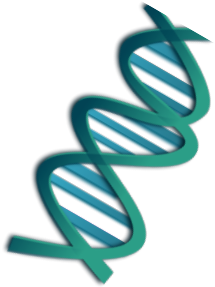
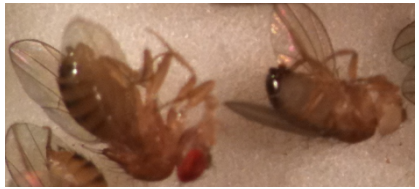


X-linked inheritance and Independent assortment

Some chromosomes have different patterns of inheritance

- Some genetic diseases much more frequent in males than in females, even when both sexes *can* get them



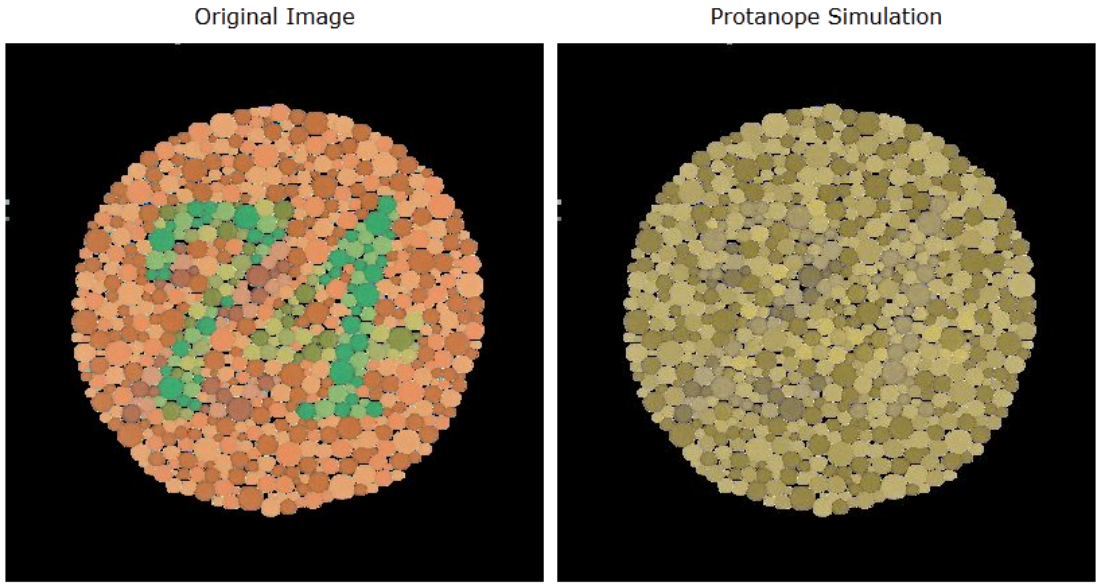
- Inheritance sometimes different based on sex of individual

Sex-linkage / X-linkage

- Some genes are not present in two copies in all organisms
  - Often (not always), males XY, females XX
  - Not the same set of genes on the X and Y despite the pairing of these chromosomes
    - Often few functional genes on Y
- Different patterns of inheritance depending on who is mom/ dad and whether kid is male or female

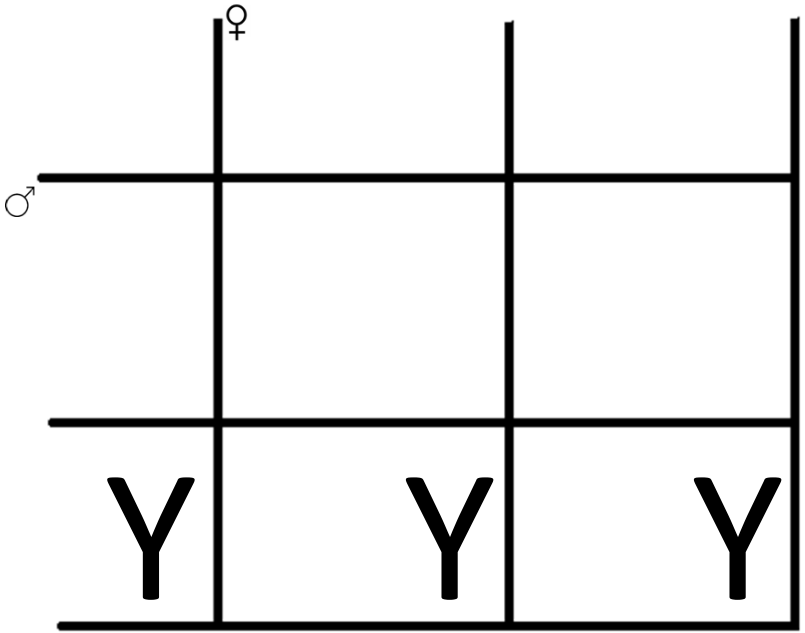
Green color blindness is X-linked recessive in humans

- Someone with green color blindness cannot see the difference between the pictures below.



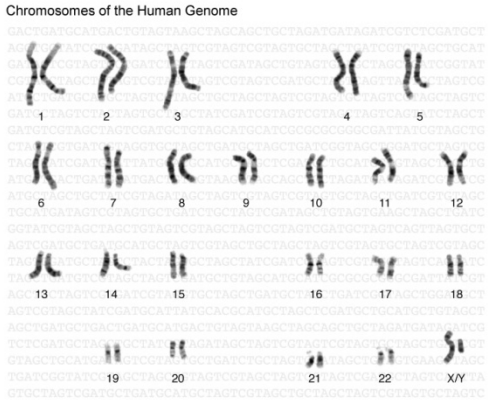
X-linked inheritance can be studied the same way

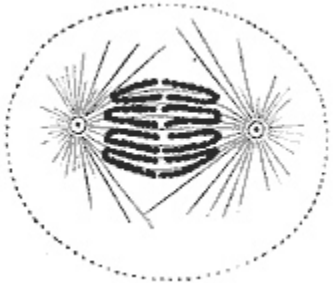
- Just insert a “Y” instead of the second allele



The genome's a big place…

- Human genome has ~23,000 protein-coding genes, and many other important loci
- Human genome is arranged into 23 pairs of chromosomes
- Chromosomes are inherited independently
  - Mendel's law of independent assortment





What happens when studying two traits, controlled by genes on different chromosomes?

- Left thumb on top
  - Dominant, T
  - Opposite- right on top- t
- Straight thumb
  - Dominant, S
  - Opposite- hitchhiker- s

What happens when studying two traits, controlled by genes on different chromosomes?

- Left thumb on top, straight thumb

  Has kids with right thumb, hitchhiker

T T S S x t t s s

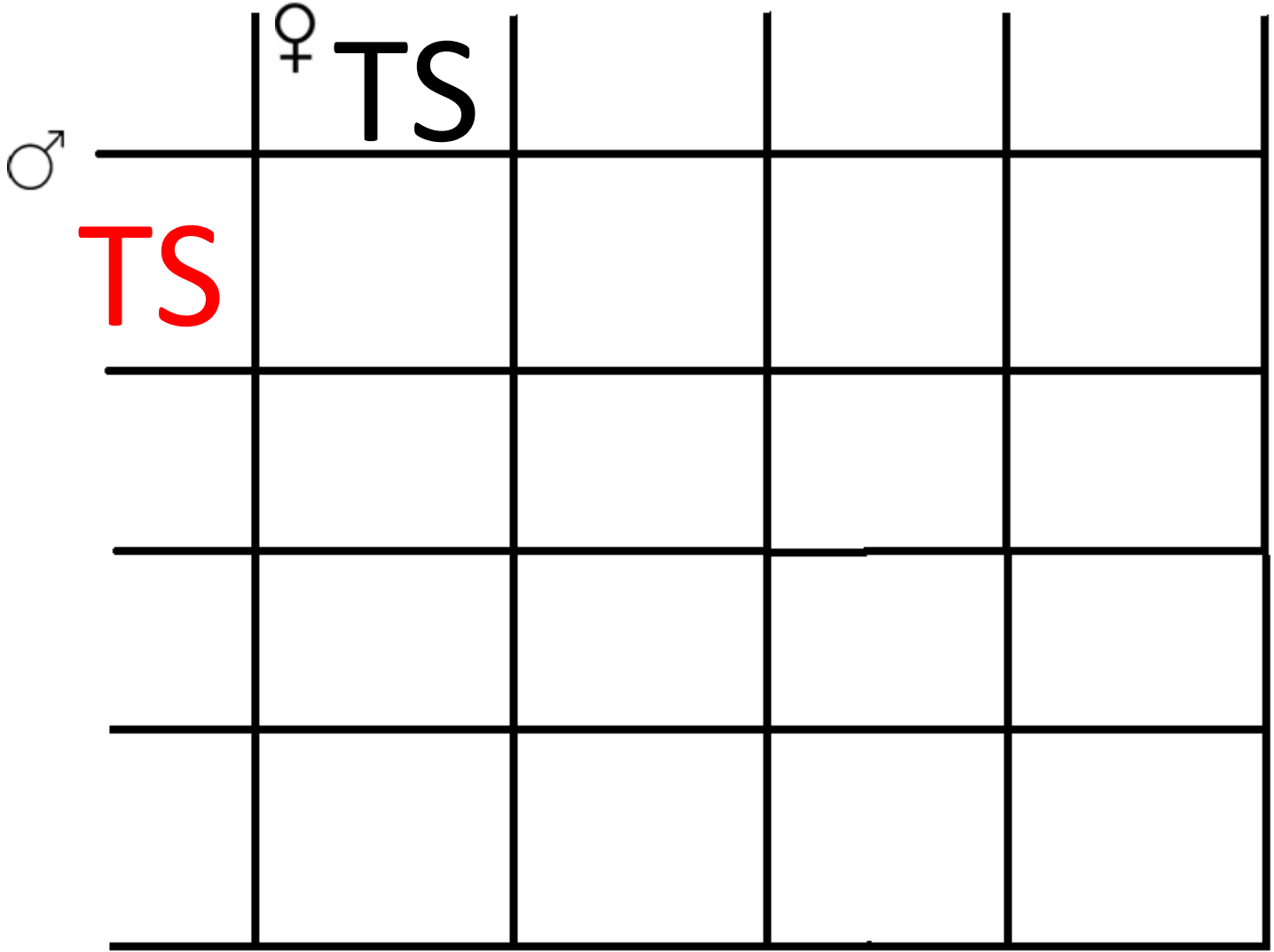
What happens when studying two traits, controlled by genes on different chromosomes?

- Kids marry each other and have kids

T t S s x T t S s

What happens when studying two traits, controlled by genes on different chromosomes?

- T and S alleles are inherited "independently" in TtSs parents
- **Gametes**: TS, Ts, tS, ts
- Two ways to approach
  - Multiply probabilities
    - ¼ TT, ½ Tt, ¼ tt; ¼ SS, ½ Ss, ¼ ss
  - Follow all gametes
    - TS can fertilize TS, Ts, tS, ts …
    - (Work out all 16 possibilities)


♀TS
♂
TS

Left = T-
Straight = S-

♂ \ ♀	TS	Ts	tS	ts
TS	TTSS	TTSs	TtSS	TtSs
Ts	TTSs	TTss	TtSs	Ttss
tS	TtSS	TtSs	ttSS	ttSs
ts	TtSs	Ttss	ttSs	ttss

Basic probability

- For two ***independent*** events, multiply the two probabilities for the joint probability

What happens when studying two traits, controlled by genes on different chromosomes?

- ¼ TT, ½ Tt, ¼ tt
- ¼ SS, ½ Ss, ¼ ss
- 9 possible genotypes

TTSS	TTSs	TTss
TtSS	TtSs	Ttss
ttSS	ttSs	ttss

- Phenotypes?

Left = T-
Straight = S-

One for y'all to try…

- Assume "independent assortment" between A and B genes
- What will be the genotypes (and proportions) of the offspring of this:

AaBb x Aabb

(Hint: multiplying probabilities will be easier.)

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