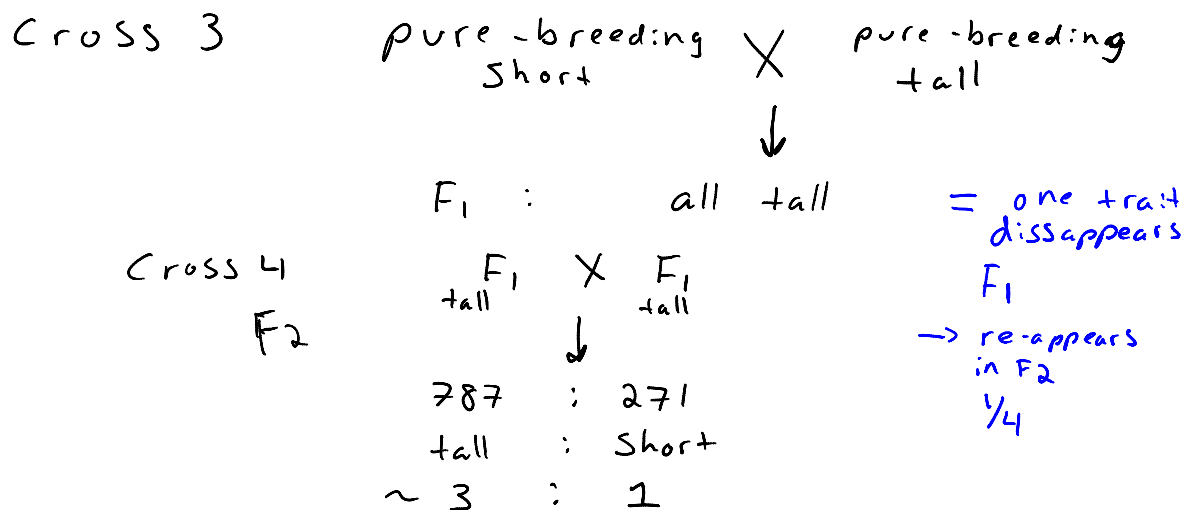# Genetics 1
- **Mendel's Experiments**
- **Mendel's Models**
- **Genetics Vocabulary**
- **Complex Models of Inheritance**
- **iClicker Question #1**

**Labs start this week!**
- **Due in Lab – Pre-Lab 01**

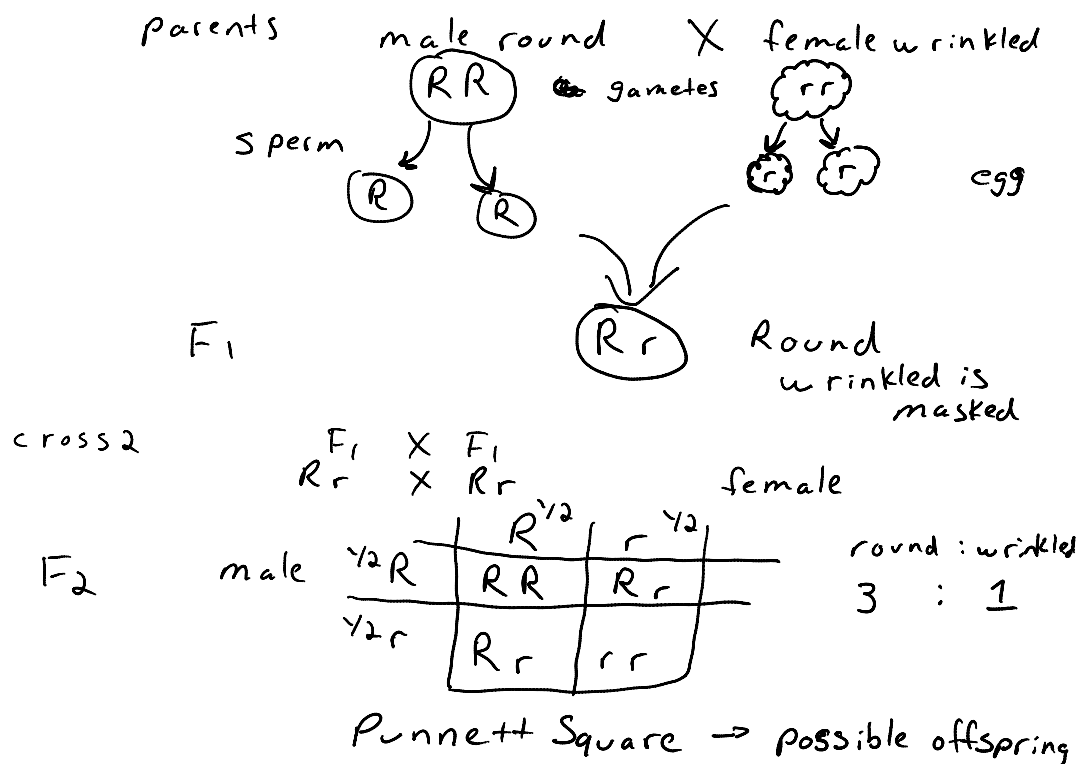- **Genetics Survey due Friday**

Mendel more experiments

Cross 3          pure-breeding       X       pure-breeding
                    Short                        tall

                                ↓

                F₁ :       all tall          = one trait
                                              dissappears
      Cross 4          F₁  X  F₁                  F₁
         F₂       tall      tall
                                ↓              → re-appears
                                                 in F₂
                787  :  271                      ¼
                tall :  Short
              ~ 3  :   1

Mendel's model →   underlying process  that g.

Mendel's model → underlying process that gives these results

Mende's Model ① genetic information comes in particles

② each particle can have ✱ one of several forms

ex. R - round        r - wrinkled
    T - tall         t - short

③ each plant has 2 particles
   ∴ 3 possible combinations

RR → round
Rr → round
rr → wrinkled

④ each parent contributes 1 particle in their gametes (egg/sperm) to their offspring

⑤ each organism has 2 particles, 1 from mom ⇥ 1 from dad

---

parents   male round   X   female wrinkled



sperm

egg

F₁                    R r   Round
                            wrinkled is masked

cross2        F₁  X  F₁
              R r  X  R r        female

F₂    male                              round : wrinkled

| | R $^{1/2}$ | r $^{1/2}$ |
|---|---|---|
| $^{1/2}$ R | R R | R r |
| $^{1/2}$ r | R r | r r |

3 : 1

Punnett Square → possible offspring

[ Example of an Exam Answer ]

$\boxed{\text{Example of an Exam Answer}}$

Genetic model of pea-shape inheritance

- pea shape is controlled by 1 gene with 2 alleles

genotype

| allele | contribution to phenotype |
|--------|---------------------------|
| R | round (dominant) |
| r | wrinkled (recessive) |

$\therefore$ RR, Rr $\rightarrow$ round

rr $\rightarrow$ wrinkled

Simple dominance

Earlobes

dangling   attached

more complex models of inheritance

① Incomplete dominance

| allele | contribution to phenotype |
|--------|---------------------------|
| A | red } incompletely dominant |
| a | white } |

$\therefore$ AA — red        Aa = pink

aa — white        $\left(\begin{array}{c}\text{intermediate to}\\\text{red & white}\end{array}\right)$

② Co-dominance $\rightarrow$ blood type

| allele | c. to p. |
|--------|----------|
| $I^A$ | bld. type A $\rightarrow$ co-dominant w/ $I^B$ |
| $I^B$ | " " B $\rightarrow$ co-dominant w/ $I^A$ |
| i | O $\rightarrow$ recessive to $I^A, I^B$ |

| genotype | | phenotype blood type |
|----------|---|-------------|
| $I^A I^A$ | $\rightarrow$ | A |
| $I^B I^B$ | $\rightarrow$ | B |
| i i | $\rightarrow$ | O |
| $I^A i$ | $\rightarrow$ | A } simple dominance |
| $I^B i$ | $\rightarrow$ | B } |

$$I^B i \longrightarrow B$$

$$I^A I^B \longrightarrow AB \longrightarrow \text{co-dominance}$$

both $A$ and $B$

# Bio 111 Genetics Definitions:

**Character** = a heritable feature of an organism (ex. eye color, pea shape, etc.

**Trait** = one of many forms of a character (ex. blue eyes, brown eyes; round peas, wrinkled peas, etc.)

**Gene** = a particle of inheritance. "Seed shape in peas is controlled by one gene." In the simplest cases, each gene controls one **character** (ex. a gene for eye color or pea shape), and each **character** is controlled by one gene.

**Allele** = an alternative form of a gene. The different *alleles* of a **gene** control different *traits* of that **character.**
(ex. "The seed shape gene in peas has two alleles, each conferring a different trait: R - round and r - wrinkled")
**wild-type allele** = the allele most commonly found in nature
**mutant allele** = an altered form of a gene that is different from wild-type

**Genotype** = the alleles present in an organism (ex. "RR", "Rr", "rr")
**homozygous** = both alleles are the same type (ex. "RR rr") a.k.a "true-breeding"
**homozygote** = an organism that is homozygous
**heterozygous** = both alleles are different (ex. "Rr")
**heterozygote** = an organism that is heterozygous

**haploid** = having only one allele of each gene; sometimes abbreviated "N". Gametes (eggs, sperm, etc.) are haploid and would therefore have genotypes like "r" or "R" but not "RR".
**diploid** = having two alleles of each gene; sometimes abbreviated "2N". Most cells of an individual are diploid and would therefore have genotypes like "RR", "Rr", etc.

**Phenotype** = the observable characteristics of an organism (ex. "round peas" or "wrinkled peas")

**dominant** = the phenotype observed in the heterozygote
_types of dominance_
(ex. A = red and a = white, so the homozygotes are AA - red and aa - white)
• **simple dominance** = the heterozygote looks like **one** of the homozygotes
(ex. if A is simply dominant to a, then Aa would be red)
• **incomplete dominance** = the heterozygote's phenotype is **in between** the homozygotes (ex. Aa would be pink - in between red and white).

Genetics 1-2