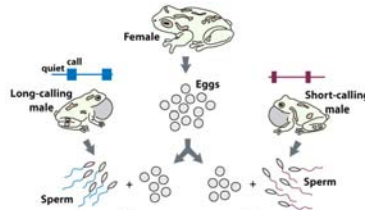


Table 11.2 Fitness of the offspring of long-calling male frogs vs. short-calling male frogs

Fitness measure	1995	1996
	Low food	Low food
Larval growth	LC better	LC better
Time to metamorphosis	NSD	NSD
Mass at metamorphosis	LC better	NSD
Larval survival	NSD	NSD
Postmetamorphic growth	—	LC better

What are male traits signaling about their genetic quality?

A) General Condition?

Why don't "good alleles" become fixed in the population after females prefer them for a while?

Hamilton-Zuk Hypothesis.

Good Genes: Barn Swallows Again

Moller's questions:

- 1) Does tail length relate to disease or parasite resistance?
- 2) Do males with longer tails have more resistant offspring?

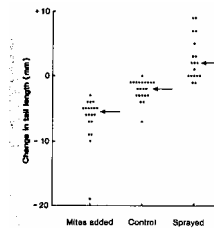


Fig. 4. Growth rate of male Barn Swallow tails between year (t) and year ($t + 1$) in relation to experimental mite treatments of their first nest in year (t). Nests were either sprayed with a pyrethrin solution, kept as controls, or inoculated with ca. 50 mites during the egg-laying period. Arrows indicate median values.

Experiment 1:

- 1)
- 2)
- 3)

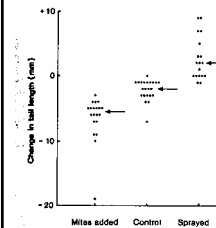
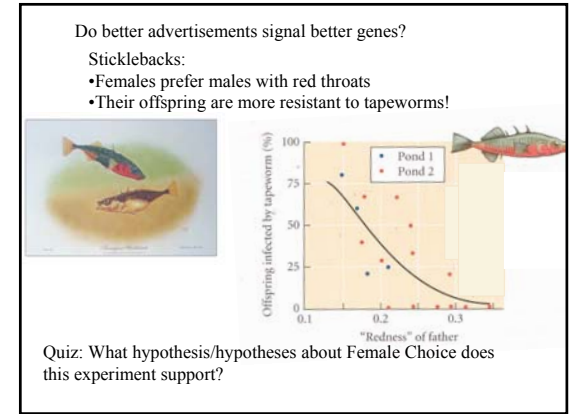
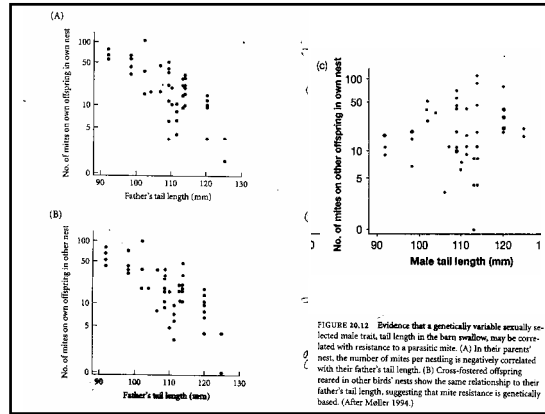
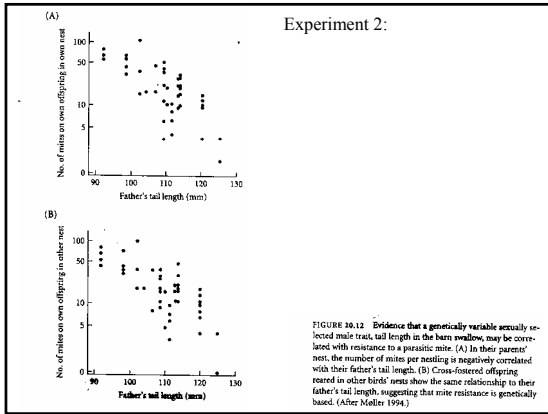


Fig. 4. Growth rate of male Barn Swallow tails between year (t) and year ($t + 1$) in relation to experimental mite treatment of their first nest in year (t). Nests were either sprayed with a pyrethrin solution, kept as controls, or inoculated with ca. 50 mites during the egg-laying period. Arrows indicate median values.



Pre-existing Sensory Bias:
 “Animals frequently show greater response to Supernormal stimuli”
 Swordtails: Females prefer males with long “Swords”

• Sister genus (*Priapella*) lacks swords
 • females prefer males if they have plastic swords attached!

Pre-existing Sensory Bias
 Female preference for swords arose first

'Runaway sexual selection':

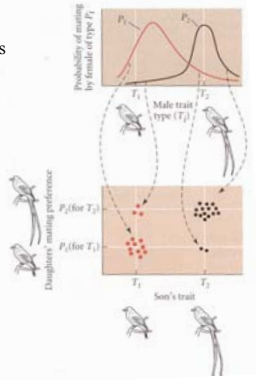
Females choose males on basis of some distinctive trait
 Offspring have exaggerated trait (males) & preference for trait (females)
 => selection reinforces trait & preference for trait simultaneously
 New phenotype spreads rapidly in population

Can get started by drift, sensory bias, good genes, etc. Just requires some initial lopsidedness in preference.

Runaway process
AKA: Sexy Son Hypothesis

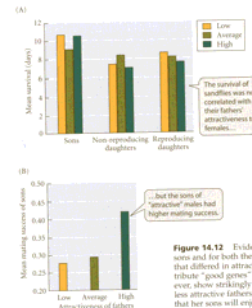
P1 & P2: preference types
T1 & T2: Male trait type

P1 mates with anyone
P2 chooses long tail

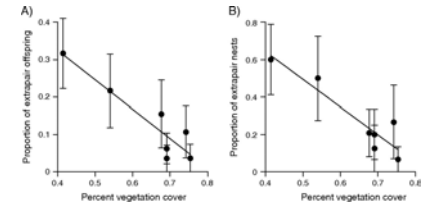


What would be good evidence for “sexy son” hypothesis:

- No evidence for direct benefits of female choice
- Offspring of attractive males should also be more attractive



Superb starlings on African savannah
Males defend territories in which females nest.
Extra-pair copulation is frequent



Rubenstein, D. R. Behav. Ecol. 2007 18:1058-1064; doi:10.1093/beheco/arm077

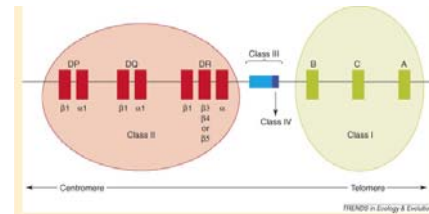
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Behavioral Ecology

Male profits if he can cause a female to produce as many of his offspring as possible
Even if it reduces female’s subsequent reproduction and survivorship.

→ Antagonistic Co-evolution → Arms Race!

Structure of Human Major Histocompatibility Complex (MHC)



- Class I & II: “Classical” MHC genes.
 - Class III & IV: immunomodulation & inflammation.
 - # of genes in each class varies among taxa.
- Humans: 224 MHC genes, 128 expressed Clustered & highly linked

From: Acevedo-Whitehouse. 2006 TREE.

EVIDENCE

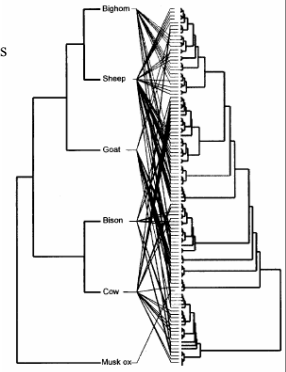
A. ABS experiences strong balancing selection and favors new variants

DRB gene (Class II)

- Most polymorphic in humans, cattle, etc.
- Much of the variation is in ABS

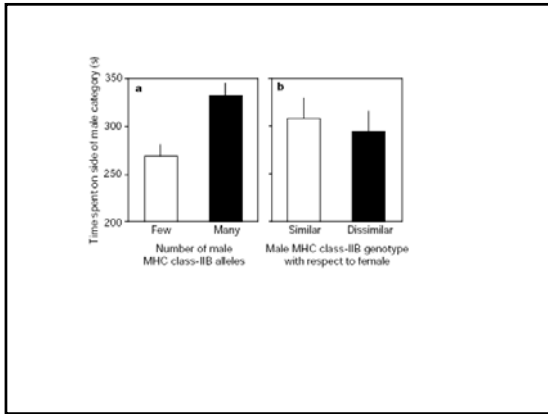
Transpecific polymorphisms

- Balancing selection =
 - Frequency dependence
 - Heterozygote advantage
- Evidence for both in MHC



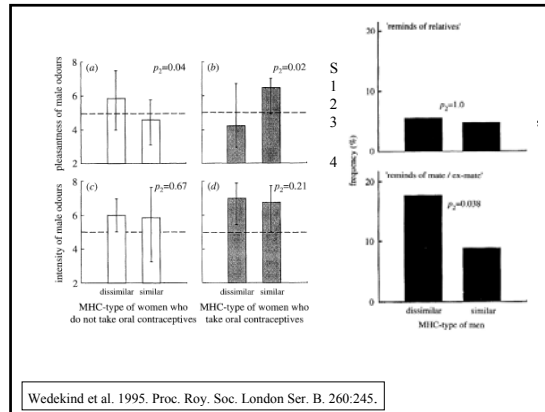
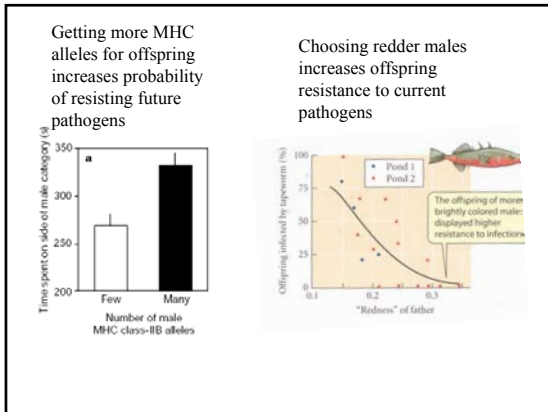
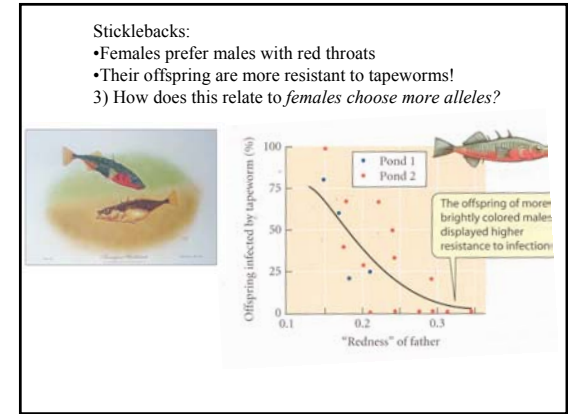
From: Gutierrez-Espeleta et al

Fig. 6 A neighbour-joining gene tree for 104 DRB sequences



Questions:

- 1) Why did they test whether females choose males with dissimilar genotypes?
- 2) How did Reusch et al rule out the hypothesis that by choosing males with more MHC alleles, they choose males with more diverse genomes?
- 3) **How does choosing more MHC alleles relate to choosing males with redder throats?**



Evidence for MHC-correlated perfume preferences in humans

Manfred Milinski and Claus Wedekind. 2001. Behavioral Ecology 12:140-149

Result: Men's and women's preference for perfume they would like to wear depended on their own MHC genotype.

Interpretation: Choosing perfume to enhance one's own MHC-related scent

Side note: Evidence (weak) that women on pill had scent reception reversed



Which male territories do females settle on?

Who fathered offspring?

Result:

- Females paired with MHC-dissimilar male
- Females solicited extra pair copulations with males having different MHC genotype from current male