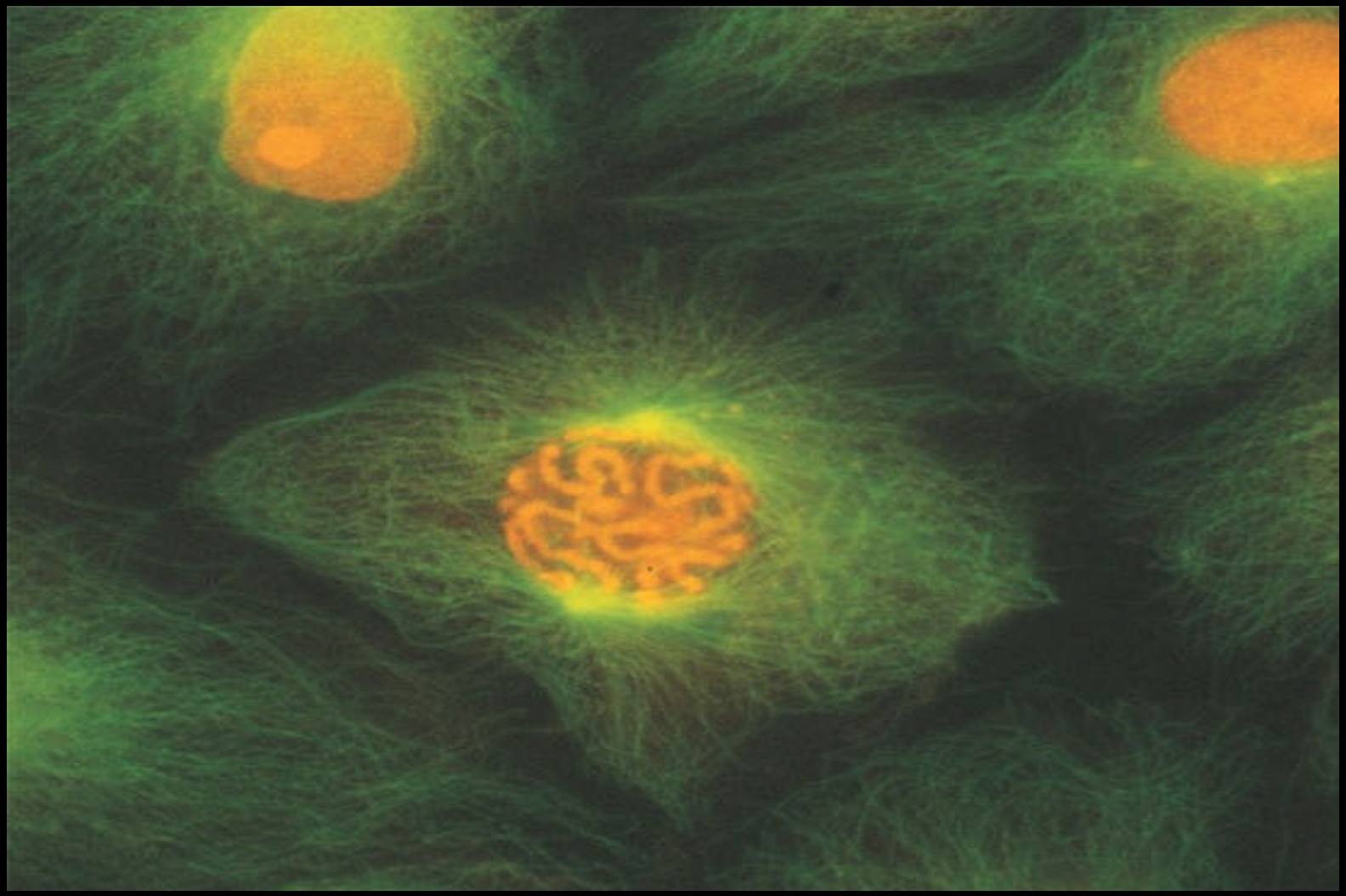
How Are Features Passed Along?

Mendel and The Idea of Gene

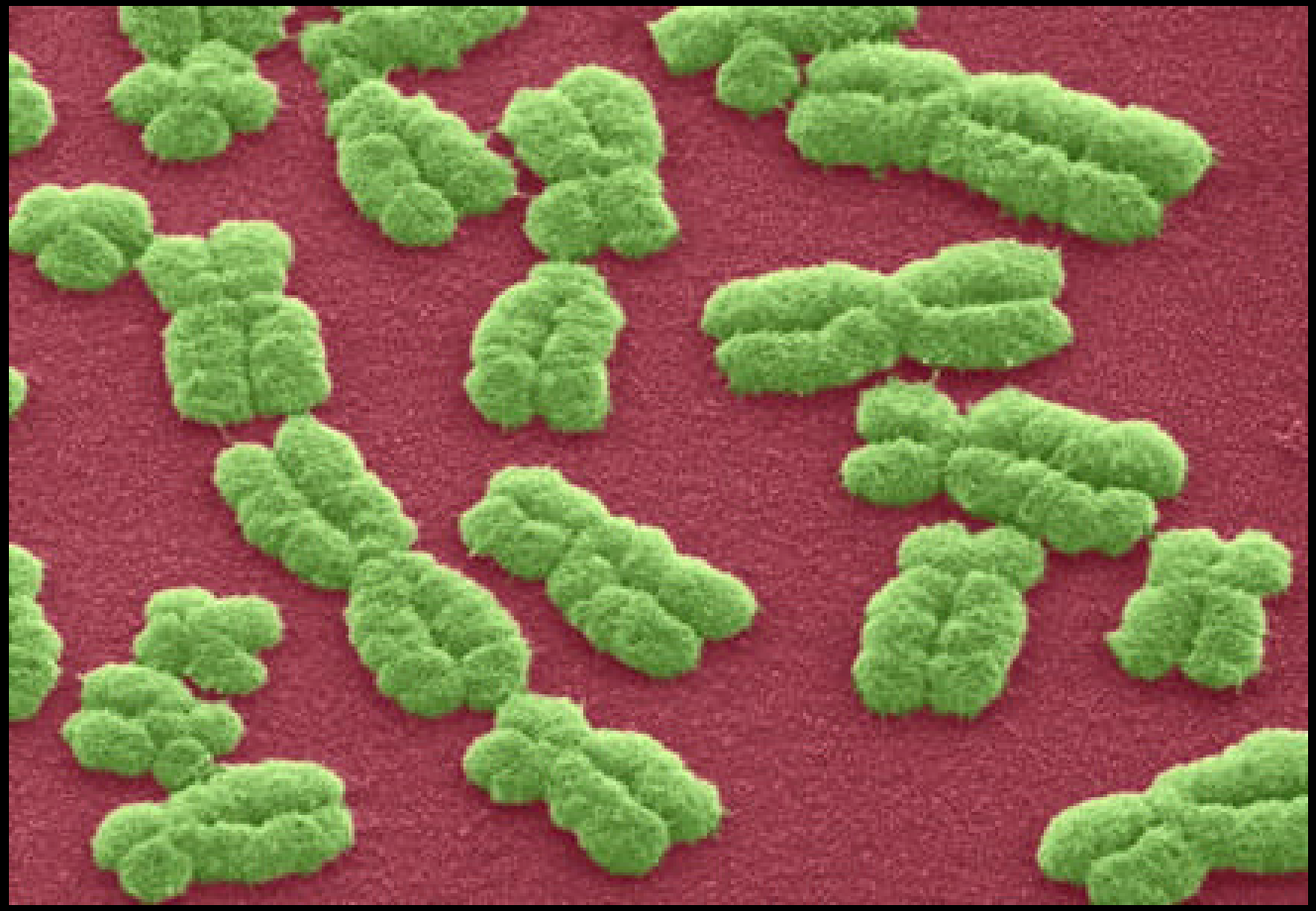
Mendel and The Idea of Gene Mendelian Genetics

- Mendelian Genetics Studies Mendelian Traits
- Many human traits follow a mendelian pattern of inheritance
- http://www.ncbi.nih.gov (Online Mendelian Inheritance in Man)

Where Are Genes Located?



What is a Chromosome?



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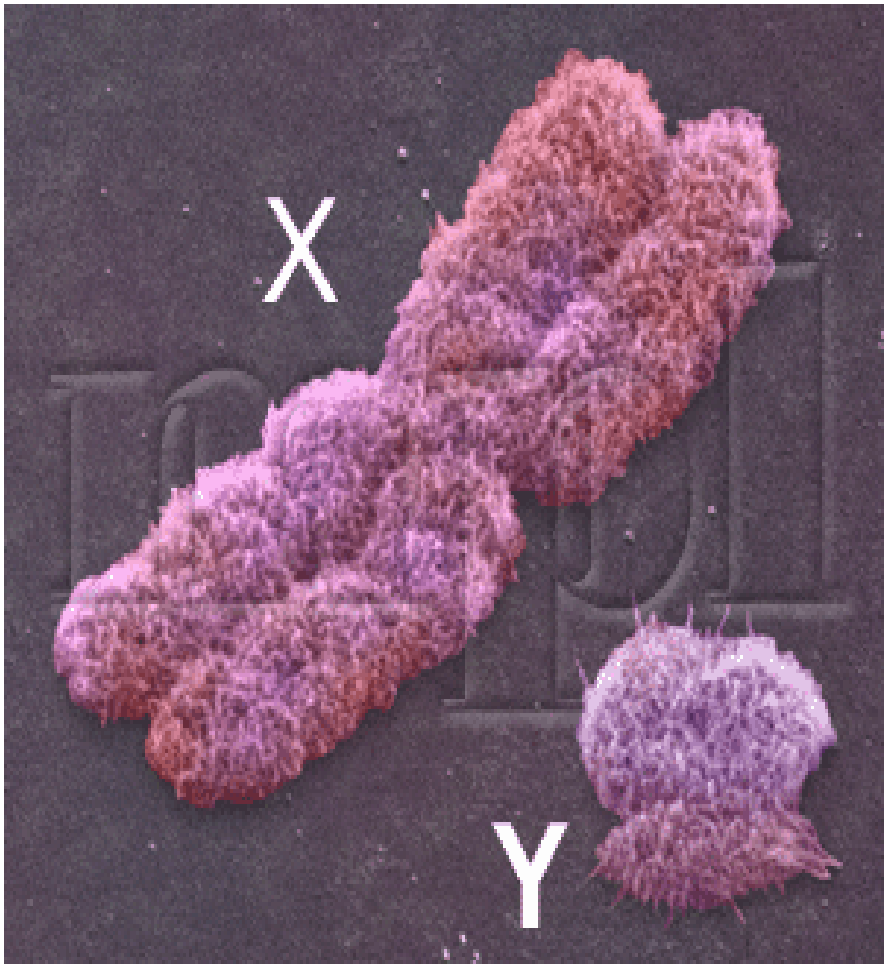
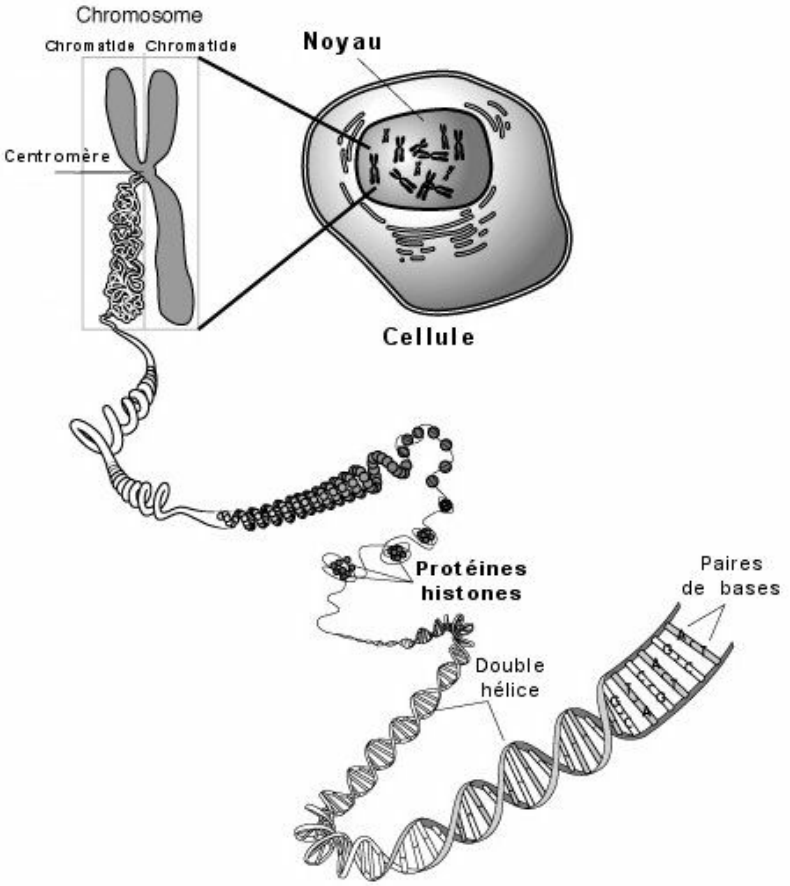
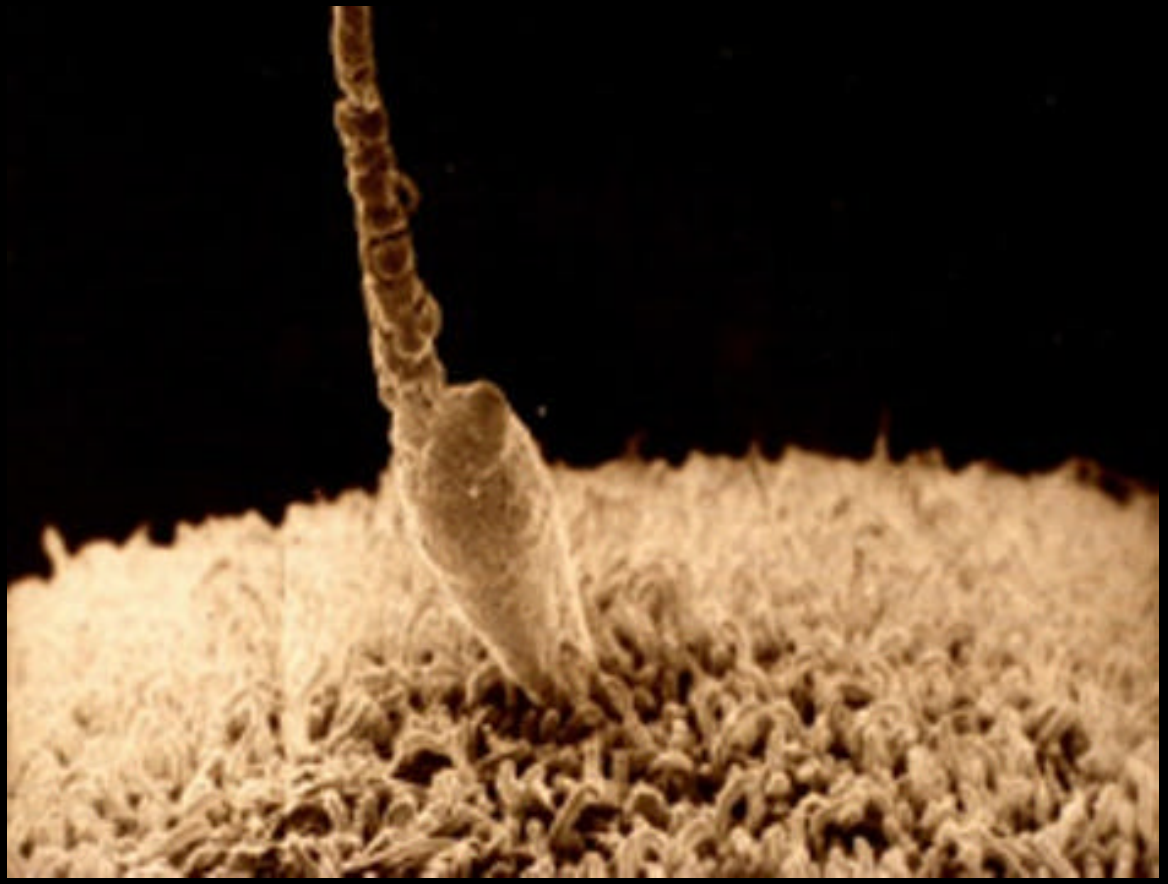
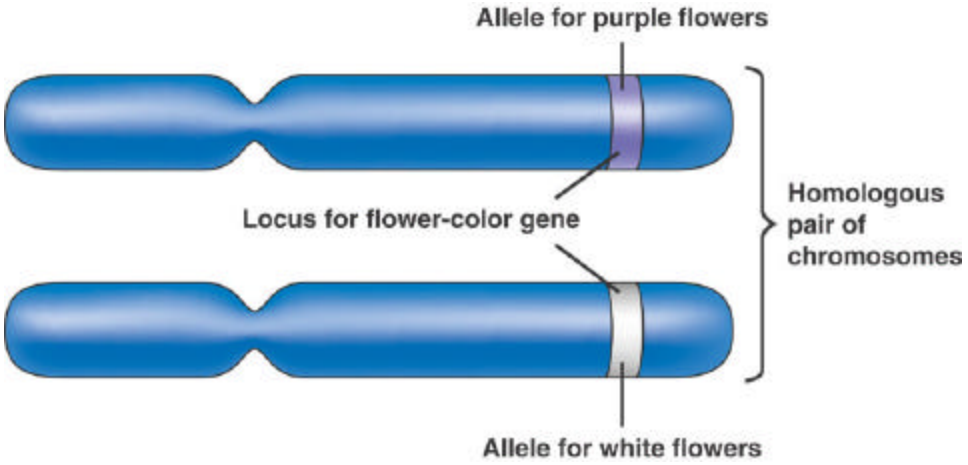




Sexual Reproduction and Fertilization: How We Inherit Genes

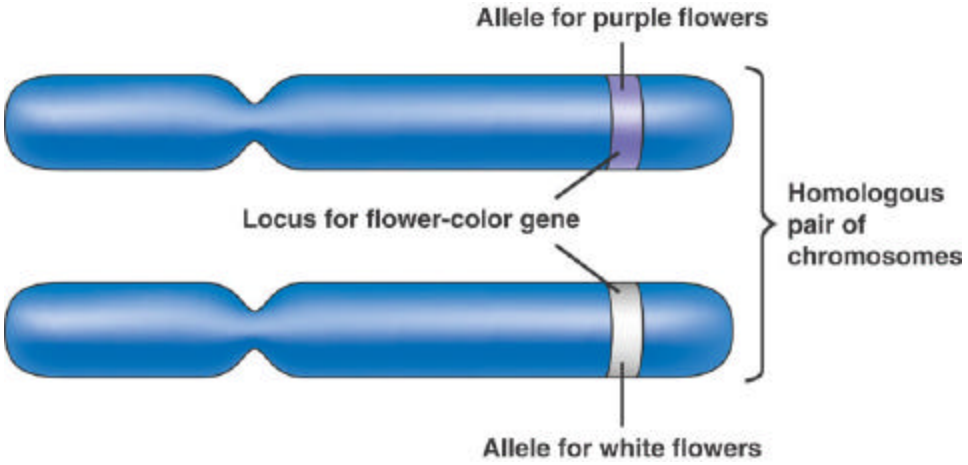


Some Genetic Terms



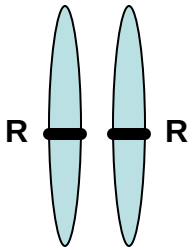
- Genes are instructions for producing a trait
- Locus is the spot each genes has on a chromosome
- Diploid cells have two genes (a gene pair) for each trait, each on a homologous chromosome
- Alleles are various molecular forms of a gene encoding for the same trait (i.e. flower color)

Some Genetic Terms

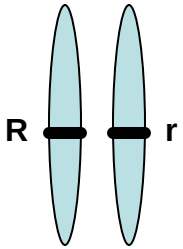


- In a homozygous condition, both alleles are the same
- In a heterozygous condition, the alleles differ
- For a given Mendelian trait, there is a dominant allele and a recessive allele
- In a heterozygous condition, a Mendelian trait would consist of a dominant allele (D) and a recessive allele (d)

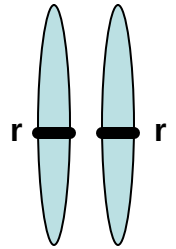
Genotype and Phenotype



***RR*, homozygous dominant genotype**

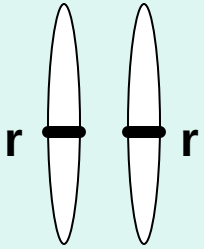


***Rr*, heterozygous genotype**

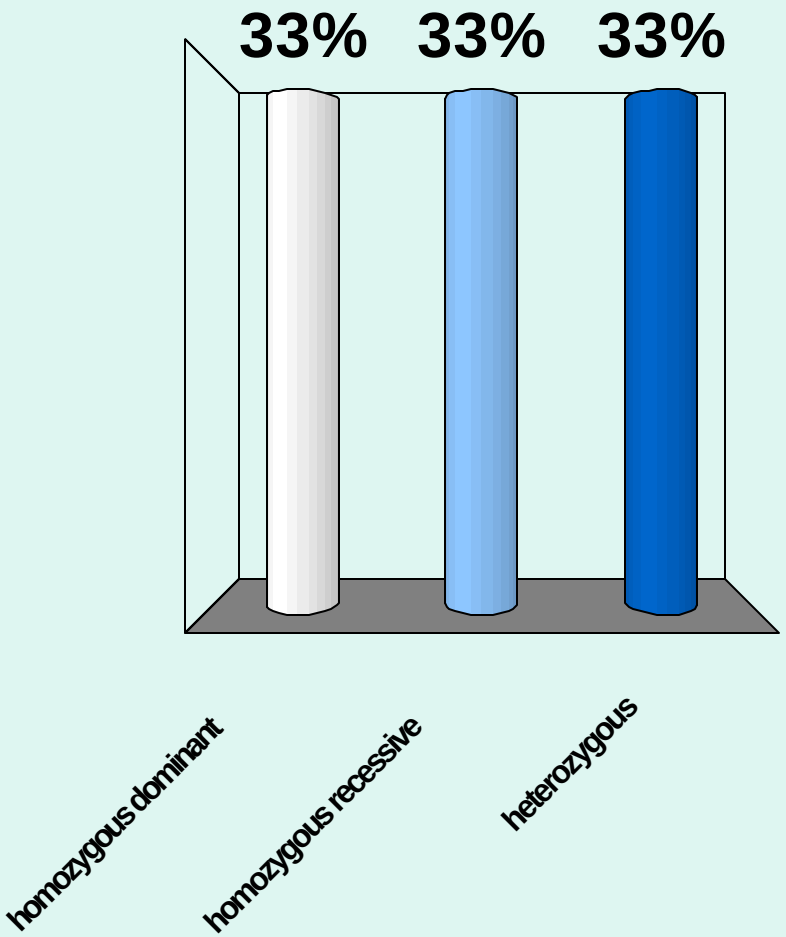


***rr*, homozygous recessive genotype**

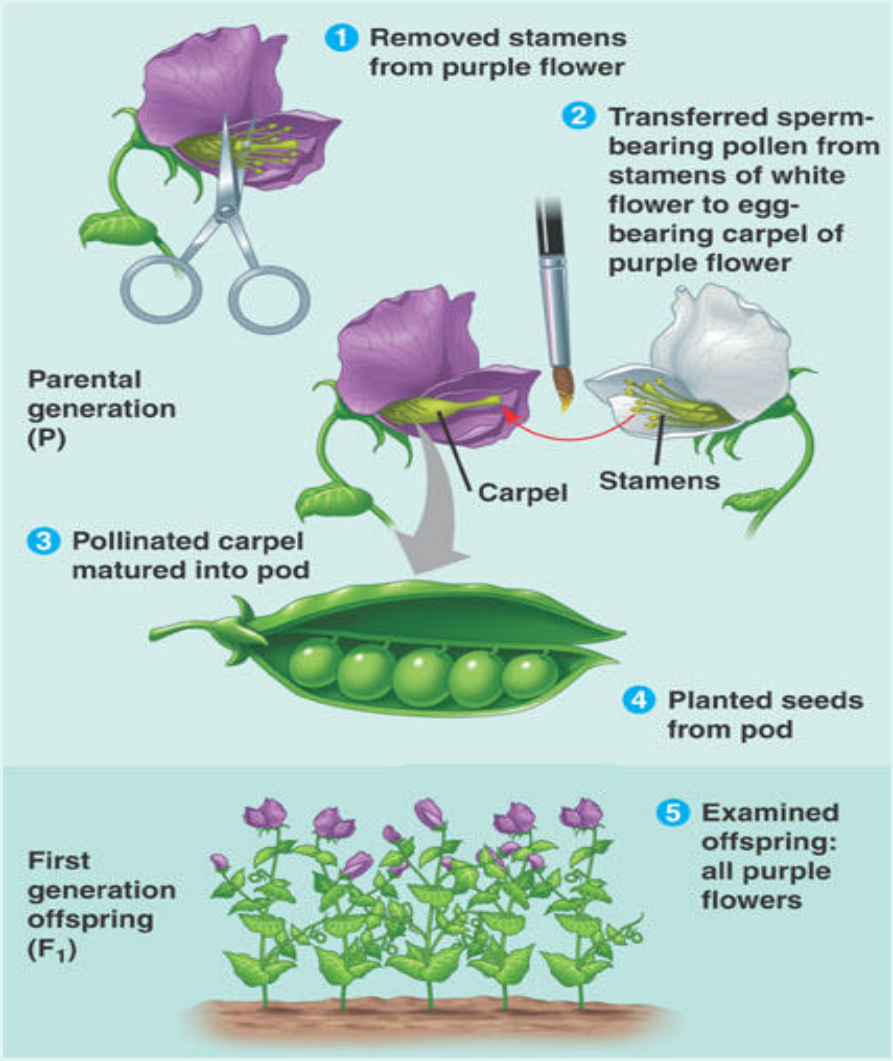
This is a/an ___ genotype



1. homozygous dominant
2. homozygous recessive
3. heterozygous

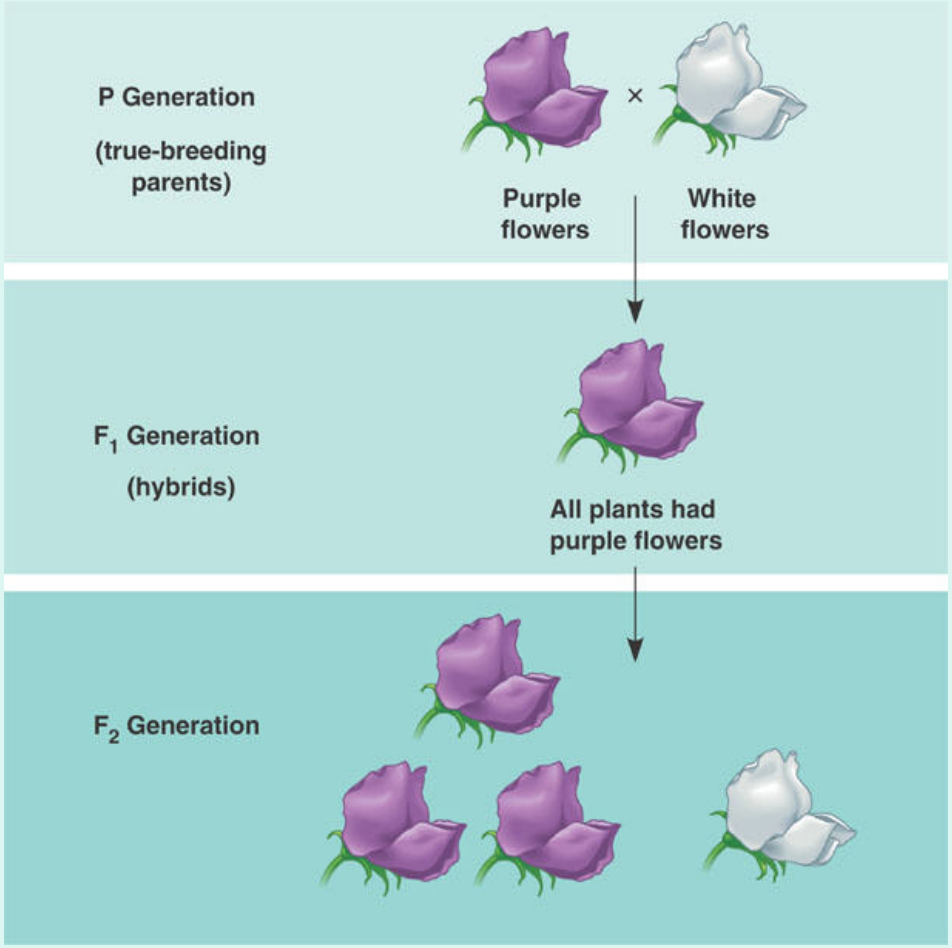


Mendel's Experiments with Peas

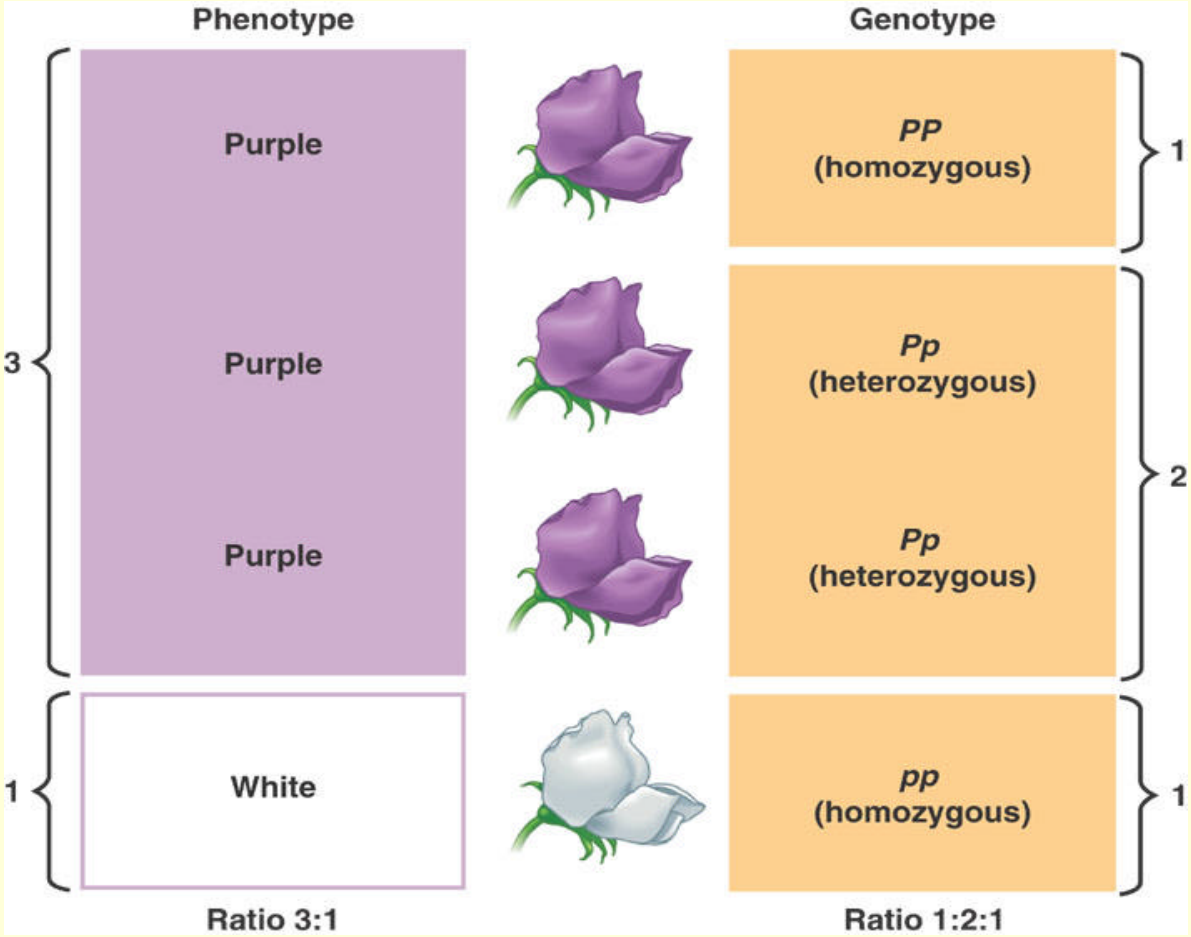


Mendel's Theory of Inheritance of Traits. Monohybrid Cross

- Unless mutations occur, Mendelian traits are inherited in a predictable fashion
- F_1: 100% purple, as they exhibit the dominant phenotype. The recessive traits is masked by the dominant gene
- F_2: 75% purple, 25% white (phenotypic ratio= 3:1). The recessive phenotype appears in the F_2



Mendel's Experiments with Mendelian Traits



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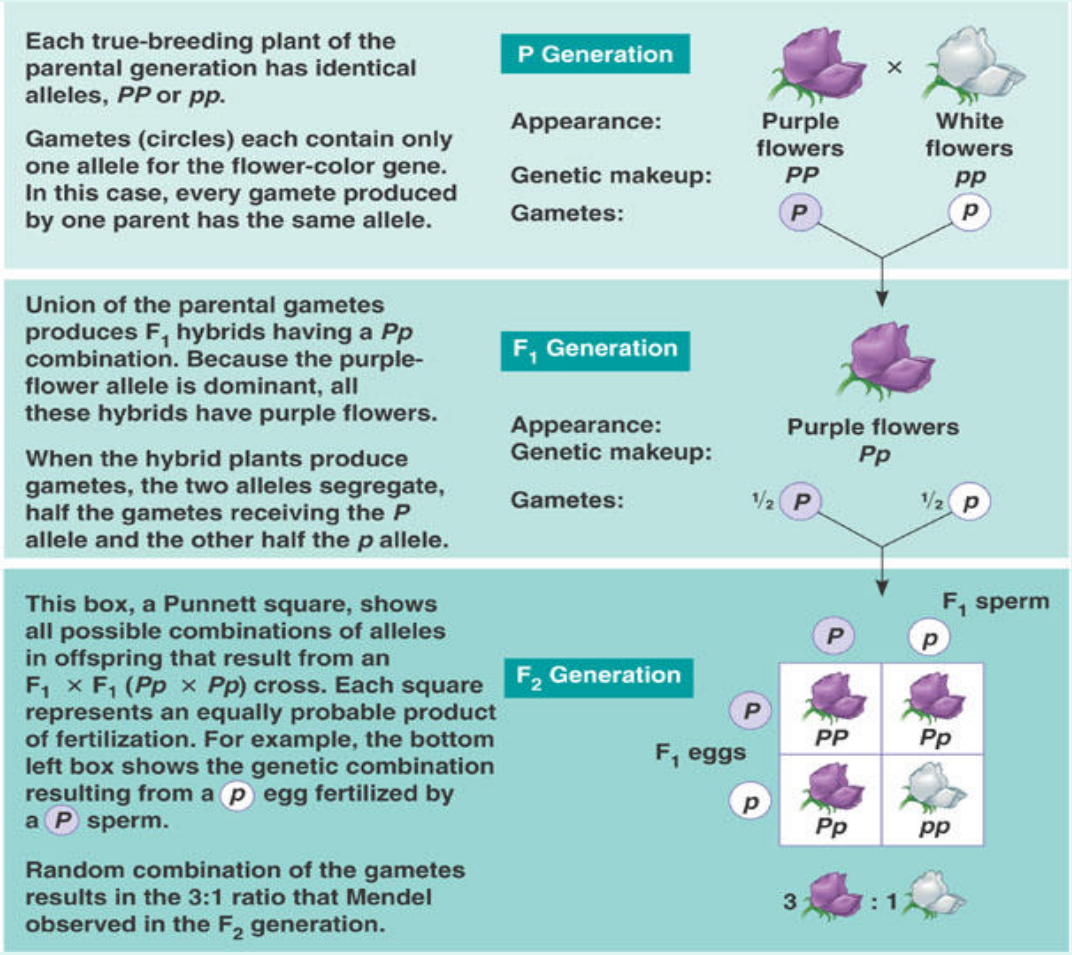
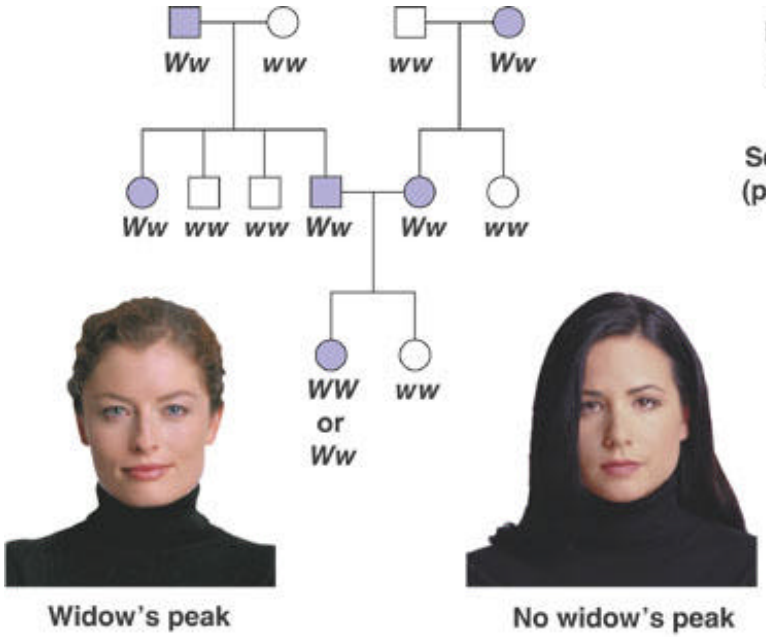
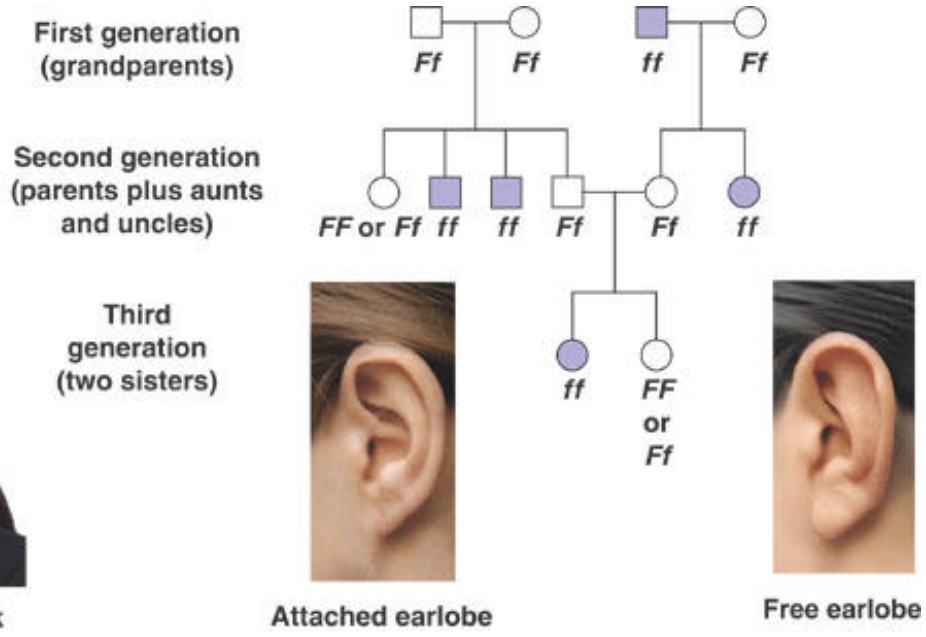


Mendelian Traits. Pedigrees



(a) Dominant trait (widow's peak)



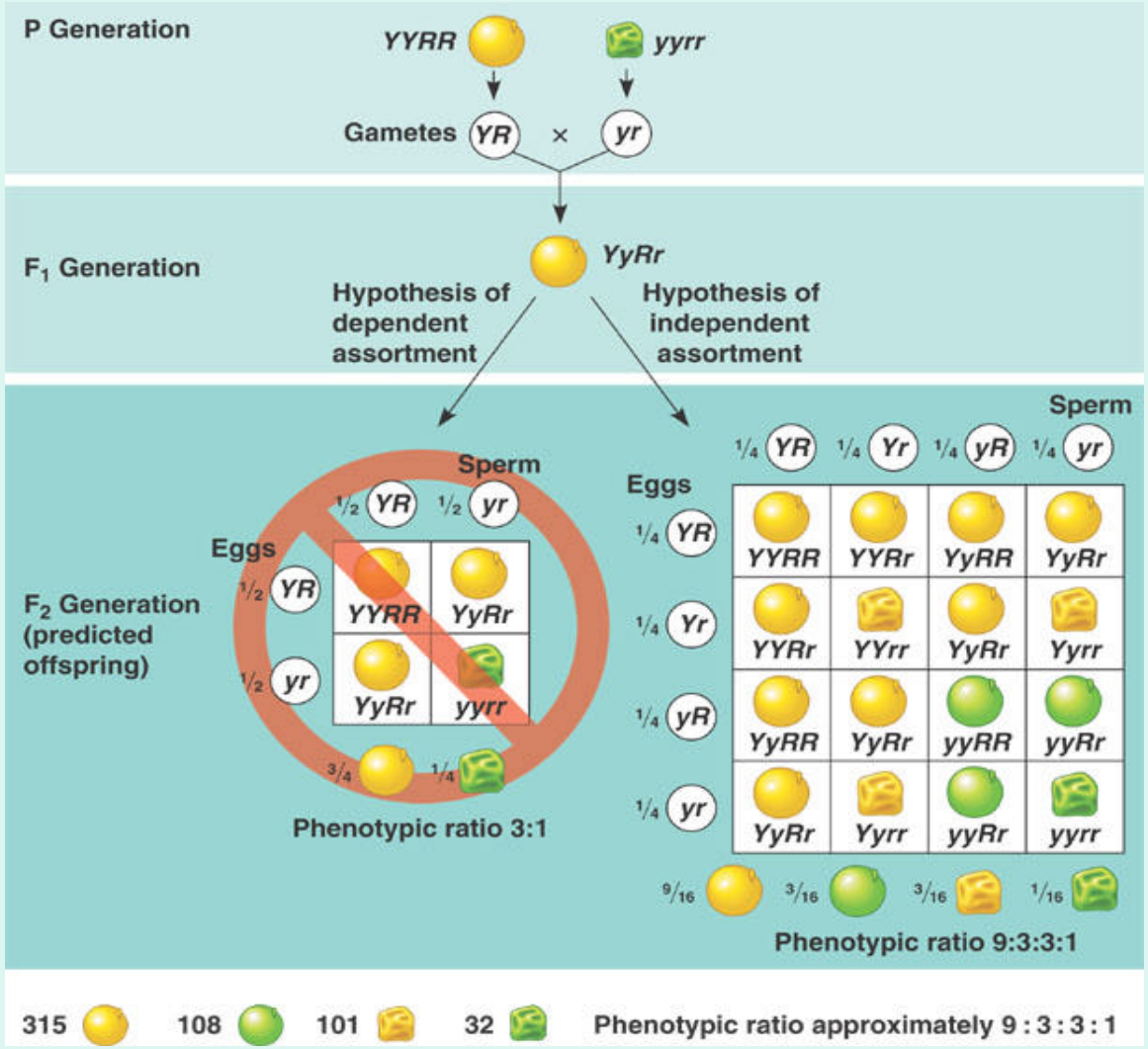
(b) Recessive trait (attached earlobe)

Mendelian Traits in Humans

Recessive phenotype: Albinism

Dominant phenotype: Achondroplasia

Mendel's Theory of Inheritance of Traits. Dihybrid Cross

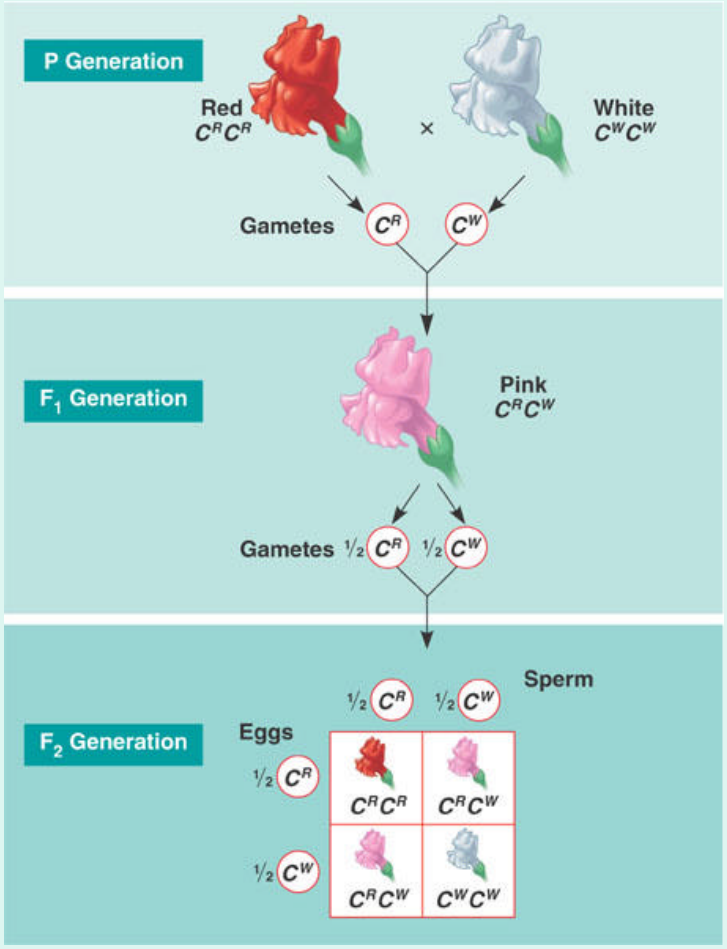


Incomplete Dominance

Incomplete Dominance in Carnation Coloration

Incomplete Dominance

- $C^R\ C^R$: Red Petals
- $C^R\ C^W$: Pink Petals
- $C^W\ C^W$: White Petals



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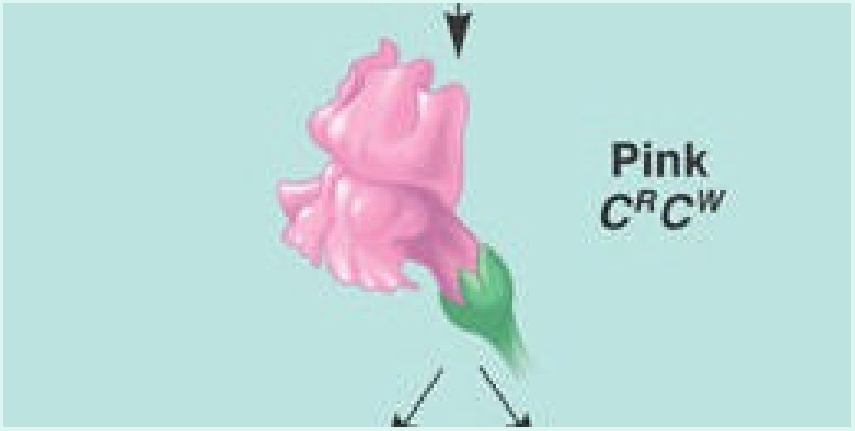

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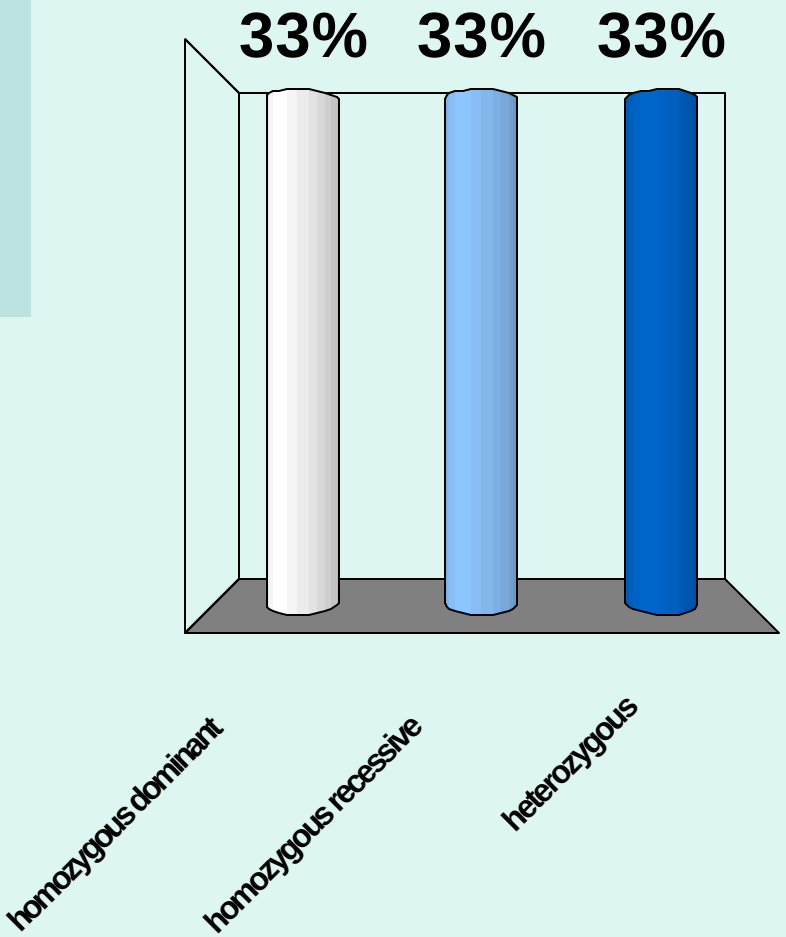

Codominance. Human Blood Types

Codominance is a condition where two non-identical alleles of a pair specify two different phenotypes, yet one cannot mask the expression of the other (blood types in humans)

Blood types in humans are an example of a *multiple allele system*

Table 14.2 Determination of ABO Blood Group by Multiple Alleles

Genotype	Phenotype (Blood Group)	Red Blood Cells
I^AI^A or I^Ai	A	
I^BI^B or I^Bi	B	
I^AI^B	AB	
ii	O	

Codominance. Human Blood Types

“A” gives to A, receives from A and O

“B” gives to B, receives from B and O

“AB” gives to AB, receives from A, B, and O

“O” gives to all blood types, receives only from O

Table 14.2 Determination of ABO Blood Group by Multiple Alleles

Genotype	Phenotype (Blood Group)	Red Blood Cells
I^AI^A or I^Ai	A	
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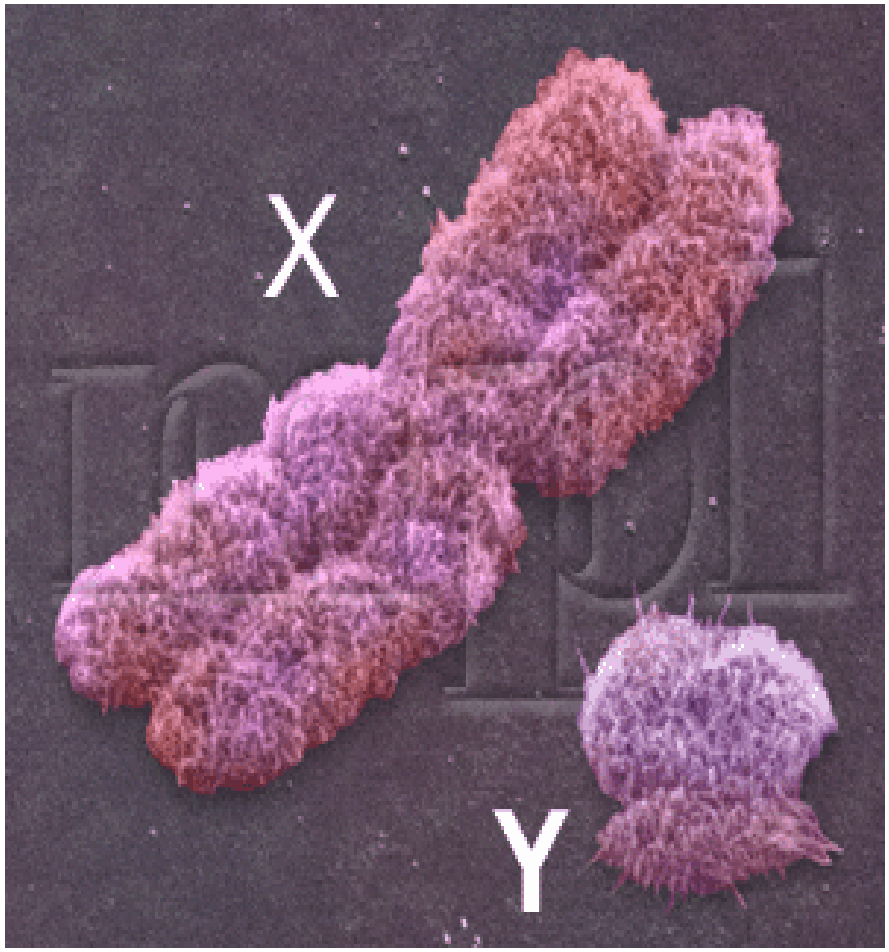
ii	O	

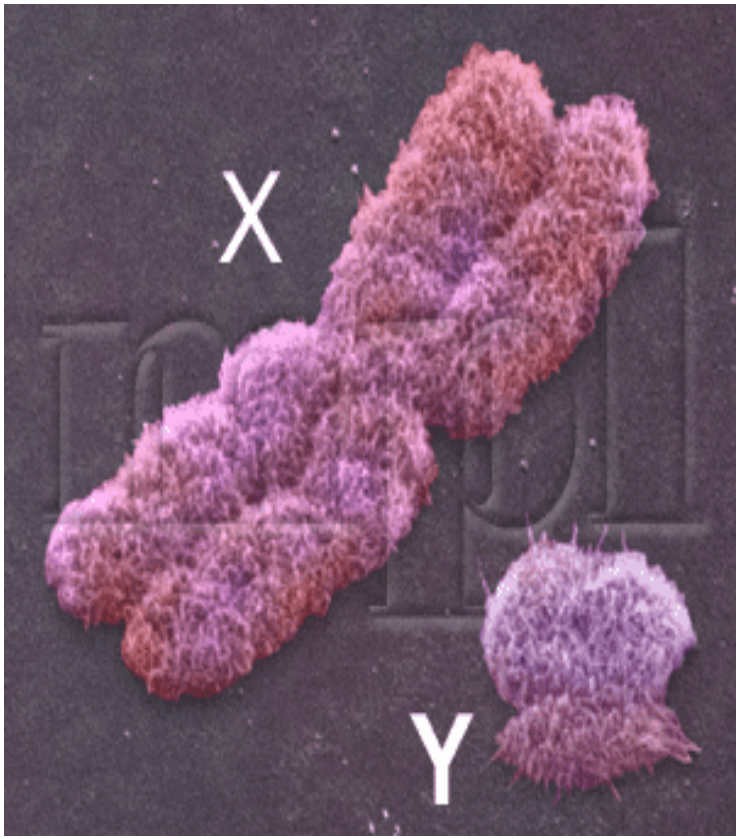
Sex Determination and Sex-Linked Traits

- Out of the 23 pairs of chromosomes, one pair contains the *sex chromosomes.* The non-sex chromosomes are referred to as *autosomes*
- Females are XX
- Males are XY



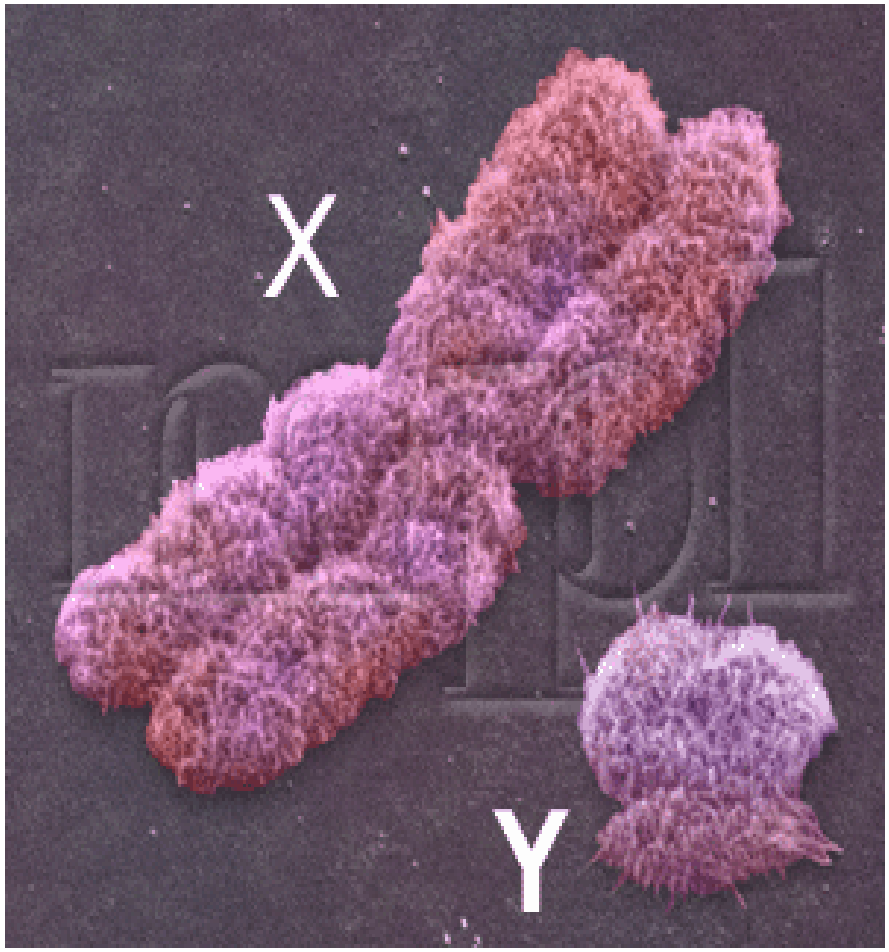
Sex Determination and Sex-Linked Traits

- How is sex determined?



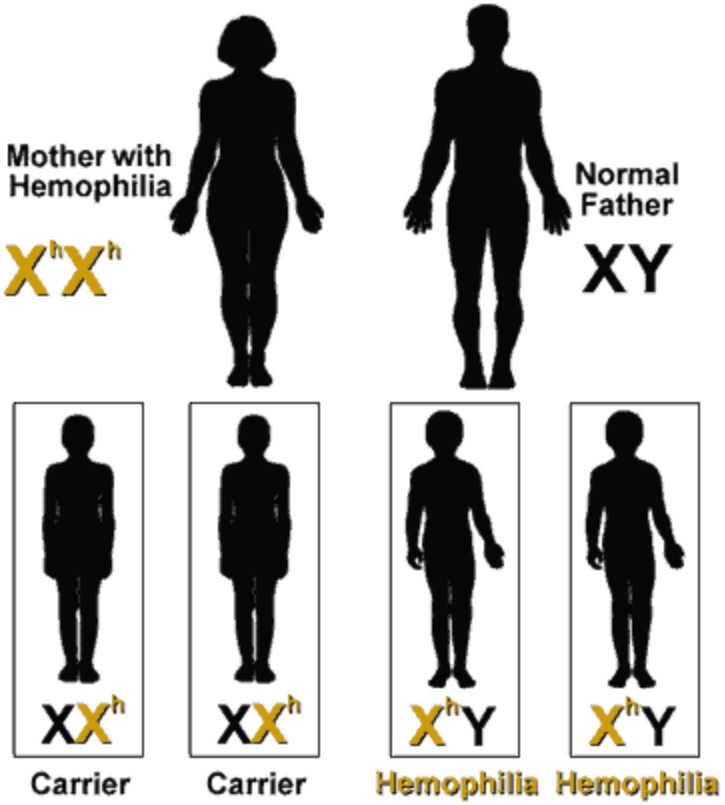
Sex Determination and Sex-Linked Traits

- Besides sex information, there are almost 80,000 genes in the X chromosome, and about 90 in the Y chromosome
- Traits and genes linked to the X chromosome are referred to as “X-linked.”
- Traits and genes linked to the Y chromosome are referred to as “Y-linked.”



X-Linked Traits

- Genes linked to the X chromosome that produce disease or certain conditions, are mostly recessive (colorblindness, haemophilia, baldness)



X-Linked Traits: Haemophilia