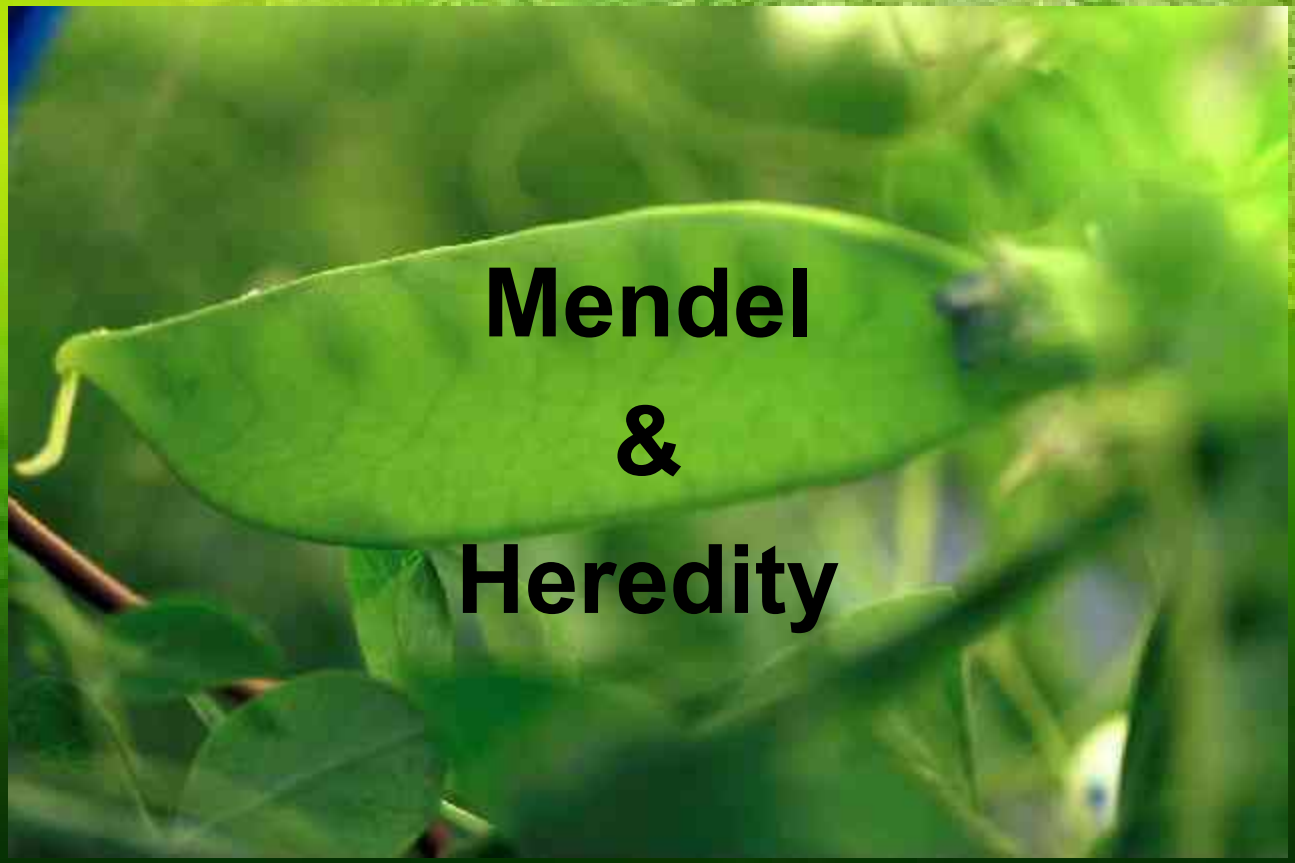
Chapter 8



Mendelian Genetics

- **Gregor Mendel-** was a Czechoslovakian monk who grew pea plants to study their traits and heredity
- the “Father of Genetics”

Mendel's Work

- **Traits-** characteristics of an organism
  - Ex: height, hair color, shape, blood type
- **Heredity-** the study of traits that are passed from parents to offspring
- **Genetics-** field of biology studying heredity & DNA

Mendel's Experiments

Plant Height: tall vs. short plants

Flower Color: purple vs. white flowers

Seed Color:yellow vs. green seeds

Seed Shape: smooth vs. wrinkled seeds

Pod Color:green vs. yellow pods

Pod Shape:inflated vs. constricted pods

Pea Plant Traits

Character	Dominant Trait	×	Recessive Trait
Flower color	Purple 	×	White 
Flower position	Axial 	×	Terminal 
Seed color	Yellow 	×	Green 
Seed shape	Round 	×	Wrinkled 
Pod shape	Inflated 	×	Constricted 
Pod color	Green 	×	Yellow 
Stem length	Tall 	×	Dwarf 

Dominant & Recessive Traits (Alleles)

- **Genes-** a segment of DNA that determines an organisms traits
  - An organism has 2 Alleles for each trait(1 from each parent)
- **Dominant Alleles (D)-** stronger genes, are always seen in the organisms appearance
- **Recessive Alleles (d)-** weaker genes, are hidden by dominant genes
  - Recessive alleles are only seen if an organism has 2 recessive genes for the trait

Dominant vs. recessive

- **Dominant** = Capitol ex: **R** - red gene
- **recessive** = lower case ex: **r** - white gene

- Genotypes:

  RR = red (pure) – 2 dominant genes

  Rr = red(hybrid) – 1 dominant, 1 recessive gene

  rr = white(pure) – 2 recessive genes

Genotype & Phenotype

- **Genotype-** the combination of genes for a trait
  - Ex: **Rr, RR, rr**
- **Phenotype-** the physical appearance of a trait
  - Ex: flower color- red or white

Rr – red hybrid

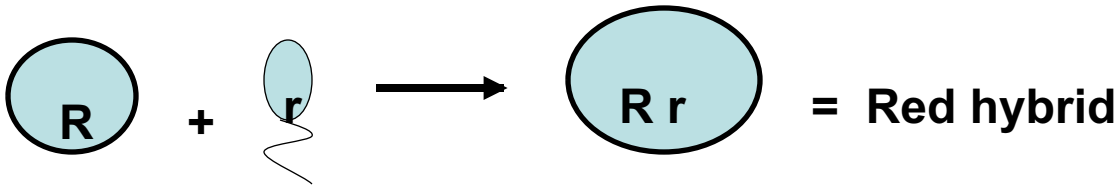
Genotype **Phenotype**

Principles of Genetics

- **Principle of Dominance-** one gene for a trait may hide the other gene and prevent it from being expressed(seen)
  - Ex: dominant hides recessive, **Rr** = red

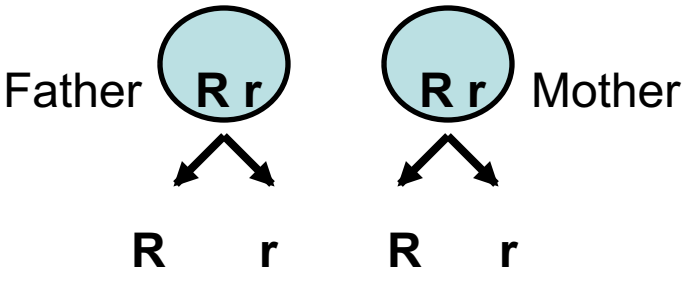
White gene is hidden

- **Principle of Segregation-** the 2 genes for a trait separate when sex cells(gametes) are formed
  - Ex: Eggs & sperm only contain 1 gene for each trait



Principles of Genetics

- **Principle of Independent Assortment-** genes for different traits separate independently of one another during the formation of gametes(egg & sperm)
  - Ex: there is a 50:50 chance of getting a specific gene from each parent



Offspring Could Be:

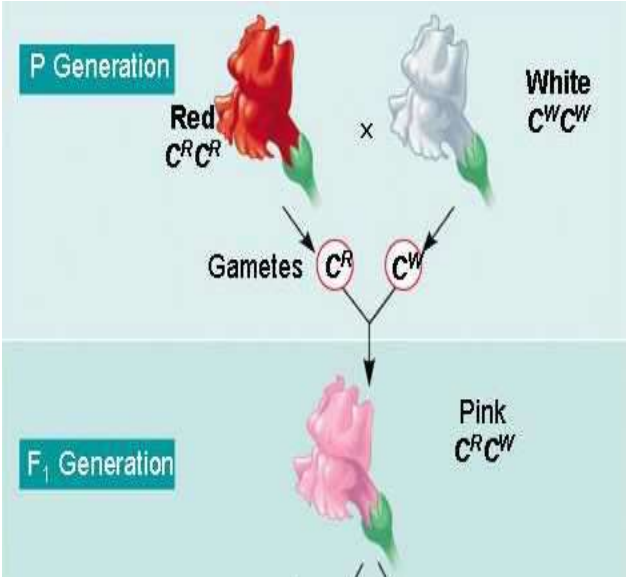
RR or **Rr** or **rr**

Incomplete Dominance

- **Incomplete Dominance** is a rare occurrence when 2 genes blend together to form a trait
  - Ex: **R** = red**RR** = red

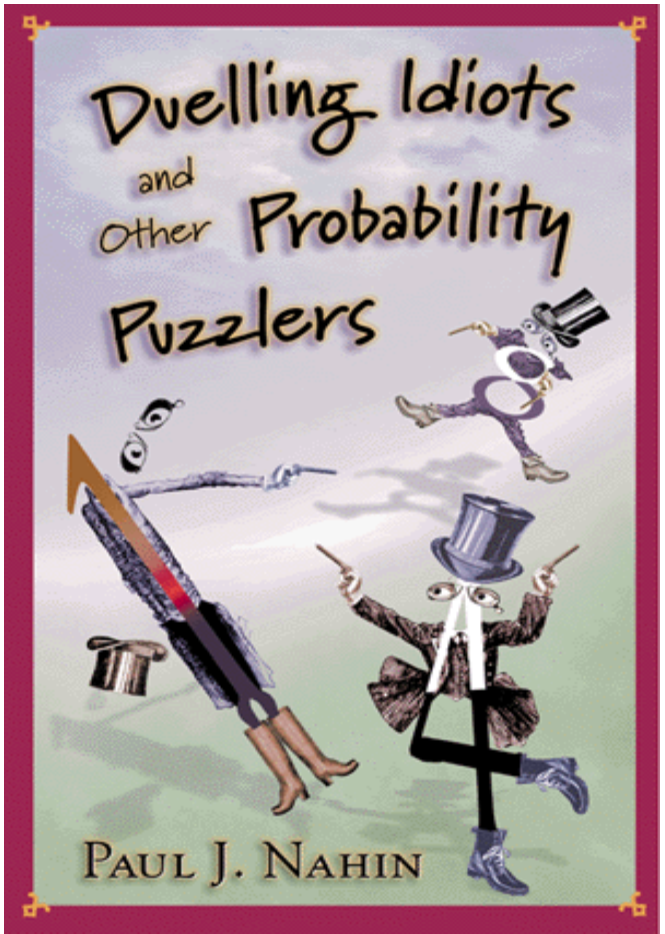
    R' = white**R'R'** = white

  RR' = pink



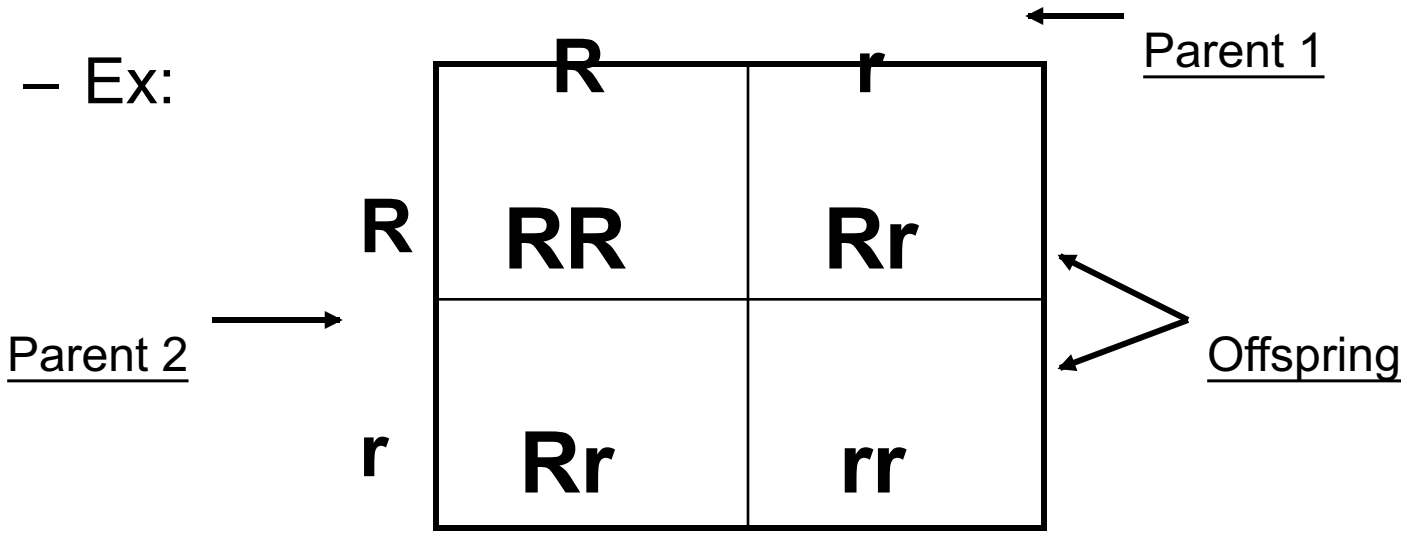
Probability

- Probability is the likelihood that a gene or trait will be inherited



Punnett Squares

- Punnett squares are charts that show possible gene combinations when 2 organisms produce offspring
  - Ex:



Monohybrid Cross

- A cross involving only 1 trait
- Both parents are hybrids in monohybrid cross

* Both parents have 1 dominant & 1 recessive gene for the trait

Ex: Eye colorEx: Pea-Pod color

Dihybrid Cross

- A dihybrid cross involves 2 traits
- Both parents are hybrids for both traits
- Both parents have 1 dominant and 1 recessive gene for each trait

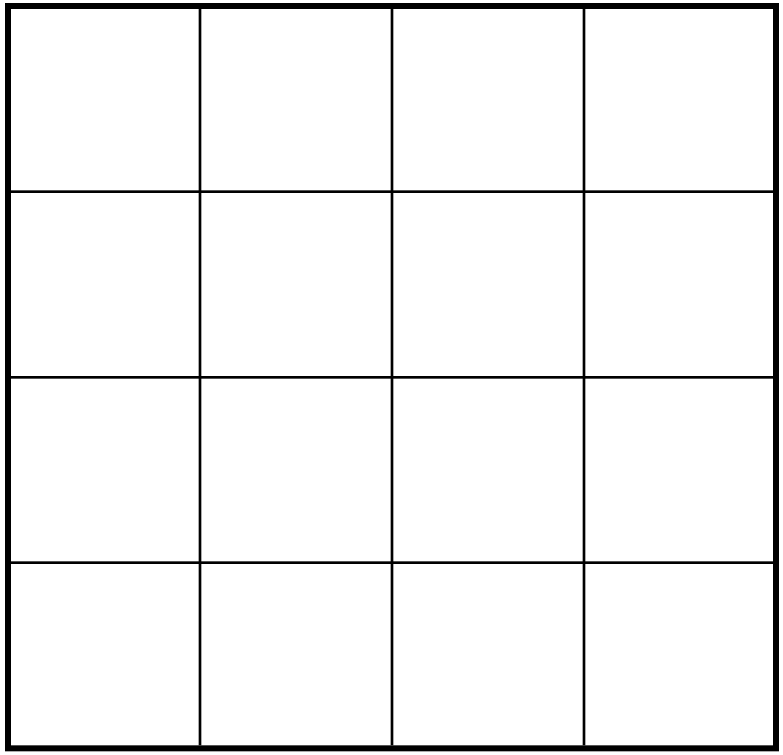
Ex: **Pea Shape & Color**

Shape: **R** = round, **r** = wrinkled

Color: **Y** = yellow, **y** = green

Dihybrid Cross

Ex: Pea Shape(**Rr**) & Pea Color(**Yy**)



Dihybrid Cross

- Phenotypic Ratio- **9:3:3:1**
- A dihybrid cross will ALWAYS result in the following ratio:

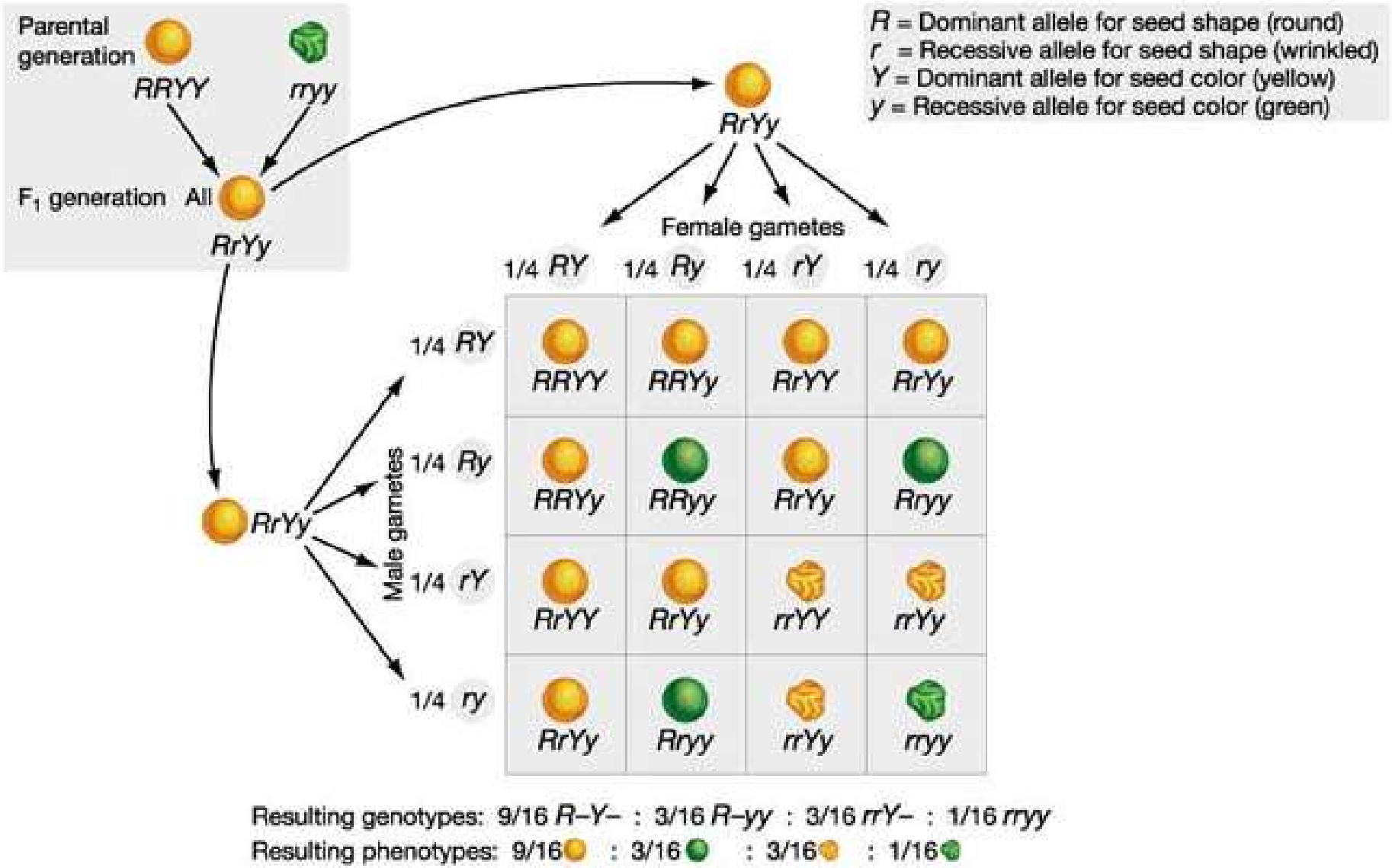
9 : both dominant traits

3 : 1 dominant & 1 recessive trait

3 : 1 dominant & 1 recessive trait

1 : both recessive traits

Dihybrid Cross



Incomplete Dominance

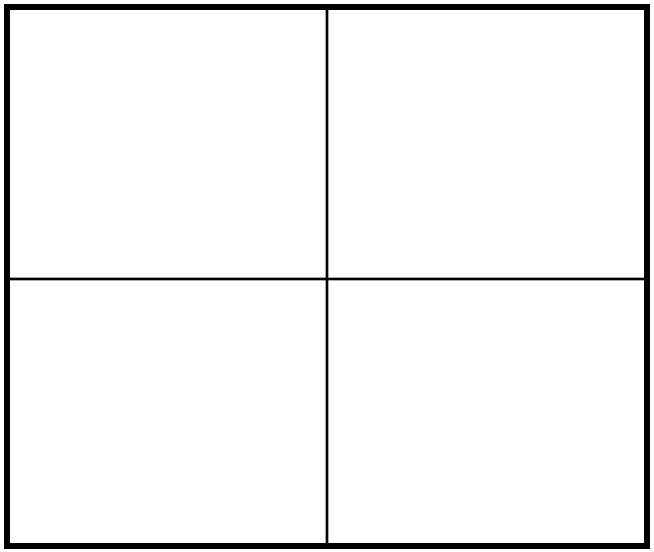
- Incomplete Dominance occurs when both genes blend together when forming a trait

Ex: Flower Color

R = red

R' = white

RR' = pink



Blood Types

- Human blood types are an example of co-dominant genes

- Human Blood Types:**A**

B

AB

O

Genetics of Blood Types

- Blood Type Genes:

  Dominant Genes = $\mathbf{I^A}$

  $\mathbf{I^B}$

  Recessive Gene = **i**

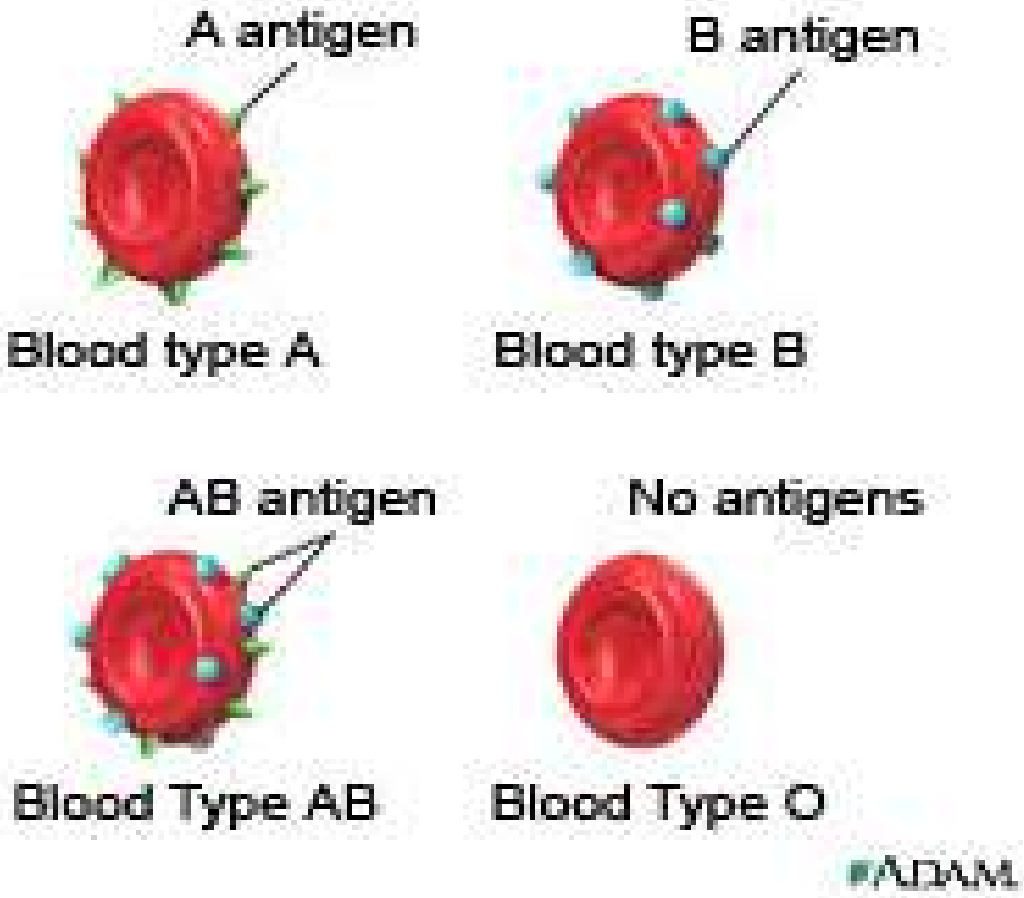
- Possible Combinations:

  I^AI^A = type A I^BI^B = type B

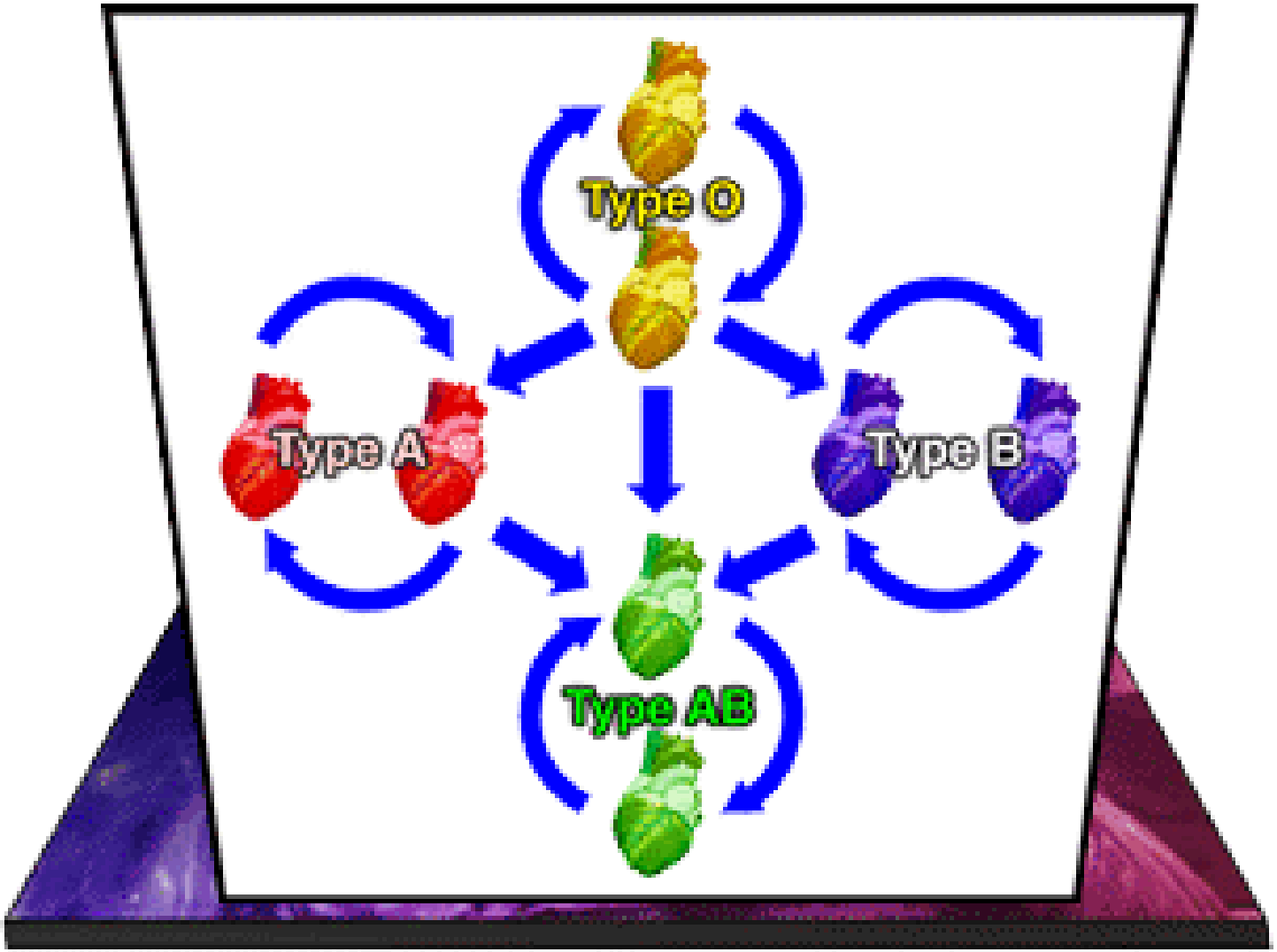
  I^Ai = type A I^Bi = type B

  I^BI^A = type AB ii = type O

Blood Types


A antigen
B antigen
Blood type A
Blood type B
AB antigen
No antigens
Blood Type AB
Blood Type O
A.D.A.M.

Giving & Receiving Blood



Blood Type Punnetts

- Ex: Mother Type AB(I^AI^B)
  Father Type O(ii)

- Ex: Mother Type A (I^Ai)
  Father Type B (I^Bi)

Sex-Linked Traits

- Sex-linked traits are traits that are inherited only on the X-chromosome
- The Y-chromosome does not carry sex-linked traits

Ex: Hemophilia(h) – a recessive sex-linked trait

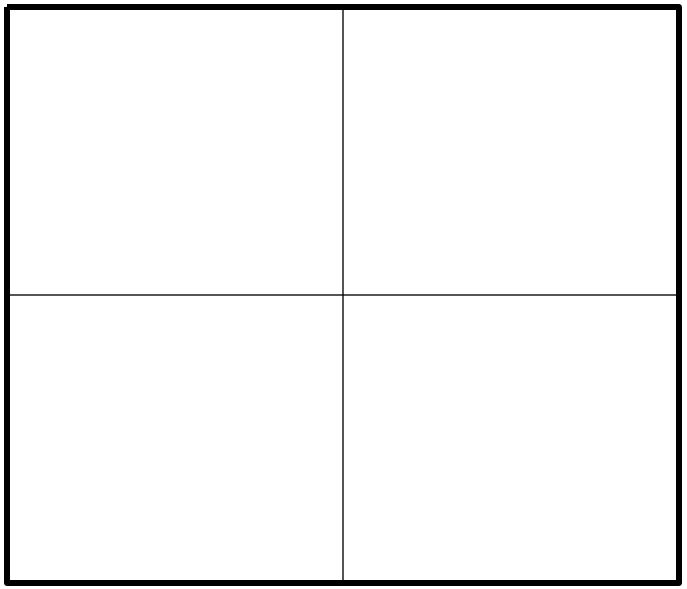
X - normal X

$\mathbf{X^h}$ - X carrying hemophilia gene

Y - normal Y

Hemophilia Punnett Square

- Carrier Mother(**X^hX**) & Normal Father(**XY**)



END OF CHAPTER 8 NOTES!!!