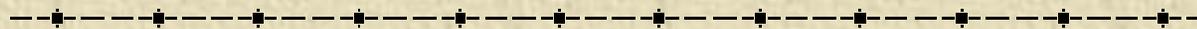




Modern Genetics



Beyond Mendel



Beyond Mendel

- ✦ Mendel discovered the basic rules of genetics but in reality, most traits are controlled by much more complex interactions
- ✦ **Genetics is more complicated than just dominant and recessive traits**

Incomplete Dominance

✦ The heterozygous phenotype is a mixture of the 2 homozygous phenotypes

✦ EX: Carnations



Codominance

✦ Characteristics of both alleles appear when an individual is heterozygous

◆ Not a mixture

✦ EX: Blood type



Codominance and multiple alleles

✦ Some traits
have 2 or
more alleles

✦ Example:
Blood Type

TYPES:

A $I^A I^A, I^A i$

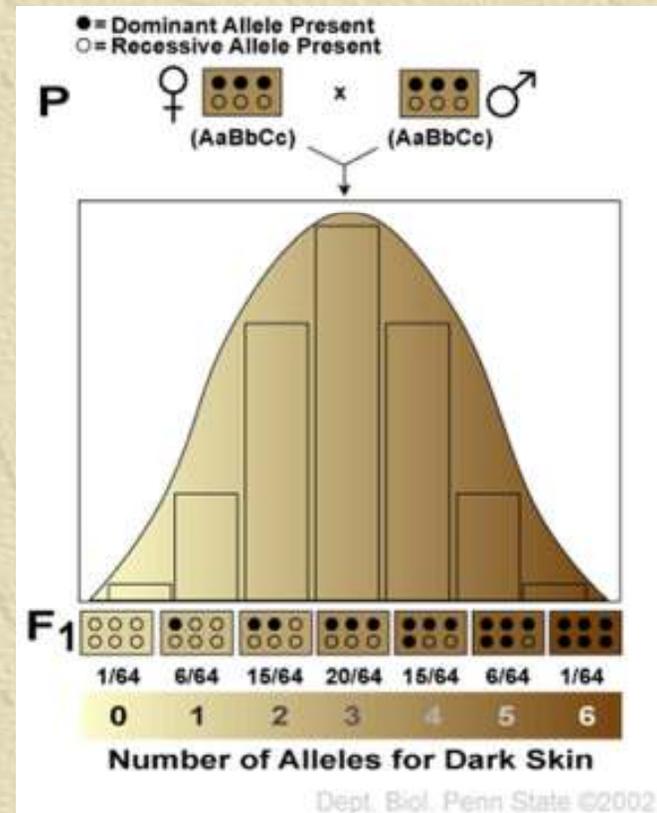
B $I^B I^B, I^B i$

AB $I^A I^B$

O ii

Polygenic Traits

- ✦ Some traits are controlled by the interaction of multiple pairs of genes
- ✦ EX: Skin color, height, eye color, fingerprint pattern,

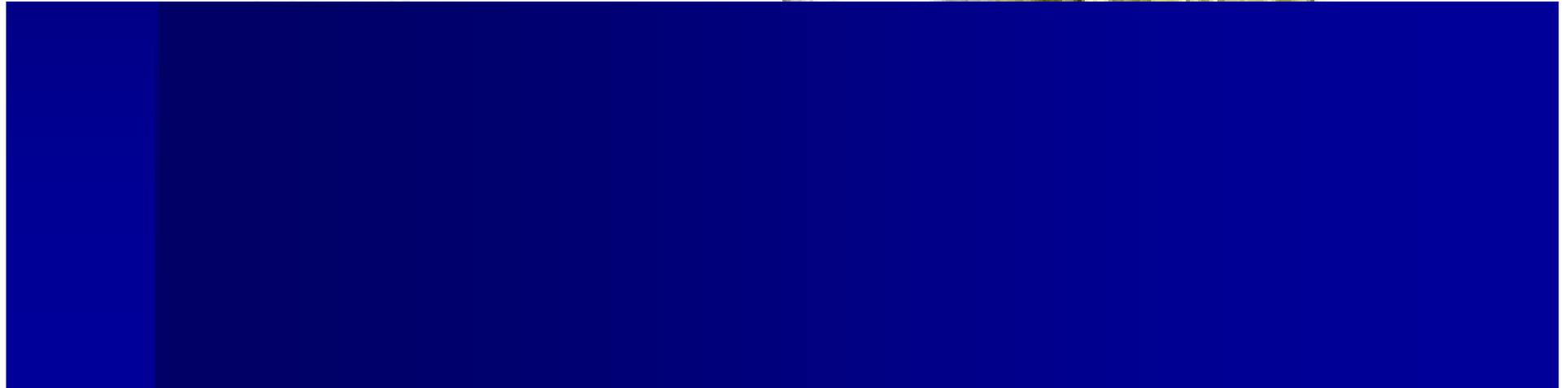
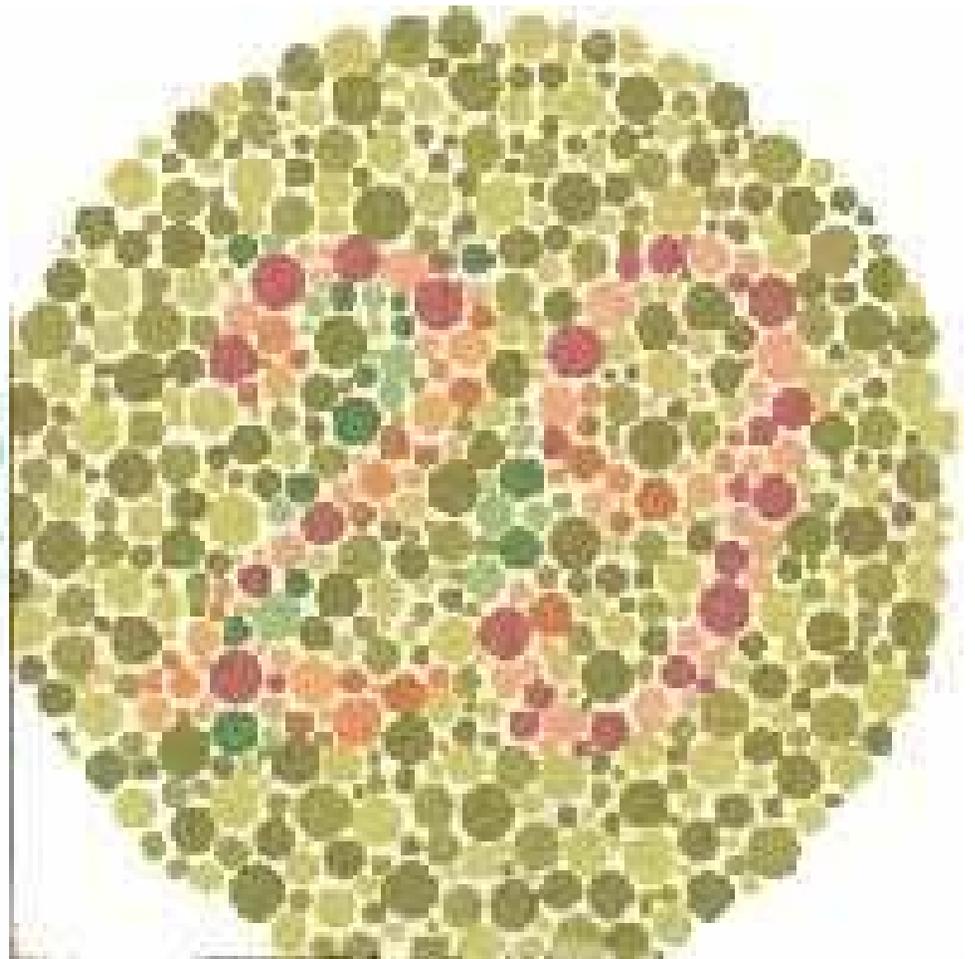
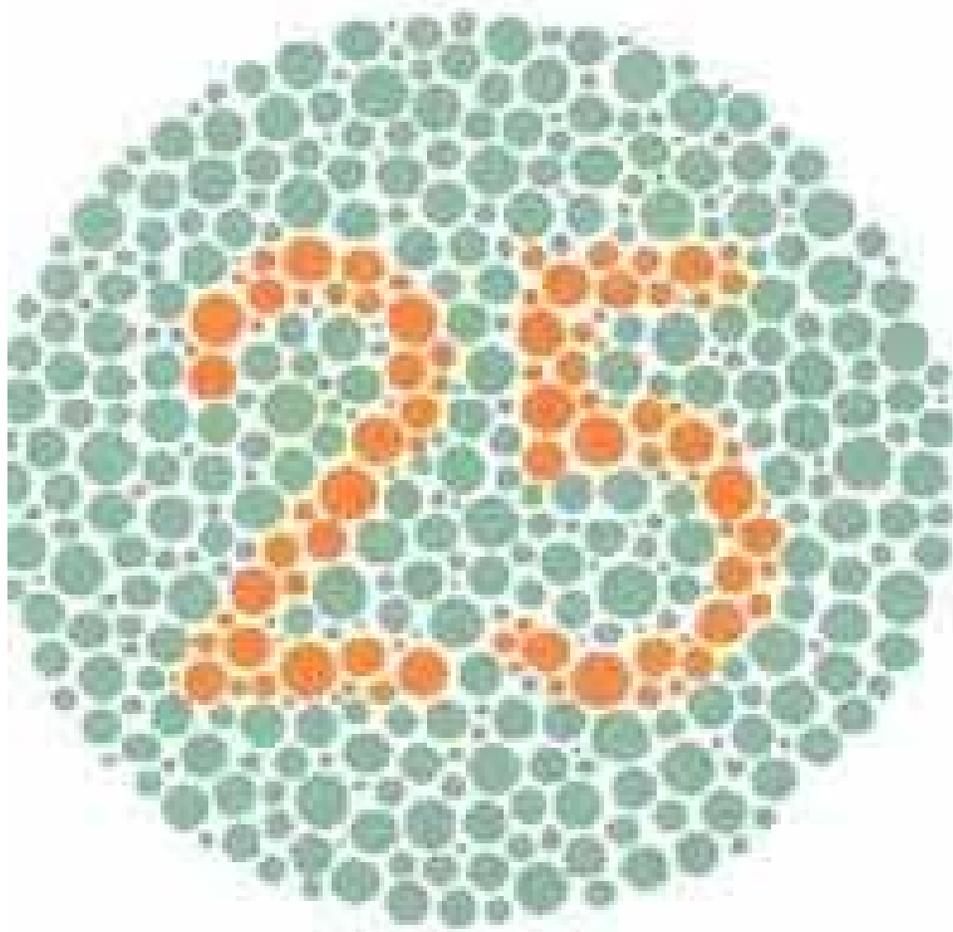


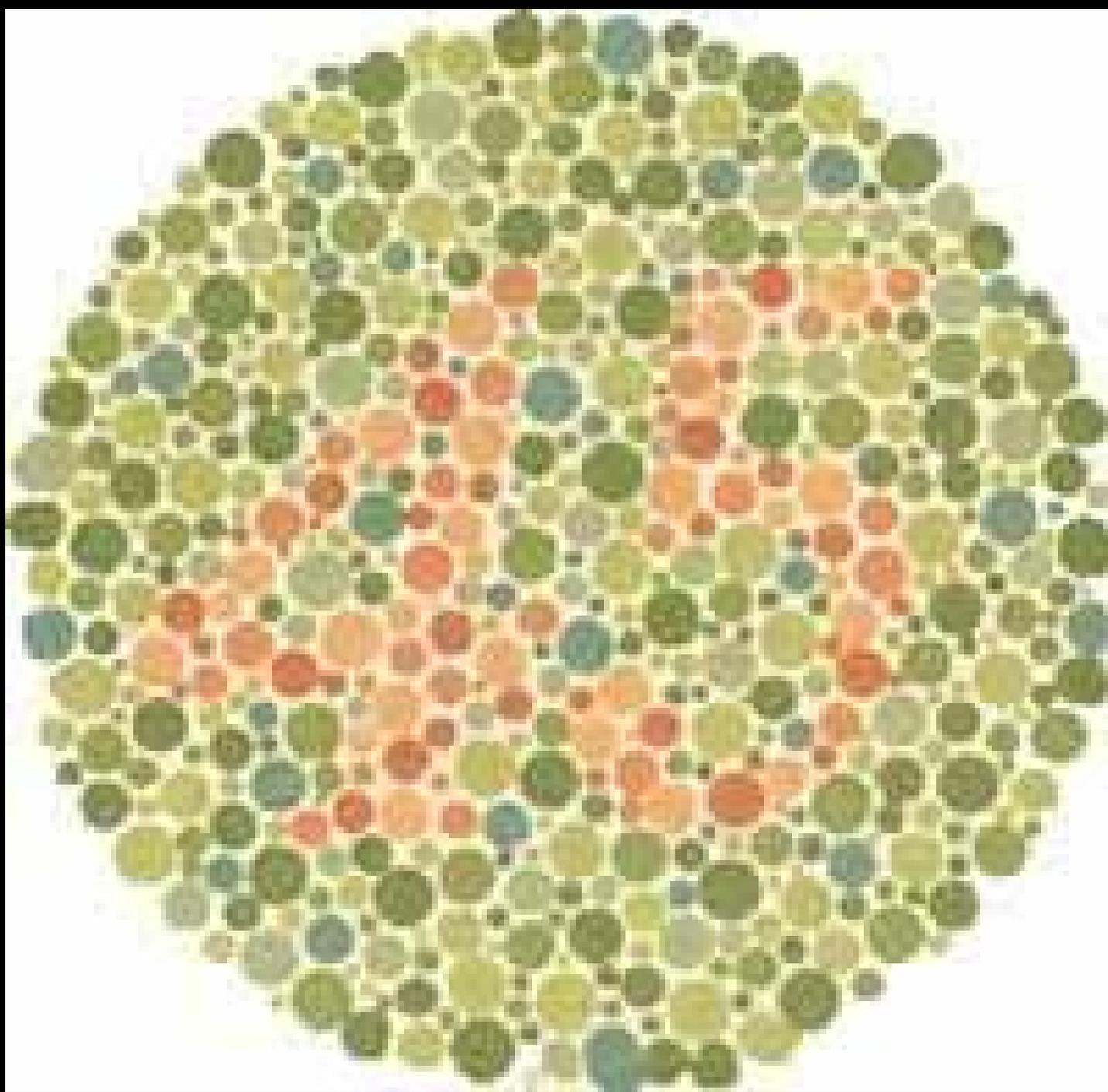
Sex-Linked Traits

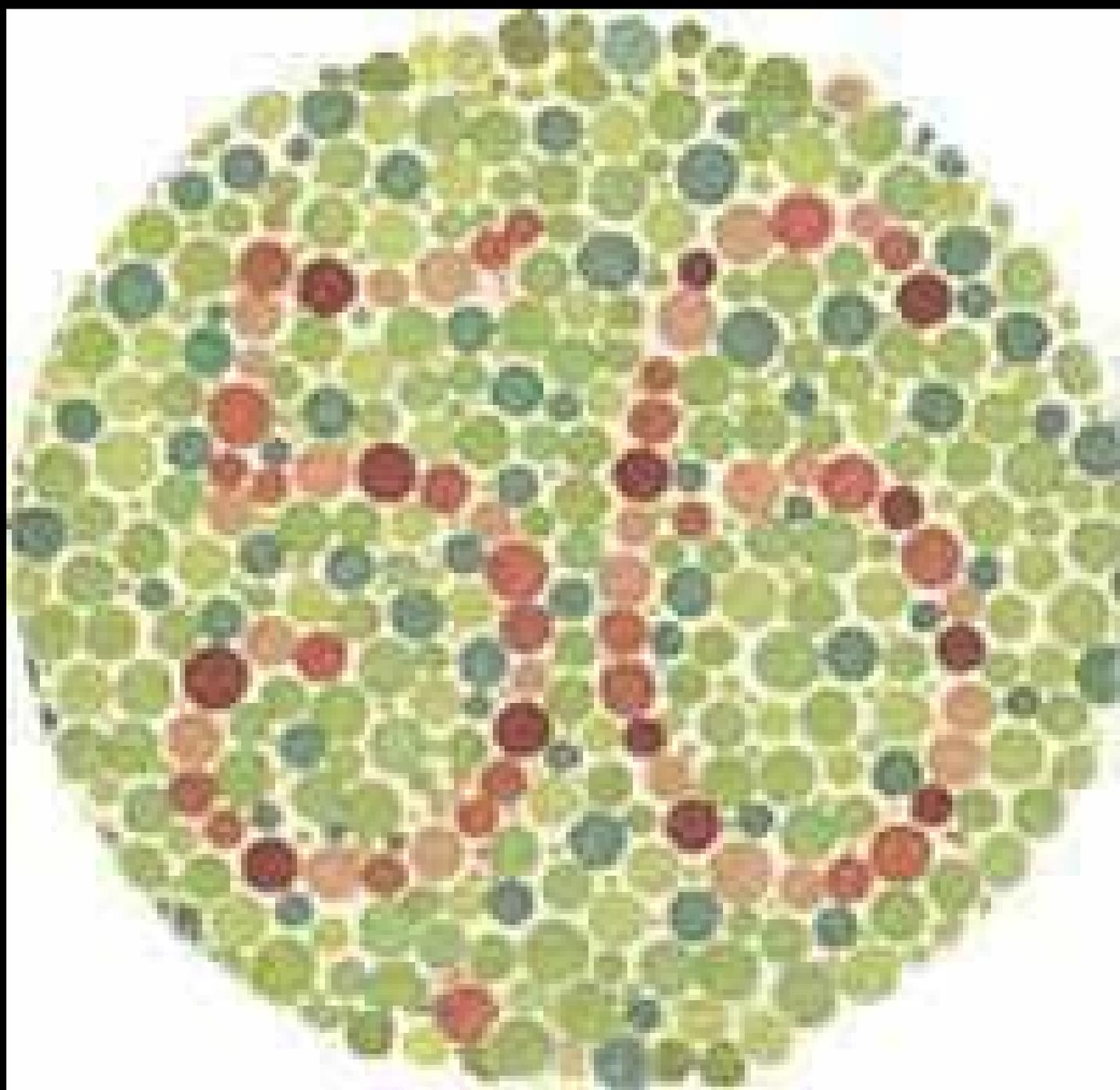
-
- ✦ Traits that are controlled by genes located on the X chromosome
 - ✦ Most are recessive traits
 - ✦ EX: Red-green color blindness
 - ✦ EX: Hemophilia

How does this affect males?

-
- ✦ Males are more commonly affected since they only have 1 X chromosome







Genetic Traits and Disorders

✦ Many genetic traits and disorders follow the patterns that Mendel discovered

- 1 gene with 2 alleles

✦ They are either dominant or recessive

Autosomal Recessive Traits

- ✠ Located on non-sex chromosomes
- ✠ Affects males and females
- ✠ Parents must be carriers or affected in order to pass them on
- ✠ In order to be affected individuals must be homozygous recessive

Recessive Genetic Disorder

Examples

✦ Traits

- ✦ Check out this website for some examples
- ✦ <http://learn.genetics.utah.edu/content/inheritance/observable/>

✦ Disorders

- ✦ Albinism, Cystic fibrosis, Phenylketonuria, Sickle cell disease, Tay-Sachs disease,

Autosomal Dominant Traits

- ✦ Located on non-sex chromosomes
- ✦ Affects males and females
- ✦ At least one parent is affected
- ✦ Does not skip generations
- ✦ Affected individuals are homozygous dominant or heterozygous

Dominant Genetic Disorder

Examples

✦ Traits

- ✦ Check out this website for some examples
- ✦ <http://learn.genetics.utah.edu/content/inheritance/observable/>

✦ Disorders

- ✦ Achondroplasia, Huntington's disease, Lactose intolerance, Polydactyly, Marfan's Syndrome

Pedigree Charts

✦ A diagram that traces the inheritance of a trait through several generations

✦ Pedigree Basics

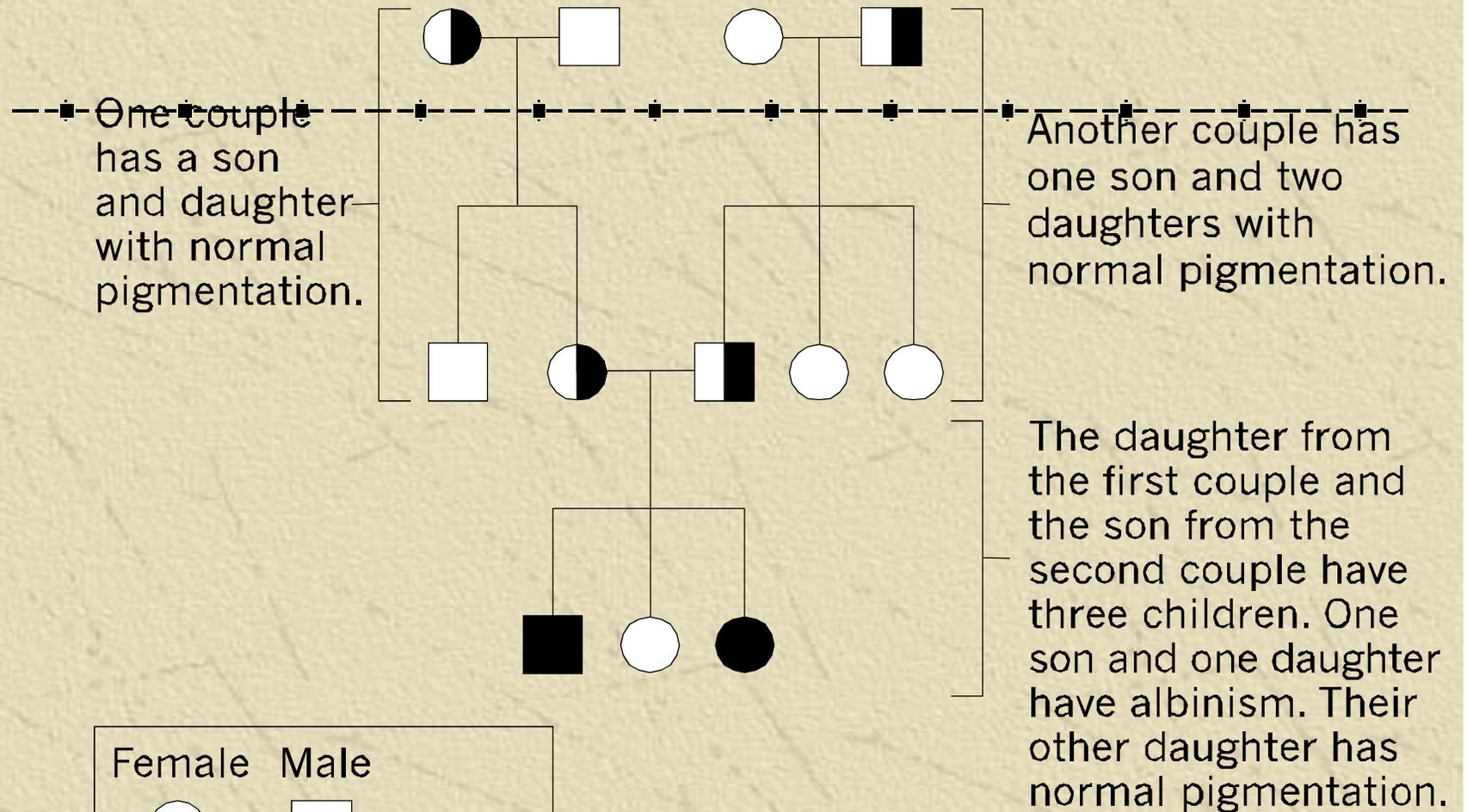
- ✦ Older generations are shown at the top
- ✦ Symbols represent people and conditions

Female	Male	
		Normal
		Carrier
		Affected

Some important vocab

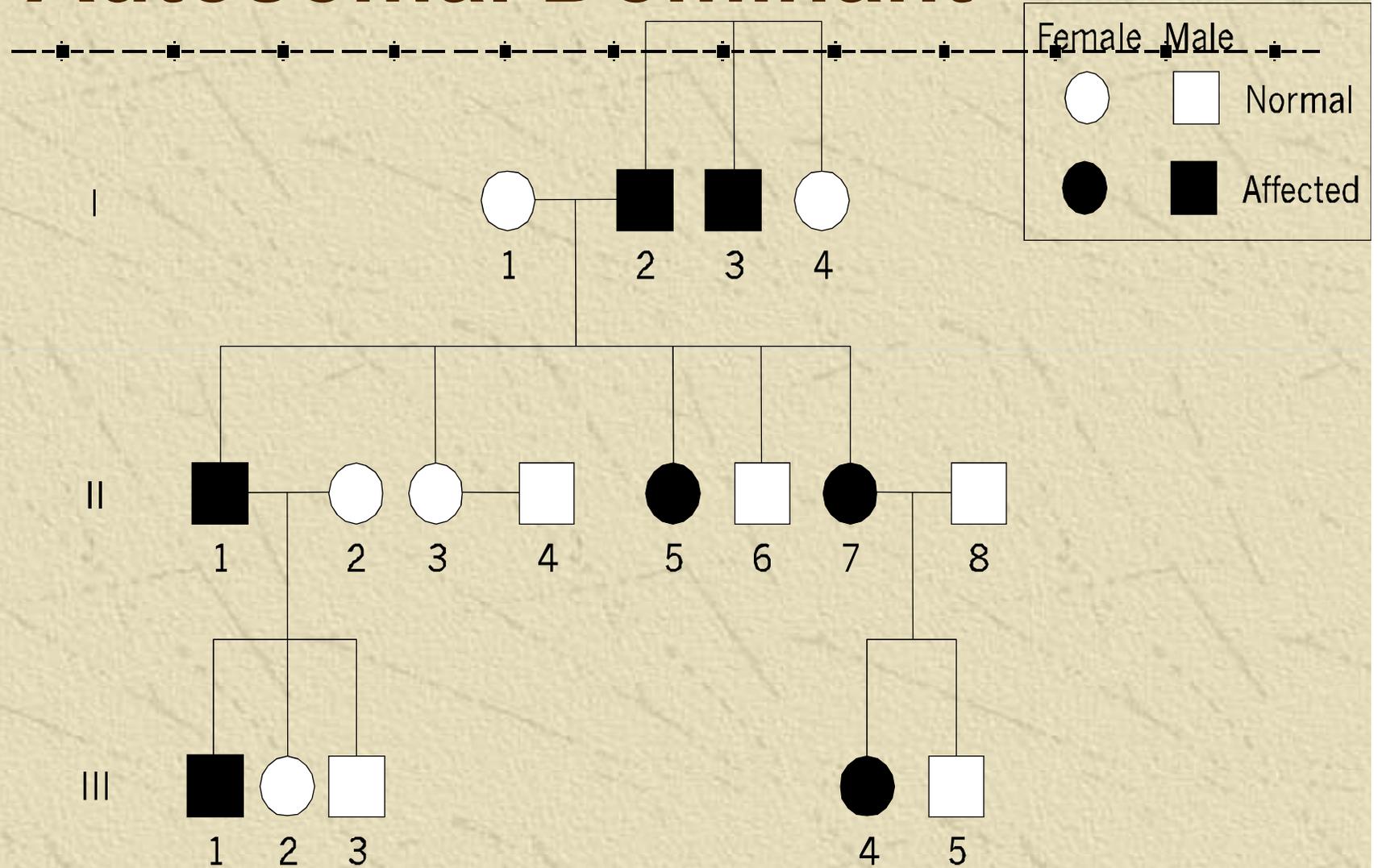
- ✦ Carrier: an individual who is heterozygous for the recessive harmful allele. Trait is not expressed.
- ✦ Affected: an individual shows the traits of the disorder. Traits are expressed.

Autosomal Recessive

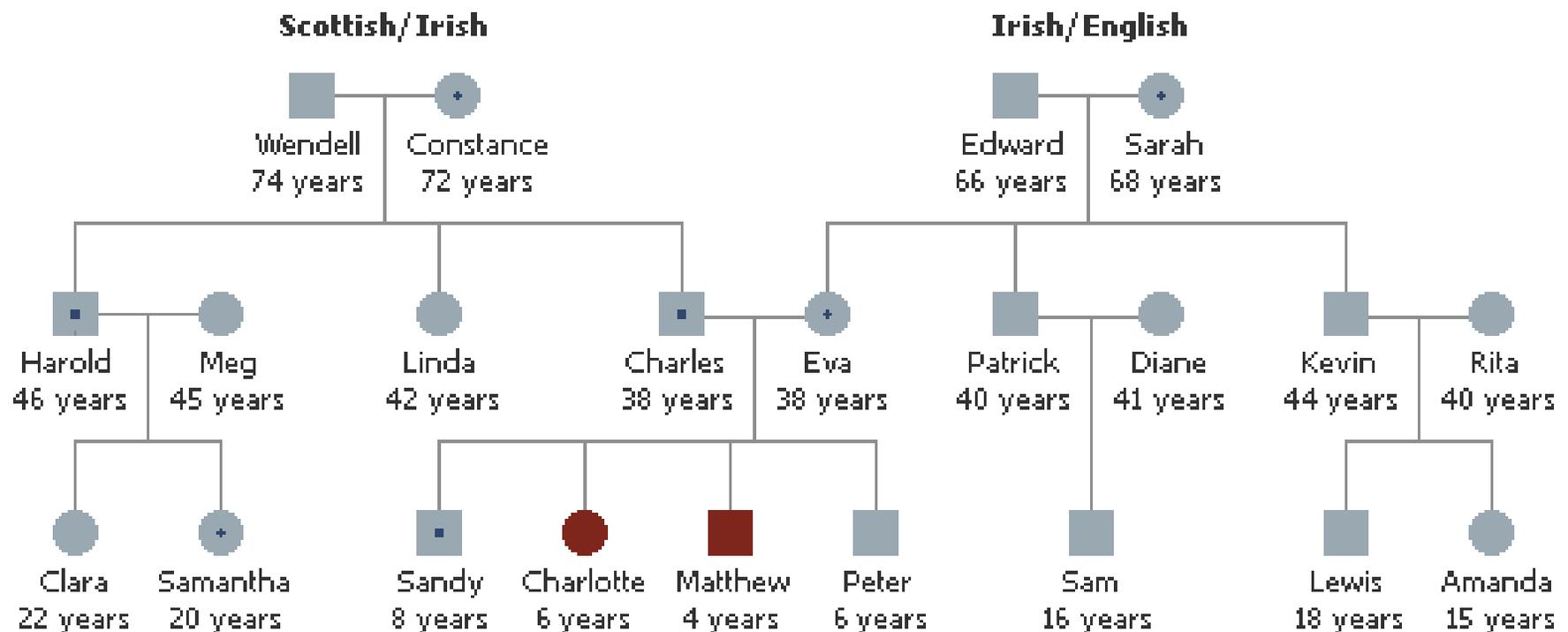


Female	Male	
		Normal
		Carrier
		Affected

Autosomal Dominant



Pedigree Chart -Cystic Fibrosis

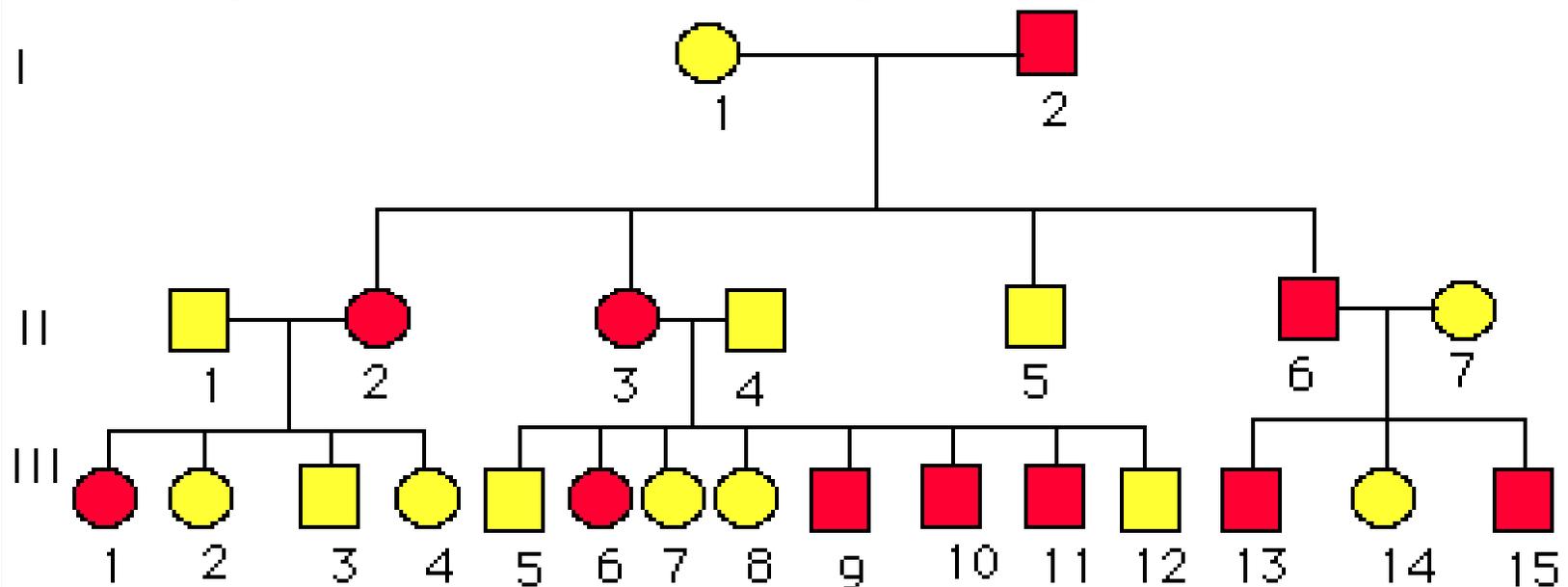


Key

- Male
- Female
- Cystic Fibrosis
- Healthy carrier of cystic fibrosis gene

Autosomal Dominant

Pedigree of a family showing Huntington disease



Nonaffected persons
have genotype $hd\ hd$
because hd is recessive

Affected persons
have genotype $HD\ hd$
because HD allele is
very rare

Hemophilia in European royal families

