

The background is a light green color with a pattern of white hexagons of varying sizes and opacities. A white rectangular box is positioned on the right side of the slide, containing the title and author information. The box has a thin green border at the bottom. The text is centered within the box.














Mendelian Genetics

ARC Workshop for Biology
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Agenda

- Mendel's Experiments
- Mendel's Conclusions
- Dominance and Recessiveness
- Principle of Segregation
- Independent Assortment
- Terms to Know
- Genotype vs Phenotype
- Homozygous vs Heterozygous
- Gamete Formation
- Punnett Squares
 - Single Trait Crosses
 - Dihybrid Crosses
- References

Mendel's Experiments

Character	Dominant trait	Recessive trait	Character	Dominant trait	Recessive trait
Seed shape	 Spherical	 Wrinkled	Flower position	 Axial	 Terminal
Seed color	 Yellow	 Green		Stem height	 Tall
Flower color	 Purple	 White			
Pod shape	 Inflated	 Constricted			
Pod color	 Green	 Yellow			

Mendel's Conclusions

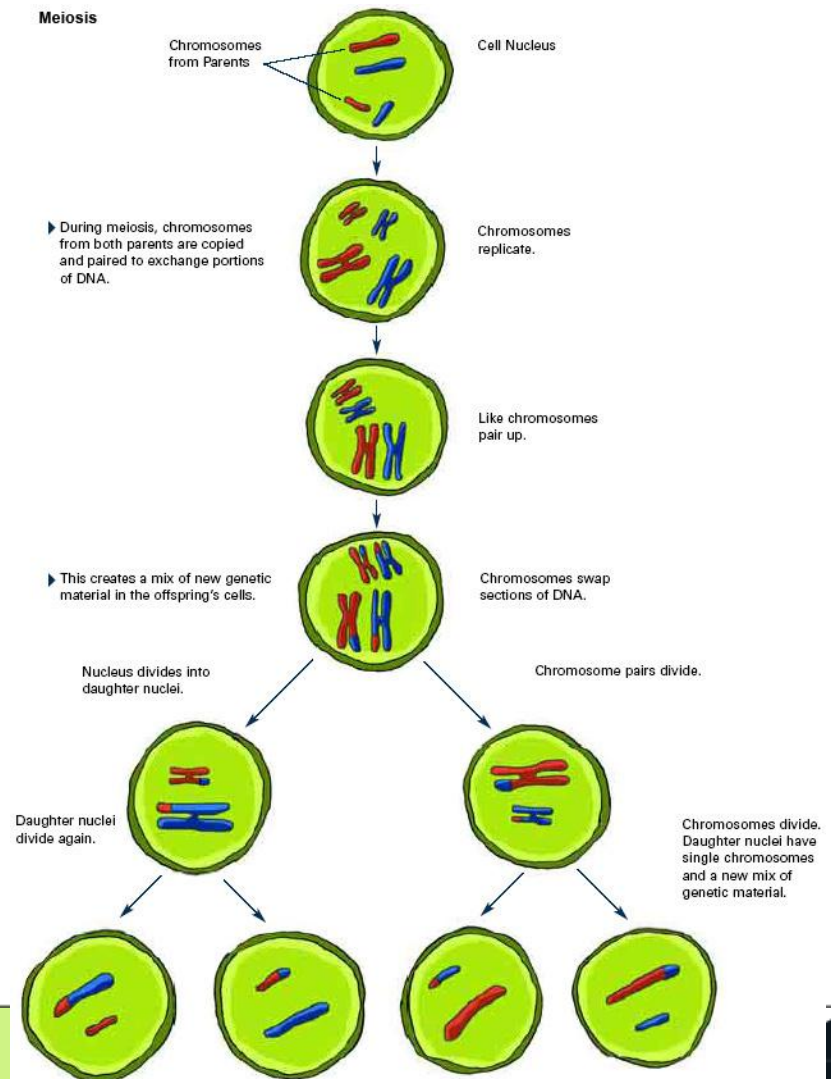
- Dominance and Recessiveness
- Principle of Segregation
- Principle of Independent Assortment

Dominance and Recessiveness

- One “factor” or allele masks the other
 - Called dominant
 - Ex. Brown eyes (B)
- The “factor” or allele is masked or not evident
 - Called recessive
 - Ex. Blue eyes (b)

Principle of Segregation

- Each reproductive cell (gamete) has only one “factor” for each characteristics.
- The two factors or alleles segregate or separate during the gamete formation.

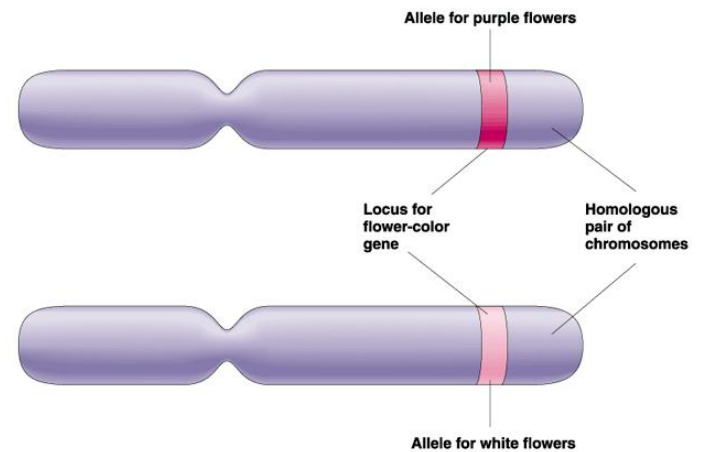
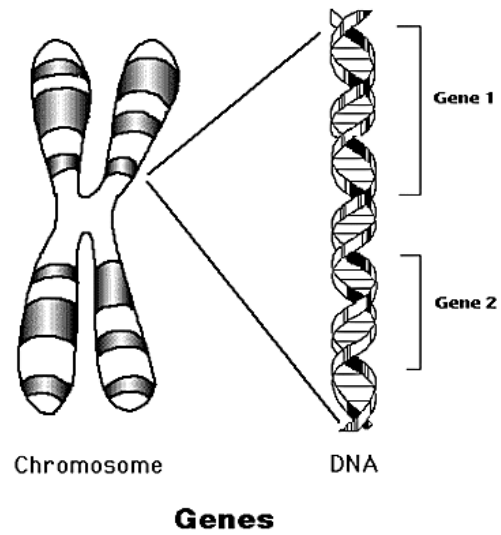


Independent Assortment

- Factors for different characteristics are distributed to reproductive cells independently.
 - Ex. Pea color inheritance is independent from height and pod color and flower position.
 - Exception: traits on same chromosome

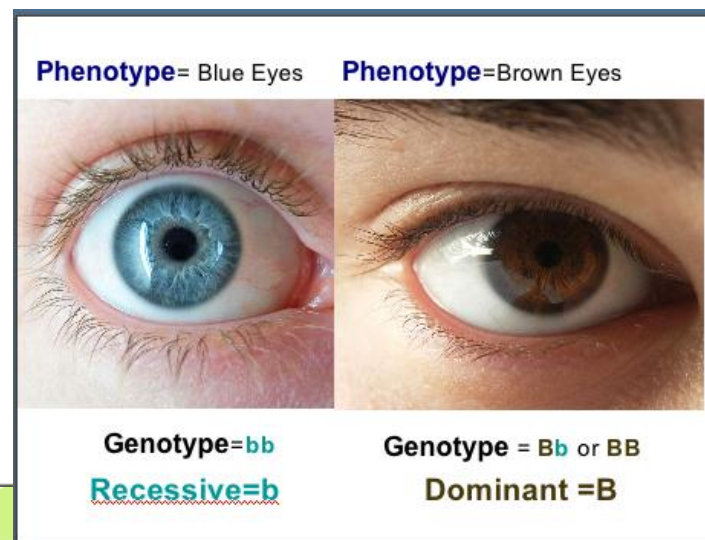
Terms:

- Chromosomes:
- Genes:
- Allele:



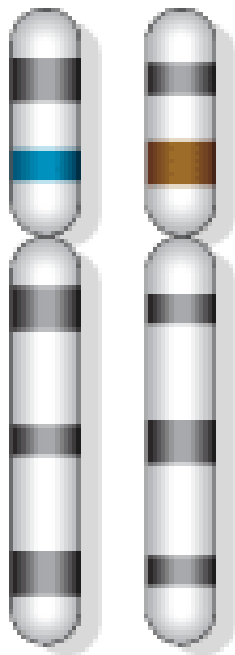
Genotype vs. Phenotype

- Genotype= exact gene makeup
 - Ex. AaBBCCDd, TtPP, Bb
- Phenotype= how a trait is expressed
 - Ex. Tall, purple, short, round, pink, etc

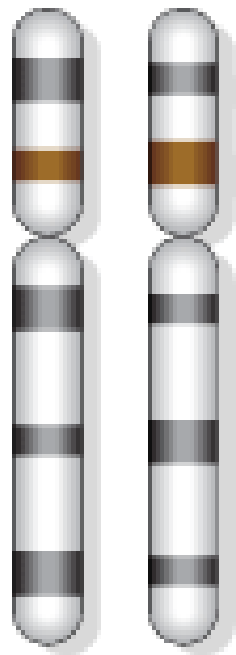


Homozygous/Heterozygous

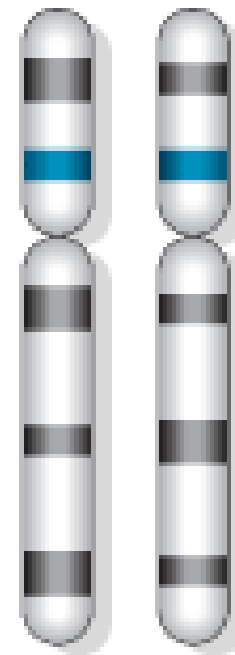
■ Allele for blue eyes (recessive)
■ Allele for brown eyes (dominant)



Individual A:
heterozygous



Individual B:
homozygous

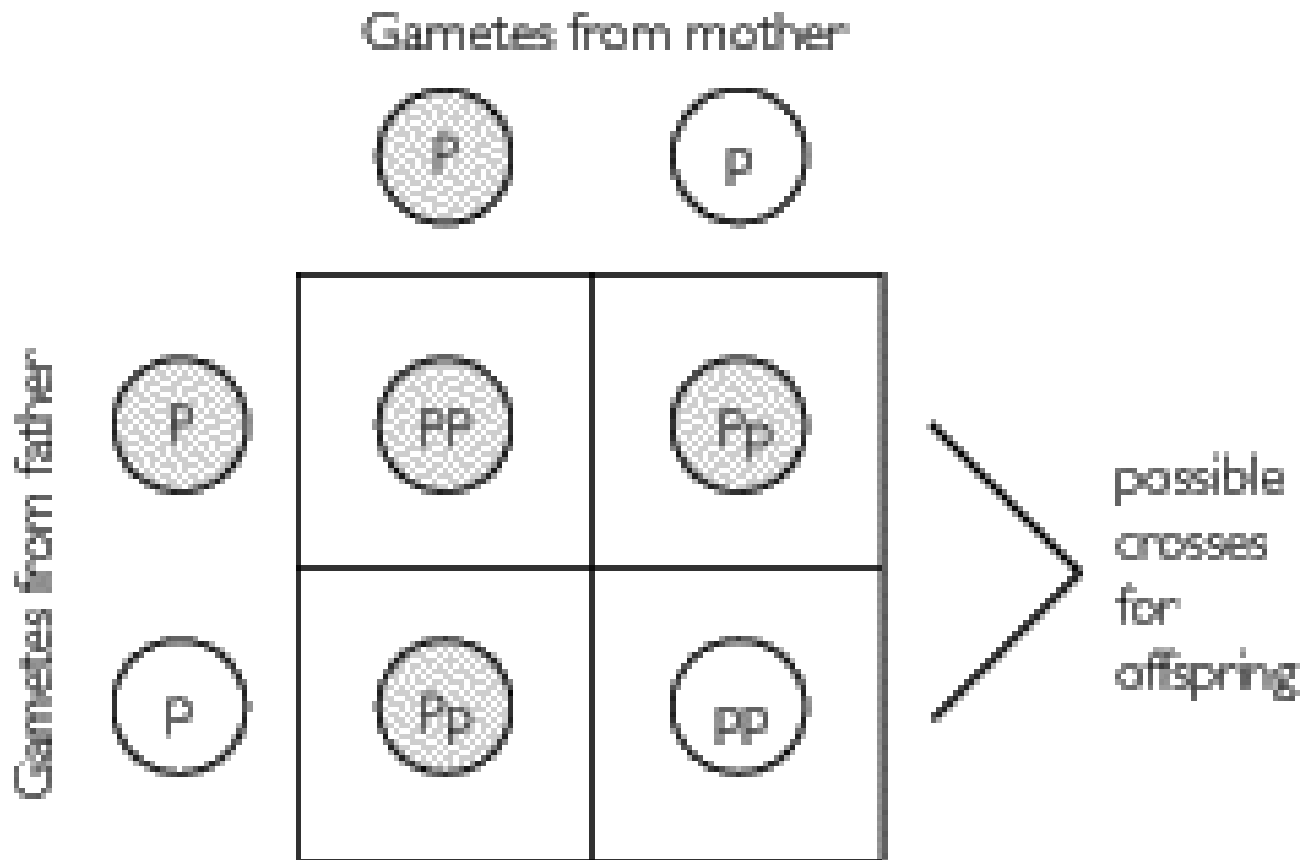


Individual C:
homozygous
recessive

Gamete formation

- Each gamete formed receives one copy of each chromosome with one copy of each allele.
 - Ex. TtPp
 - Can make 4 different gametes:
TP, Tp, tP, tp
 - What gametes can an individual with the genotype AaBB make?
 - What gametes can an individual with the genotype PpTtMm make?

Punnett Square Setup



Single Trait Crosses

- In pea plants, yellow seeds are dominant over green seeds.
 1. Cross a pure breeding yellow plant with a green plant.
 2. Cross a heterozygous yellow plant with a heterozygous yellow plant.
 3. Cross a heterozygous yellow plant with a green plant.

Single Trait Crosses

1. $YY \times yy$

Y Y
y
y

Yy	Yy
Yy	Yy

All offspring are yellow.

1. $Yy \times Yy$

Y y
Y
y

Phenotypic ratio- 3 Yellow: 1 Green

1. $Yy \times Yy$

YY	Yy
Yy	yy

Yy	Yy
yy	yy

Dihybrid Cross: Two trait cross

AaBb x AaBb

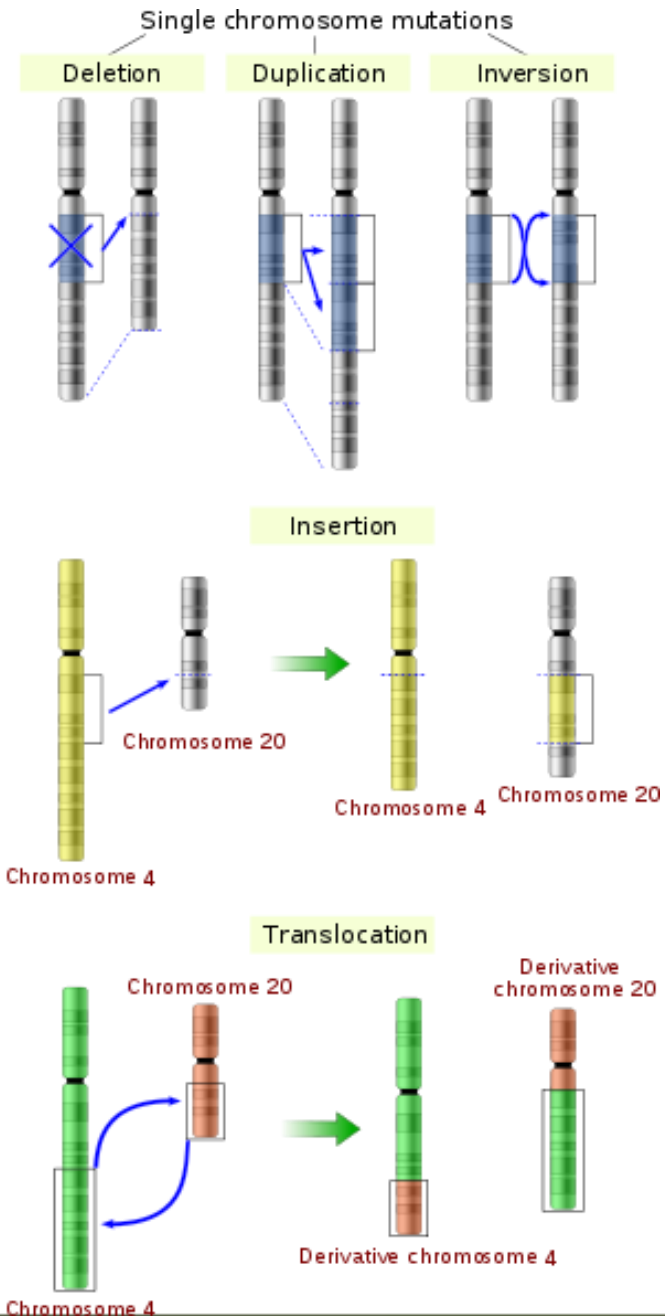
A-attached earlobe a-free earlobes

B-Brown eyes b-blue eyes

	AB	Ab	aB	ab
AB				
Ab				
aB				
ab				

Types of Mutations

- Deletion
- Duplication
- Inversion
- Insertion
- Translocation



References

- Some basic resources:
 - http://www.biology-online.org/2/5_mendelian_genetics.htm
 - <http://www.youtube.com/watch?v=dOs6tLAYcUQ>
 - <http://www.youtube.com/watch?v=7ETkwTicSVk&feature=related>
- Punnett squares:
 - <http://www.youtube.com/watch?v=d4izVAkhMPQ>
- ARC Website:
 - iit.edu/arc
- ARC Biology Schedule:
 - http://www.iit.edu/arc/tutoring_schedule/biology.shtml

Questions?