Overview of Lecture: Sex & Reproduction.
see the schedule for reading and watching assignments

THE FOLLOWING PREVIEW HAS BEEN APPROVED FOR ALL AUDIENCES

Bullet Points:
• Copulation vs genetic recombination
• Demographic & genetic costs of sex
• What are the ultimate benefits?
• Parasites & the Red Queen
• Sexual selection is a game
• Inter- & Intra-sexual selection
• Human mating systems
• Evolutionary Psychology
• The science of beauty
• Beauty and student engagement, learning and evaluation of teaching
Learning Goals:

1. Be able to explain the demographic and genetic costs of sexual recombination. Describe the hypothetical benefits of recombination and use an example to help explain why sex is more common in changing or unpredictable environments.

2. Be able to explain how a game-theoretic perspective can help explain how/why sexual selection can select for different traits in males and females. Briefly, what is the essence of Batemen’s Principle? Why is it clearly a caricature of human mating systems. Why can’t one sex or the other “win the battle of the sexes?”

3. Be able to describe and explain how/why the removal of sexual competition in Pitnick’s experimental evolution study with fruitflies results in the rapid evolution of different morphologies, compared to controls with typical sexual competition. What does human morphology relative to related primates suggest about the ancestral human mating system?

4. Be able to describe what the field of evolutionary psychology seems to be showing about the evolution of human perceptions of attractiveness.

5. Be able to describe what the study by Wolbringa & Riordan suggests about the impacts of college teacher appearance on student engagement, learning and Student Evaluation of Teaching (SET).
Watch: Why Sex? SciShow
Watch: What If Animals Gave Relationship Advice?
Read: Show Me Your Plumage: NYT
Read: Vote for Ugly: The New Yorker

Show Me Your Plumage

By EMILY EAKIN  JULY 14, 2002

SEXUAL SELECTIONS

What We Can and Can’t Learn About Sex From Animals.

By Marlene Zuk.
There are two principal modes of animal reproduction. **Asexual reproduction** is the cloning of one parent. In most cases, just mitotic cell division w/o meiosis & fertilization.

**Sexual reproduction** is the creation of offspring by the fusion of haploid gametes to form a diploid zygote. Haploid gametes are formed by meiosis. The female gamete, the *ovum* (unfertilized egg), is usually a relatively large and nonmotile cell full of resources. The male gamete, the *spermatozoon*, is a small, motile cell.

http://www.pbs.org/wgbh/evolution/sex/advantage/index.html

**essay: The Advantage of Sex** by Matt Ridley

Most [animals] reproduce sexually, despite the automatic reproductive advantage experienced by asexual variants. This implies the operation of selective forces that confer an advantage to sexuality and genetic recombination, at either the population or individual level. The effect of sex and recombination, combining isolated beneficial mutations at different genetic loci, which increases the efficiency of natural selection, is likely to be a major factor favoring their evolution and maintenance. ...

Sex releases the speed limit on evolution. Colegrave N. NATURE 420 (6916): 664-666 DEC 12 2002 ... I show that sex can increase the rate of adaptation to novel nutrient conditions in the facultatively sexual single-celled chlorophyte Chlamydomonas reinhardtii ...
Now, a study of stick insects supports classical theories about the perils of life without sex.

Jens Bast at the University of Lausanne in Switzerland and his colleagues extracted RNA from ten species of stick insect in the genus Timema. … five reproduce sexually and five reproduce asexually.

Compared with the sexually reproducing insects,
Asexual lineages should rapidly replace sexual populations. Why sex then? The Red Queen hypothesis proposes that parasite-mediated selection against common host genotypes could counteract the per capita birth rate advantage of asexuals. Under the Red Queen hypothesis, fluctuations in parasite-mediated selection can drive fluctuations in the asexual population, leading to the coexistence of sexual and asexual reproduction.

Does shifting selection by parasites drive fluctuations in the fitness and frequency of asexuals in nature?

Combining long-term field data with mesocosm experiments, we detected a shift in the direction of parasite selection in the snail Potamopyrgus antipodarum and its coevolving parasite, Microphallus sp. … Coevolving parasites drive temporal change in the relative fitness and frequency of asexuals, potentially promoting the coexistence of reproductive modes in P. antipodarum.
If evolution by natural selection adapts animals to their environments, why are males & females often so different? [we’re focused on sexual reproduction, not on gender identity, which is more nuanced]

Mating systems begin with sex but differentiate around parental care.

Sex is a game [speaking technically, of course:]

"And I like honesty in a relationship... I'm not into playing games."
Bateman’s Principle:
- the “battle of the sexes”
  (without parental care)

Fruit flies:

There appears to be stronger selection on females to mate more than once - in fruitflies w/o pair bonds or paternal care

This is a controversial caricature, see -
Rethinking Bateman’s Principles:
Challenging Persistent Myths of Sexually Reluctant Females and Promiscuous Males
Z Tang-Martínez 2016 J. Sex Research 53, 532–559

In a diploid sexual species, in each generation,
half of the chromosomes and genes come from males & half from females.
Excepting the X & Y sex chromosomes (in mammals; Z & W in birds: females are ZW),
all of your genes spent ~ half their history in in males and ~ half in females.

Neither sex wins ‘the battle of the sexes.’

If one male has relatively more offspring, other males have relatively less,
males don’t have more offspring than females on average,
just greater variance in reproductive success than females.

We evaluated the influence of … sexual selection upon male reproductive traits in a naturally promiscuous species, D. melanogaster. Sexual selection was removed in two replicate populations through enforced monogamous mating with random mate assignment or retained in polyandrous controls. {lots of males & females per bottle}

Monogamous mating eliminates … mate competition, mate discrimination, sperm competition, cryptic female choice and, hence, sexual conflict.

Levels of divergence between lines in sperm production and male fitness traits were quantified after 38-81 generations of selection. …

**females** mated once with monogamous males produced offspring at a faster rate and produced a greater total number of surviving progeny than did **females** mated to control males.

The results indicate that sexual selection [male-male competition for access to mating] favours the production of increased numbers of sperm in D. melanogaster and … favours some male traits conferring a direct cost to the fecundity of females.
Intrasexual selection for dominance & access in one sex selects for **sexual dimorphism** between the sexes.

Does size dimorphism in humans suggest anything about ancestral mating systems?

**Figure 15-5** Dimorphism Data for Primates

**BBC. 1.5m Chinese 'descendants of one man'**

Over 1.5 million served. Not by McDonalds but Giocangga, the grandfather of the founder of the Qing dynasty, Recent genetic research suggests that over 1.5 million Chinese men are the direct descendants of this one single man. ... the average Chinese man at the time of Giocangga would only have around 20 descendants living today.
Abstract:
Psychological evidence suggests that sex differences in morphology have been modified by sexual selection so as to attract mates (intersexual) or intimidate rivals (intrasexual selection):

Women compete by advertising reproductive value...[expected future reproduction]
Low waist-hip ratio is sexually attractive in women...

Men's physical appearance tends to communicate social dominance, which has the combined effects of intimidating reproductive rivals and attracting mates.
The male beard is not obviously related to phenotypic quality...

The evolutionary psychology of physical attractiveness: Sexual selection and human morphology.

The Science of Sex Appeal: An Evolutionary Perspective.
Waist-hip ratio in women is often considered a key feature in physical attractiveness. Measured directly from this image, the frontal WHR of the model in this image is approximately 0.69.


Waist-to-Hip Ratio across Cultures: Trade-Offs between Androgen- and Estrogen-Dependent Traits
E Cashdan 2008 Current Anthropology 49: 1099-1107

Optimal Waist-to-Hip Ratios in Women Activate Neural Reward Centers in Men.

Eye-Tracking of Men’s Preferences for Waist-to-Hip Ratio and Breast Size of Women. Dixson et al Arch Sex Behav 2011 40:43–50
For Online Daters, Women Peak at 18 While Men Peak at 50, Study Finds. Oy.

By Maya Salam Aug. 15, 2018

… a new study about online dating published in the journal Science Advances.

In it, researchers studied the “desirability” of male and female users, based on how many messages nearly 200,000 users seeking opposite-sex partners got over one month on a “popular, free online-dating service” and if those sending the messages were desirable based on the same criteria.

Elizabeth Bruch at the University of Michigan and an author of the study said:

“...it steadily declined from the time women were 18 to the time they were 65, and also how steep it was,”

Michelle Drouin, a developmental psychologist, was not surprised by the new study — in part because they “align with evolutionary theories of mating” in which youth suggests fertility, she said.

Dr. Drouin pointed out … that

“men are just less interested in earning potential or power, and more interested in physical attractiveness.”
Facial attractiveness: evolutionary based research.
We review the facial characteristics that influence attractiveness judgements of faces

The influence of shape and colour cue classes on facial health perception
A L Jones 2017
Facial cues to health can be divided into two broad classes: facial shape, which is linked to previous health and is relatively fixed; and facial coloration, … changes over the short-term, reflecting current health.
Male facial attractiveness - Evidence for hormone-mediated adaptive design.

This study ... examine the facial preferences of 42 female volunteers at two different phases of their menstrual cycle.

Preferences were measured using a 1200 frame QuickTime movie that was designed to systematically modify a facial image from an extreme male (0) to an extreme female configuration (1200).

{masculine face (& 2/4th digit length) associated w/ testosterone}

The results indicate that **females exhibit**

The results are interpreted as support for a hormonal theory of facial attractiveness, whereby perceived beauty depends on an interaction between displayed hormone markers {masculinity} and the hormonal state of the viewer.

[see Women’s Preferences for Men’s Facial Masculinity Adaptive Human Behavior and Physiology 2017 3:304-320 for info on variation across women, related to “condition.”]
How beauty works. Theoretical mechanisms and two empirical applications on students' evaluation of teaching. [SET]

http://www.sciencedirect.com/science/article/pii/S0049089X16000089

Plenty of studies show that the physical appearance of a person affects a variety of outcomes in everyday life. 
[salary, trust, election results, etc.]

We want to test five hypotheses

H1. There is a high degree of inter-individual agreement on the physical attractiveness of instructors among students. (Beauty Consensus)

H2. Students skip classes less when instructors are physically more attractive even if course quality is held constant. (Attractiveness Attention Boost)

H3. Physically attractive instructors receive more favorable evaluations of teaching. (Attractiveness Treatment Advantage)

[Hot or not: do professors perceived as physically attractive receive higher student evaluations? Riniolo et al. 2006. J. General Psychol. 133: 19–35]

H4. The effect of physical attractiveness on course ratings and absenteeism is stronger, if the sexes of rater and ratee differ. The effect is more pronounced if a male student rates a female instructor. (Intersexual Attraction Effect)

H5. Greater physical attractiveness of an instructor leads to worse ratings in the case of her failing to meet the expectations of students. (Beauty Penalty)

Study 1: a descriptive analysis of actual UG classes in Germany.
the results are consistent with the experiment below, but – possible confounds?
How beauty works. Theoretical mechanisms and two empirical applications on students' evaluation of teaching. [SET]
http://www.sciencedirect.com/science/article/pii/S0049089X16000089

Study 2 uses data gathered in a series of laboratory experiments conducted at the University of Munich.

After receiving the [fake identical] CV [and a morphed, fictitious photograph] all participants listened to an eleven-minute audio recording of a lecture [on] the analysis of social structure: the discussion on classes, strata, and milieus … the voice was systematically adjusted for male or female voice characteristics using the software MorphVoxPro. [same lecture, different voice, photo & CV] After listening to this lecture, one half of the participants completed a SET questionnaire Then either an easy or hard test on the content of the lecture followed. The other half of the participants completed both documents in the opposite order. … the outcome of interest is students' ratings of the overall quality of the lecture
How beauty works. Theoretical mechanisms and two empirical applications on students' evaluation of teaching. [SET]
http://www.sciencedirect.com/science/article/pii/S0049089X16000089

Results

We find no evidence that attractiveness effects become stronger if rater and ratee are of the opposite sex.

When we look at ratings given after the test, the positive effect of attractiveness disappears for female instructors and becomes negative for male instructors.

The statistical model explains only 6.6% of total variation in the data.
How beauty works. Theoretical mechanisms and two empirical applications on students' evaluation of teaching. [SET]


Conclusions

Raters revealed a high degree of consensus when evaluating instructors' appearances and these beauty evaluations in turn resulted in differential treatments of instructors. … differences in instructors' productivity could not solely explain the latter effect.

Attractive instructors who gave students a hard test were punished more severely with lower SET scores.

[see Vote for Ugly: The New Yorker ]