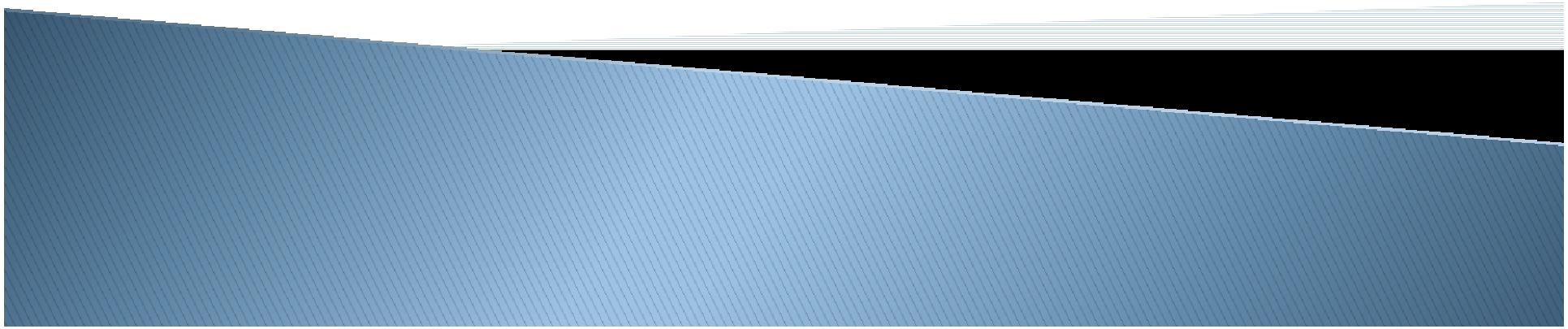
Chapter 8: Mendelian Genetics

Notes



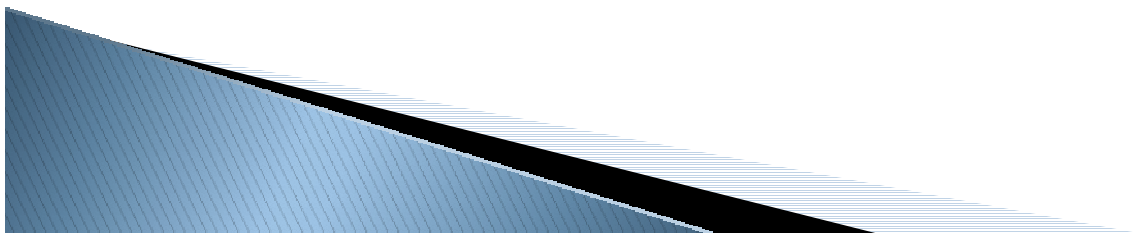
Heredity

- The passing on of characteristics from parents to offspring
  - We inherit a version of our characteristics from our parents, such as eye color, hair color, and skin color.

- The branch of biology which focuses on inheritance is called ***GENETICS***.

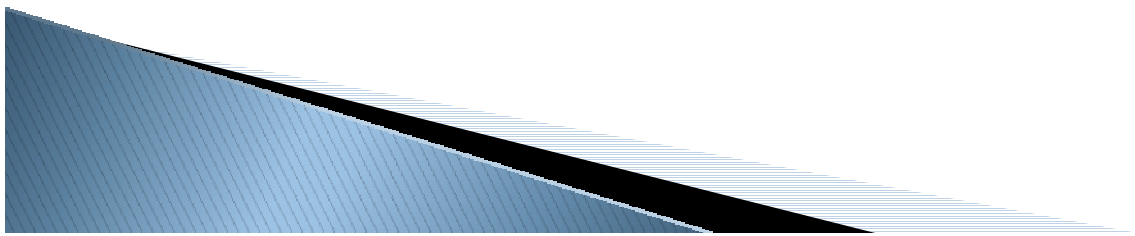
Gregor Mendel

- Mendel conducted experiments with pea plants
- He crossed plants with the same and with different traits of the same characteristic
  - **Cross**-breeding or mating of two individuals
  - For example, he crossed plants that had purple flowers with plants that had white flowers
  - He made observations on the offspring of those crosses
  - He used math to explain the results he found



Mendel's experiments

- Mendel began by self-pollinating pea plants for several generations to ensure that they were all true-breeding
- ***True-breeding*** plants, when self-pollinated, will have offspring of all the same trait
- He used the true breeding plants as his parental generation or **P generation**
- The ***P generation*** plants are the first plants crossed in a breeding experiment



The next step…

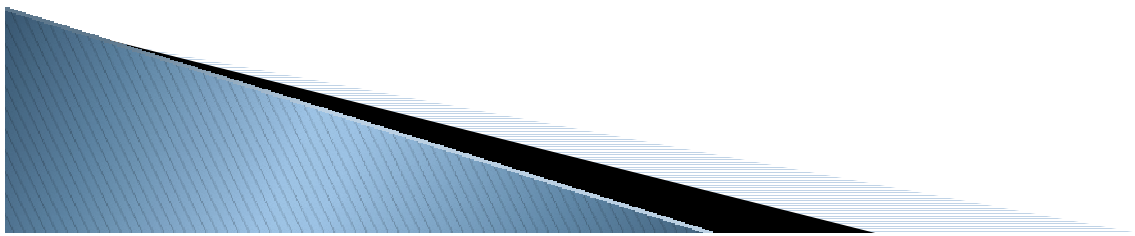
- Then Mendel crossed true breeding parents of different traits, such as purple flowers crossed with white flowers
- He noted that all offspring of this cross had purple flowers
- The offspring of this cross are called the ***F_1 generation*** (first filial)
- Why were there no white flowered plants?

And the next step….

- Then Mendel allowed the F_1 generation to self-pollinate
- What results do you think he found?

The F_2 generation

- The offspring of the F_1 self-pollination is called the **F_2 generation**
- The offspring from the self-pollination of the F_1 generation included plants with purple flowers **and** plants with white flowers
- The offspring had purple flowers to white flowers in a 3:1 ratio (**3 purple** flowers for every **1 white** flower)
- What does this mean?



Mendel's Hypotheses

1. For each inherited character, an individual has two copies of each gene-one from each parent.
2. There are alternative versions of genes.
3. When two different versions are inherited together, one may be completely expressed while the other is not visible in the organism's appearance.
4. When gametes are formed, each has only one version of the inherited character. During fertilization, each gamete contributes one version of the inherited character.

Alleles

- The different versions of a gene, or inherited character
- For flower color, one allele codes for purple, and the other codes for white
- For example, the allele for purple flowers is represented by **P**, and the allele for white flowers is represented by **p**

Dominance

- The allele that is expressed visibly when two different alleles are present in an individual is the **dominant** allele
- When two different alleles are present in an individual, the allele that is not visibly expressed is called **recessive**

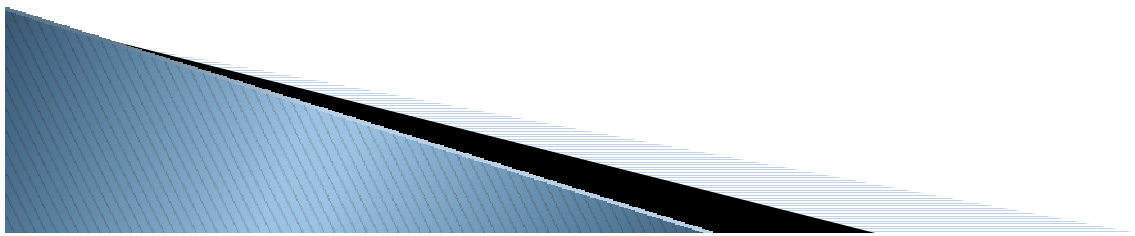
More Genetics Terms

- When an individual inherits **two different** alleles for the same gene they are **heterozygous** for that gene
- When an individual inherits the **same** allele from each parent they are said to be **homozygous** for that gene
- If the alleles for flower color are P for purple flowers and p for white flowers then
  - **PP** or **pp** are the **homozygous** individuals
  - **Pp** are the **heterozygous** individuals

**Remember these alleles occur in pairs, one from mother and one from father

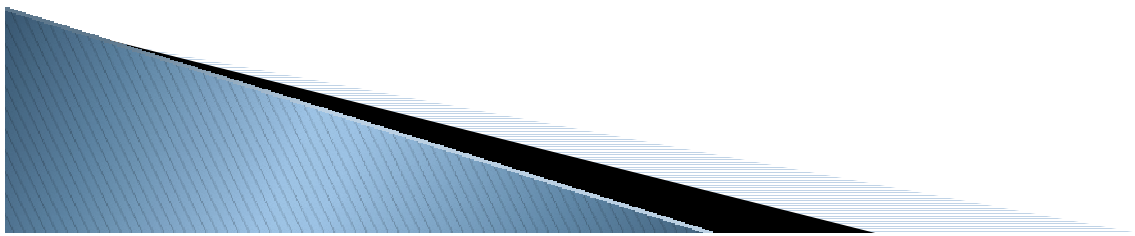
What's the Difference?

- Genotype and phenotype
- The genotype is what we *don't see*. It is the pair of alleles that an individual has for a given gene.
- The phenotype is what we *do see*. It is the physically expressed form of the gene.
- The phenotype is dependent on the genotype, but we cannot always determine the genotype from the physical appearance of the gene.



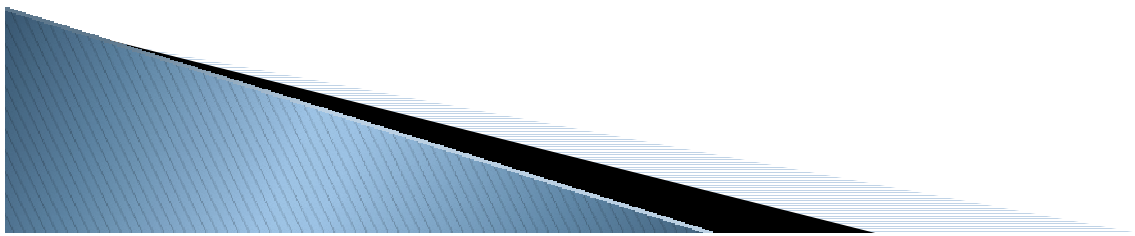
Law of Segregation

- When gametes are formed during meiosis, the two alleles a parent has for a given gene are separated.
- We already know this one!!



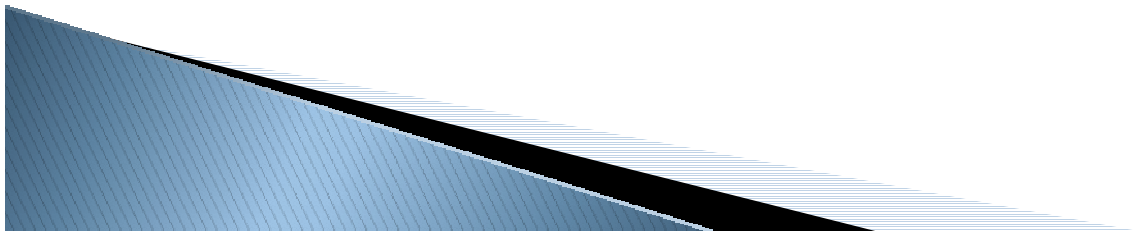
Law of Independent Assortment

- The alleles for different genes separate independently of one another during gamete formation.
- We know this one, too!!



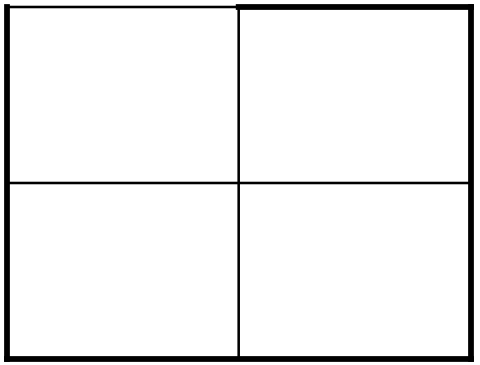
Punnett Squares

- These can be used to predict the outcome of a genetic cross.
- The possible gametes that one parent can produce are written above the top of the square over two different boxes.
- The possible gametes the other parent can produce are written along the side of the square next to two different boxes.



Punnett Square Example

- Below is an example of a Punnett Square where one parent plant is homozygous for purple flowers (PP) and the other parent is homozygous for white flowers (pp).



More fun with Punnett Squares

- Practice making a few more Punnett Squares using homozygous and heterozygous parents.