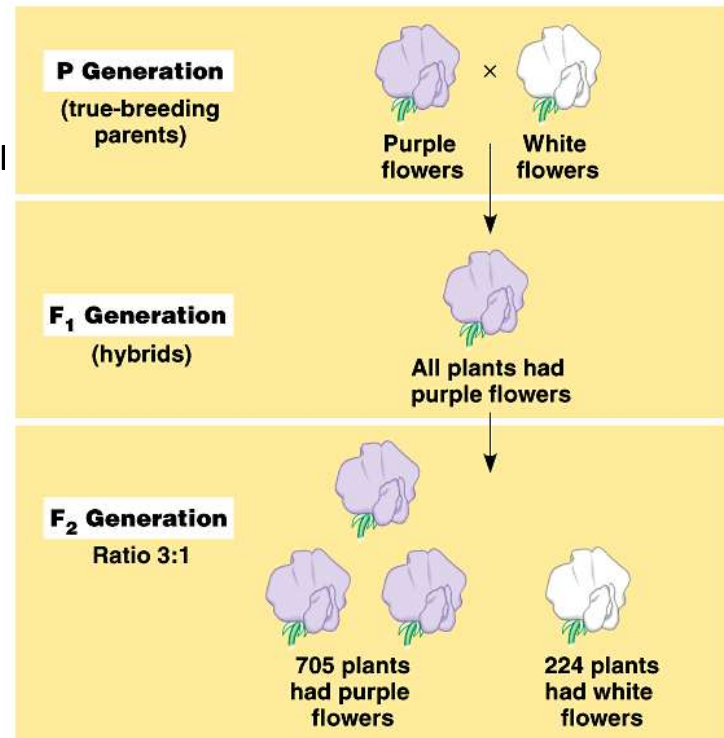




*Mendel &  
The Gene Idea*

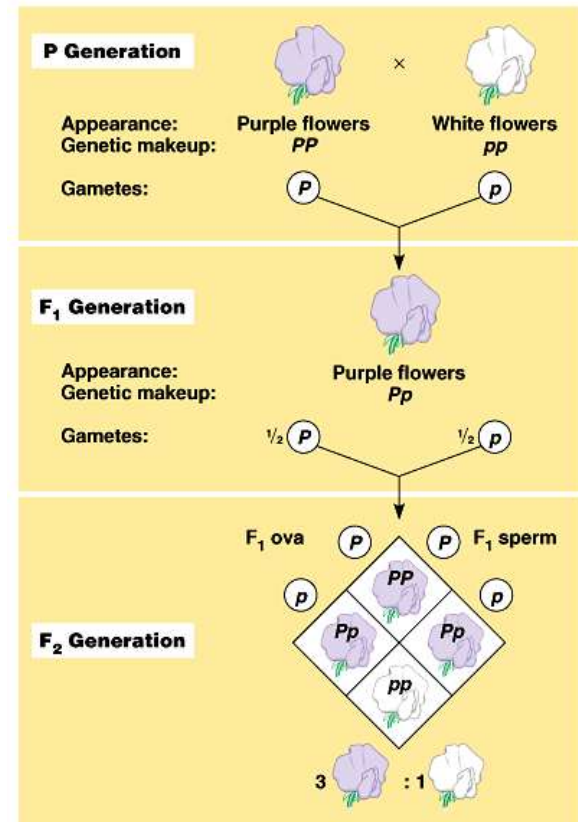
# Mendelian genetics

- Character (heritable feature, i.e., fur color)
- Trait (variable for a character, i.e., brown)
- True-bred (all offspring of same variety)
- Hybridization (crossing of 2 different true-breeds)
- P generation (parents)
- F<sub>1</sub> generation (first filial generation)



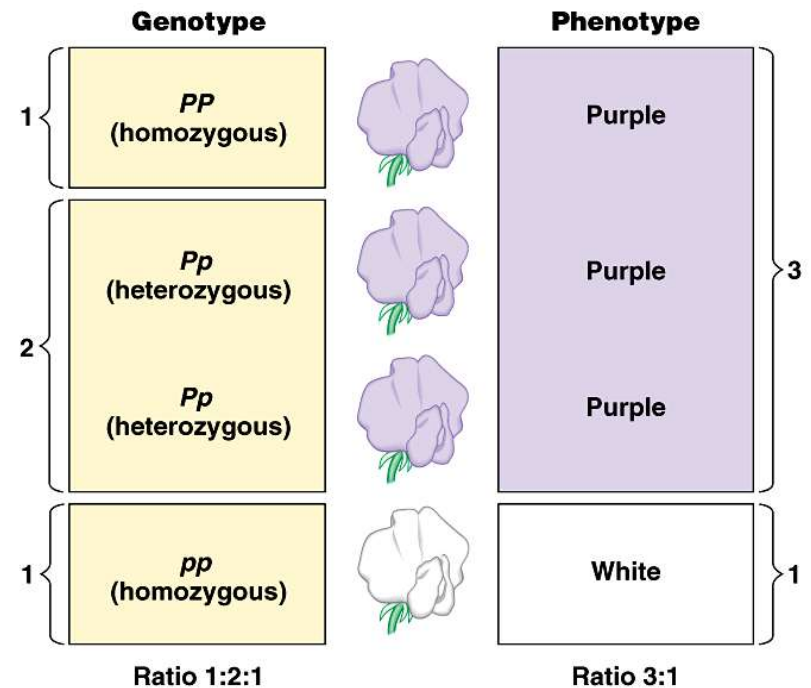
# Leading to the Law of Segregation

- ▶ Alternative versions of genes (alleles) account for variations in inherited characteristics
- ▶ For each character, an organism inherits 2 alleles, one from each parent
- ▶ If the two alleles differ, then one, the dominant allele, is fully expressed in the organism's appearance; the other, the recessive allele, has no noticeable effect on the organism's appearance
- ▶ The alleles for each character segregate (separate) during gamete production (meiosis).
- ▶ Mendel's **Law of Segregation**



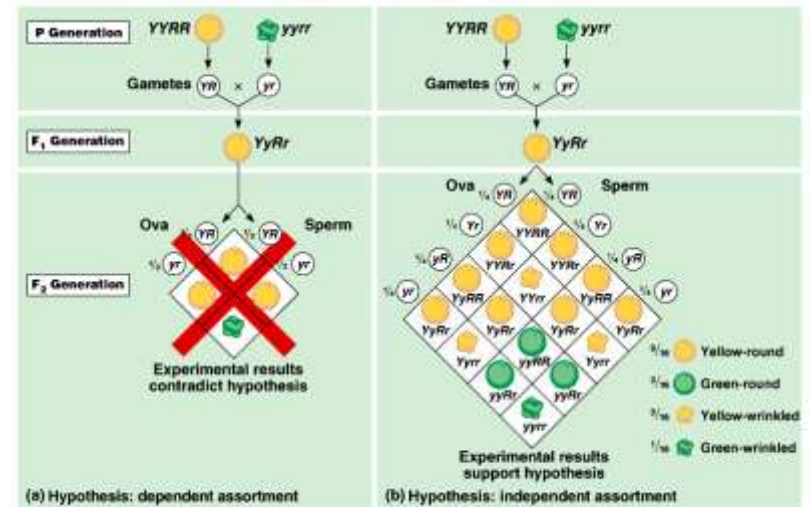
# Genetic vocabulary.....

- ▶ Punnett square: predicts the results of a genetic cross between individuals of known genotype
- ▶ Homozygous: pair of identical alleles for a character
- ▶ Heterozygous: two different alleles for a gene
- ▶ Phenotype: an organism's traits
- ▶ Genotype: an organism's genetic makeup
- ▶ Testcross: breeding of a recessive homozygote X dominant phenotype (but unknown genotype)



# The Law of Independent Assortment

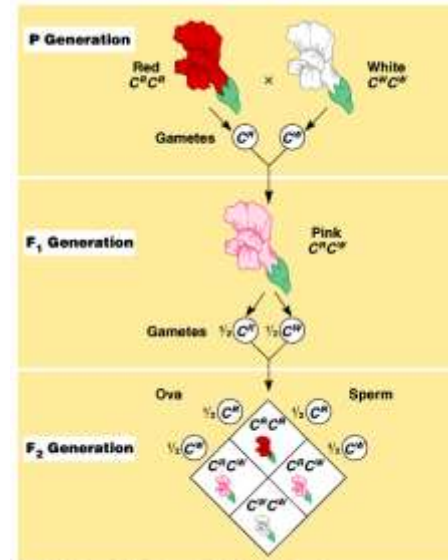
- ▶ Law of Segregation involves 1 character. What about 2 (or more) characters?
- ▶ Monohybrid cross vs. dihybrid cross
- ▶ The two pairs of alleles segregate independently of each other.
- ▶ Mendel's ***Law of Independent Assortment***



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# Non-single gene genetics, I

- ▶ *Incomplete dominance*: appearance between the phenotypes of the 2 parents.  
Ex: snapdragons
- ▶ *Codominance*: two alleles affect the phenotype in separate, distinguishable ways.  
Ex: Tay-Sachs disease
- ▶ *Multiple alleles*: more than 2 possible alleles for a gene.  
Ex: human blood types



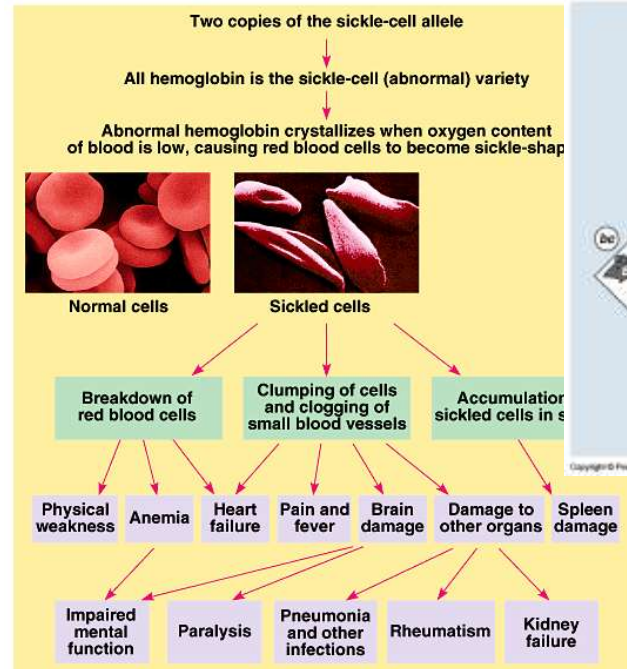
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(a) Phenotype (blood group)	(b) Genotypes (see p.258)	(c) Antibodies present in blood serum	(d) Results from adding red blood cells from groups below to serum from groups at left			
			A	B	AB	O
A	$I^A I^A$ or $I^A I$	Anti-B	Agglutination	Agglutination	Agglutination	No agglutination
B	$I^B I^B$ or $I^B I$	Anti-A	Agglutination	Agglutination	Agglutination	No agglutination
AB	$I^A I^B$	—	Agglutination	Agglutination	Agglutination	No agglutination
O	$ii$	Anti-A Anti-B	No agglutination	No agglutination	No agglutination	No agglutination

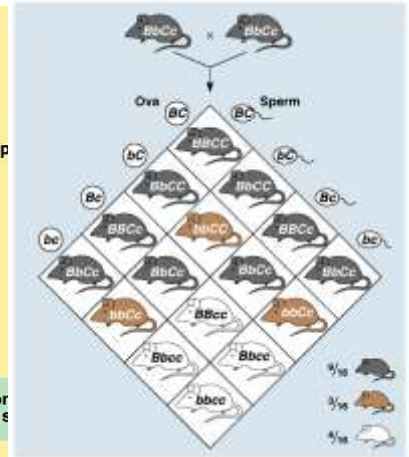
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# Non-single gene genetics, II

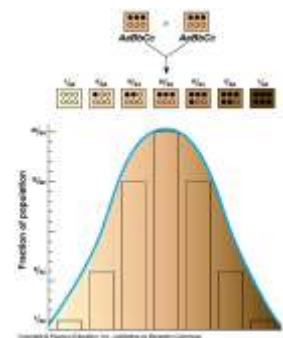
- ▶ **Pleiotropy:** genes with multiple phenotypic effect. Ex: sickle-cell anemia
- ▶ **Epistasis:** a gene at one locus (chromosomal location) affects the phenotypic expression of a gene at a second locus. Ex: mice coat color
- ▶ **Polygenic Inheritance:** an additive effect of two or more genes on a single phenotypic character Ex: human skin pigmentation and height



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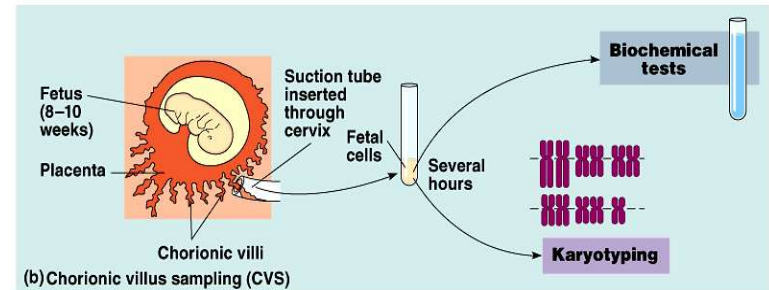
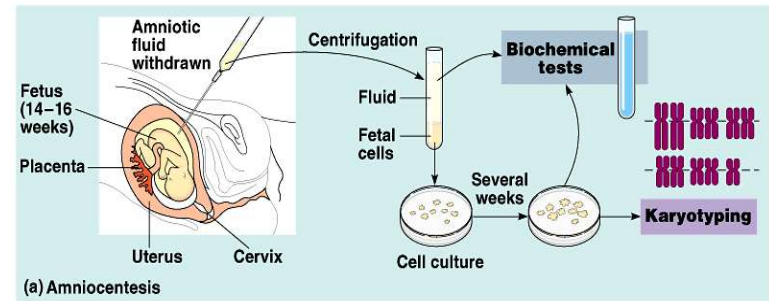
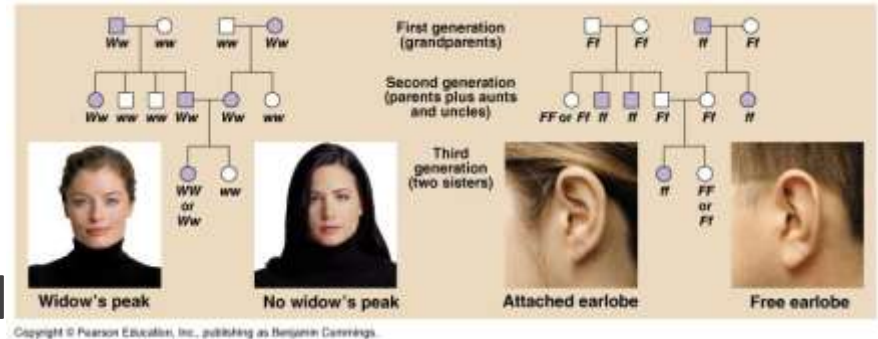
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# Human disorders

- ▶ The family pedigree
- ▶ Recessive disorders:
  - Cystic fibrosis
  - Tay-Sachs
  - Sickle-cell
- ▶ Dominant disorders:
  - Huntington's
- ▶ Testing:
  - amniocentesis
  - chorionic villus sampling (CVS)





## Pop Quiz

- In peas, green (G) is dominant to white (g). If two heterozygous plants are crossed, what is the probability of having a white offspring.