



Gregor Mendel

Chapter 11.1

- **Gregor Mendel:** Father of genetics, studied peas
- **Genetics:** field of biology devoted to understanding how characteristics are transmitted from parents to offspring
- **Heredity:** transmission of characteristics from parents to offspring

Mendel Rap

Peas in a Pod



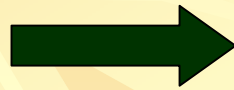
- Mendel examined peas for heritable traits
- Traits: particular forms of one characteristic



Characteristics vs. Traits

Characteristic:

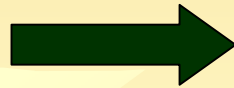
Seed Shape



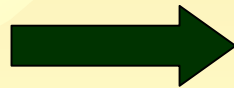
Seed Color



Flower Color



Pod Color



Traits:

Wrinkled or round

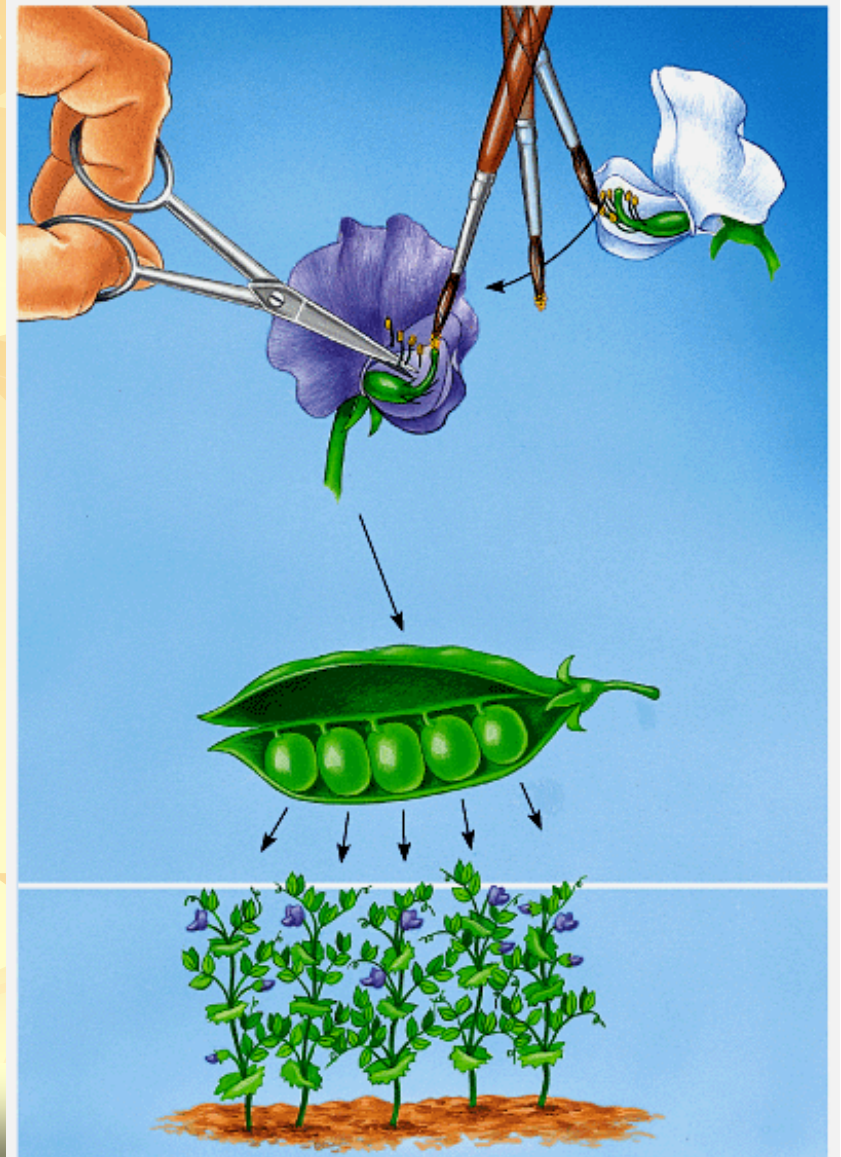
Yellow or green

Purple or white

Green or yellow

Mendel's Experiments

- Mendel conducted his experiments by controlling how pea plants reproduced



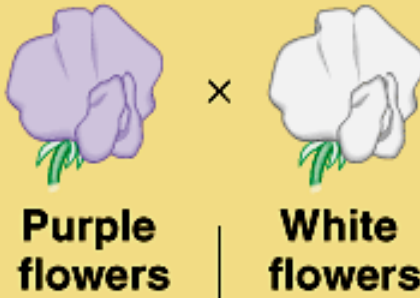
1st: He grew plants that were pure for each trait (true-breeding).

True-breeding: Same trait always appears when self-fertilized.

2nd: He took flowers from different pure strains and crossed them (F₁ generation).

3rd: He allowed the F₁ generation to self-pollinate to produce offspring (F₂ generation)

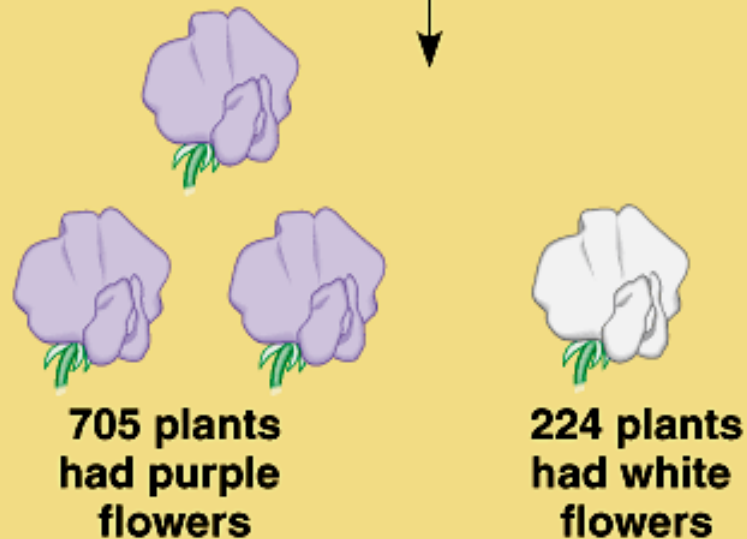
P Generation
(true-breeding
parents)



F₁ Generation
(hybrids)

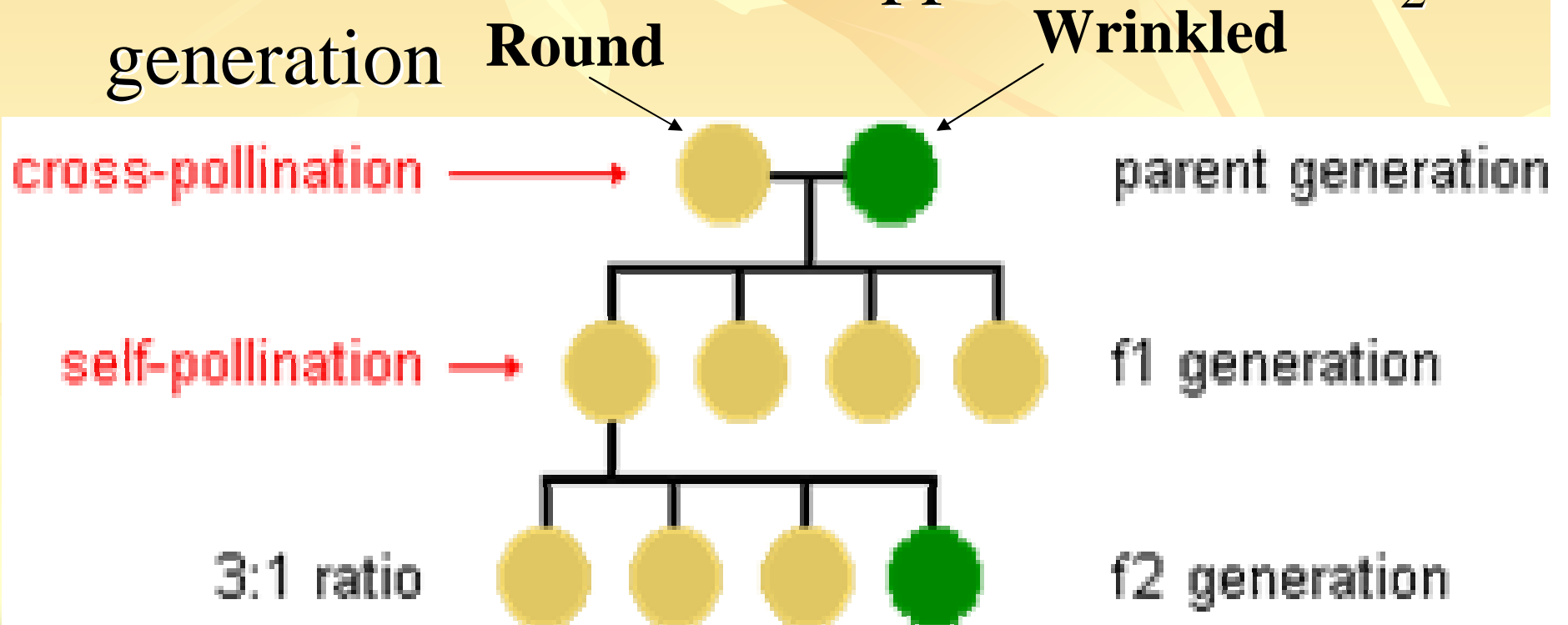
















F₂ Generation
Ratio 3:1



Mendel's Results

- Pure Wrinkled X Pure Round \rightarrow all F_1 seeds were round
- BUT wrinkled seeds reappeared in the F_2 generation



| Characteristic | P cross | F ₁ generation | F ₂ generation | Actual ratio | Probability ratio |
|--------------------------------|--|---|---------------------------------|--------------|-------------------|
| Position of flowers along stem |  axial × terminal |  axial | 651 axial 207 terminal | 3.14:1 | 3:1 |
| Height of plant |  tall × short |  tall | 787 tall 277 short | 2.84:1 | 3:1 |
| Pod appearance |  inflated × constricted |  inflated | 882 inflated 299 constricted | 2.95:1 | 3:1 |
| Pod color |  green × yellow |  green | 428 green 152 yellow | 2.82:1 | 3:1 |
| Seed texture |  smooth × wrinkled |  smooth | 5,474 smooth 1,850 wrinkled | 2.96:1 | 3:1 |
| Seed color |  yellow × green |  yellow | 6,022 yellow 2,001 green | 3.01:1 | 3:1 |
| Flower color |  purple × white |  purple | 705 purple 224 white | 3.15:1 | 3:1 |

Mendel's 3 Conclusions

1. There was something in the pea plant that controlled the characteristics he observed
 - He called these controlling things “Factors”
2. There must be a pair of “factors” controlling each trait
3. One “factor” in the pair may prevent the other from having an effect

Recessive and Dominant Traits

- **Dominant**: A factor that covers or masks another factor
- **Recessive**: A factor that is covered or masked when paired with a dominant factor

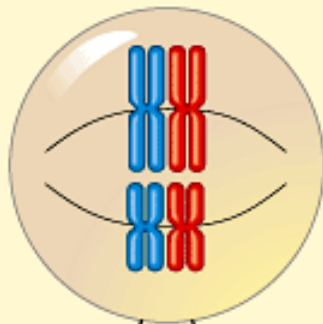
Law of Segregation

- Paired factors separate during the formation of gametes
- Each gamete receives 1 factor from each pair
- When 2 gametes combine offspring would have 2 factors controlling each trait

Law of Independent Assortment

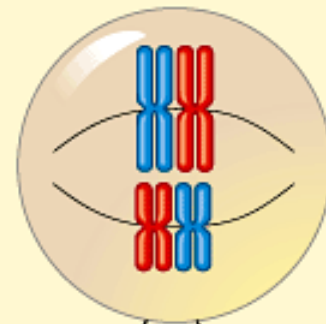
- Factors for different characteristics are distributed to gametes independently
- This means that dominant traits don't necessarily travel together – it's possible to be dominant for one trait and be recessive for another

Possibility 1

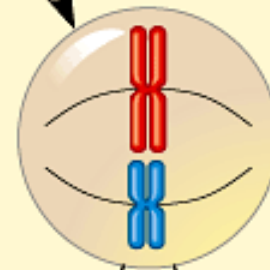
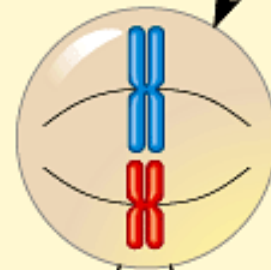
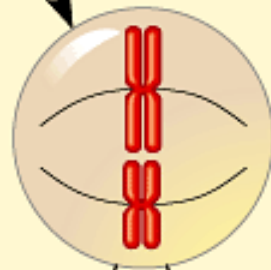
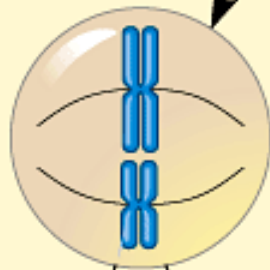


Two equally probable
arrangements of
chromosomes at
metaphase I

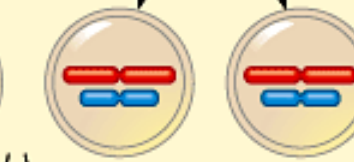
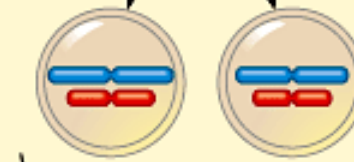
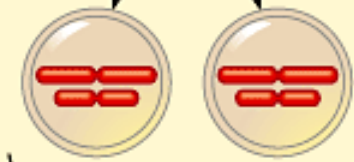
Possibility 2



Metaphase II



Gametes



Combination
1

Combination
2

Combination
3

Combination
4

1

2

3

4