Gene Interactions

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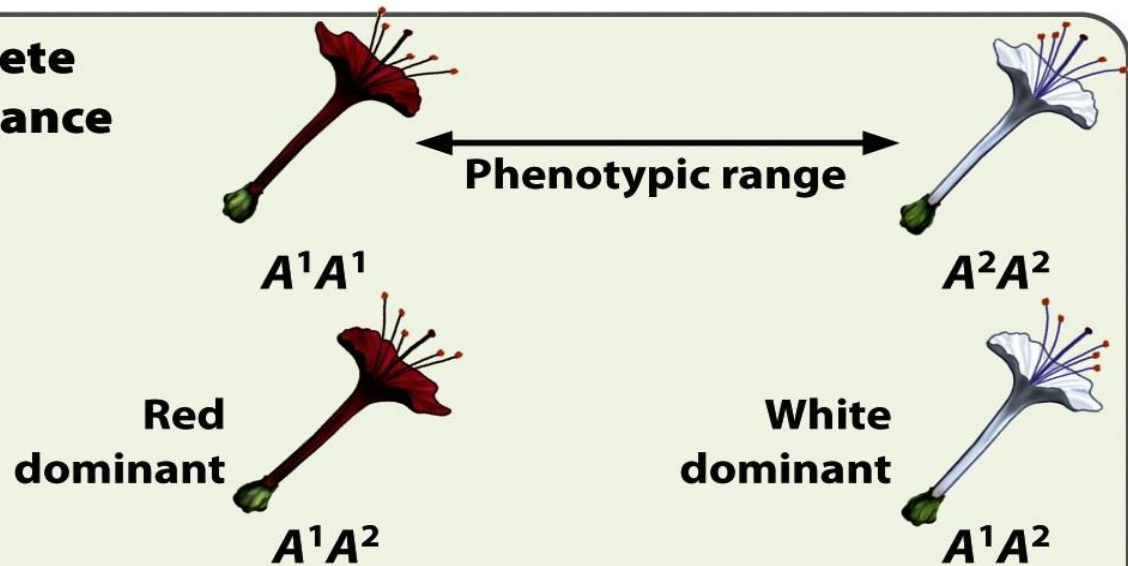# Gene Interactions
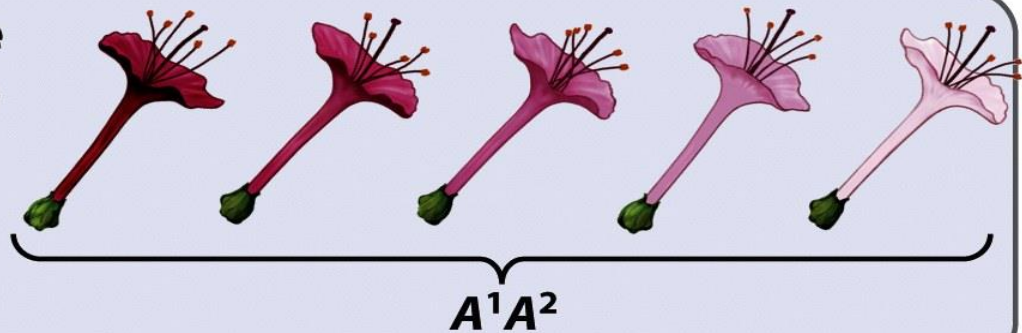
Intra-genic ➡️ Dominance
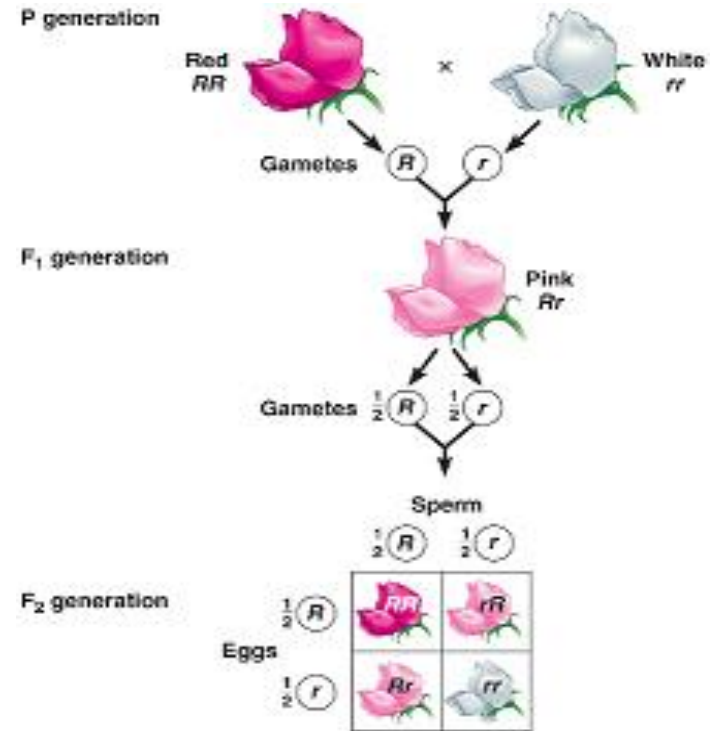Incomplete Dominance
Co-dominance
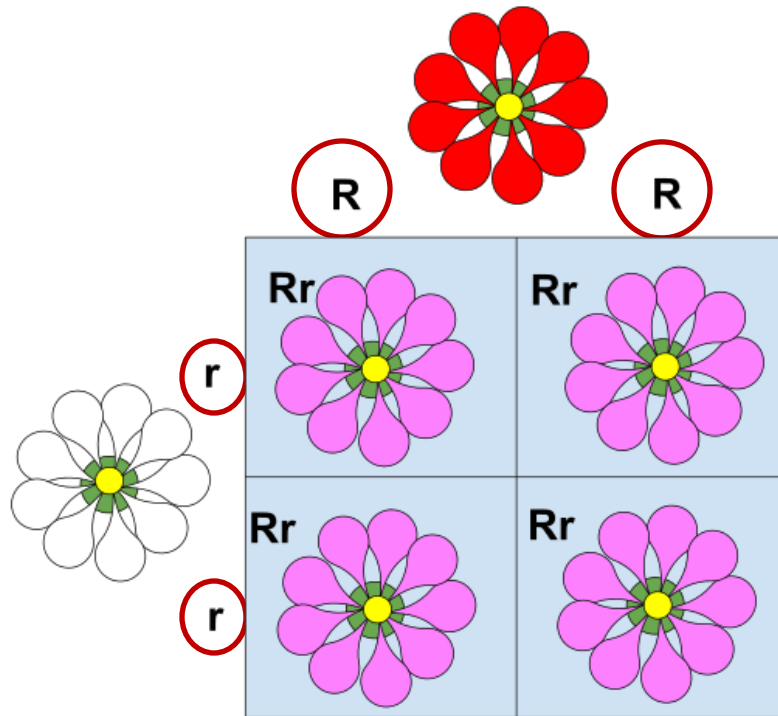
Inter-genic ➡️ Epistasis
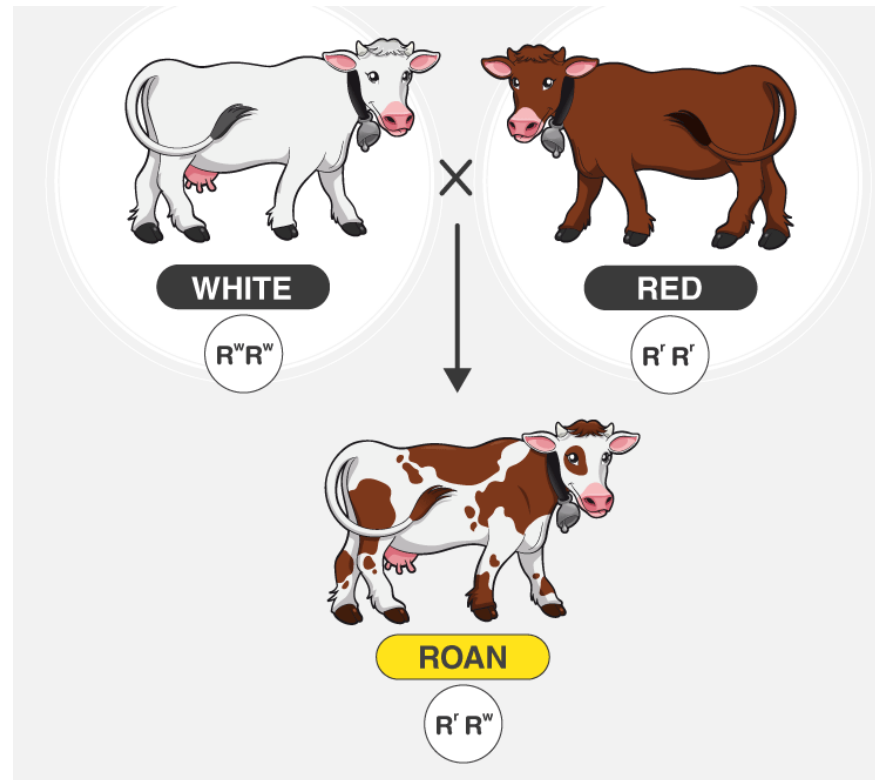
Dominance

Incomplete Dominance

Incomplete dominance: Neither allele masks the other and both are observed as <u>a blending </u>in the heterozygote.

Co-dominance

Codominance: Neither allele masks the other so that effects of both alleles are observed in heterozygote without blending

Dominance, Incomplete Dominance and Co-dominance

Type of Dominance	Definition
Dominance	Phenotype of the heterozygote is the same as the phenotype of one of the homozygotes.
Incomplete dominance	Phenotype of the heterozygote is intermediate (falls within the range) between the phenotypes of the two homozygotes.
Codominance	Phenotype of the heterozygote includes the phenotypes of both homozygotes.

Epistasis - Definition

- Epistasis is a form of gene interaction in which one gene **masks** the phenotypic expression of another.

- There are no new phenotypes produced by this type of gene interaction.

Epistatic versus Hypostatic

- The alleles that are masking the effect are called **epistatic alleles**

- The alleles whose effect is being masked are called the **hypostatic alleles**

Recessive or Dominant?

- Epistasis can be described as either recessive epistasis or dominant epistasis.

- Let's look at an example of recessive epistasis….

Labrador Retrievers

- Fur color in Labrador Retrievers is controlled by two separate genes.
  - Fur color is a polygenic trait!

Gene 1: Represented by B
      : Controls color

Gene 2: Represented by E
      : Controls expression of B

Labrador Retrievers

- If a Labrador retriever has a **dominant B allele**, they will have black fur.

- If they have **two recessive alleles (bb)** they will have brown fur.

Labrador Retrievers

- If a retriever receives at least one dominant "E" allele, they will remain the color that the "B" allele coded for.
  - Either black of brown

- However, if a dog receives a pair of homozygous recessive "e" alleles, they will be golden regardless of their "B" alleles!

Labrador Retrievers

- BBEE and BbEe ➡ Black retrievers
- bbEE and bbEe ➡ Brown retrievers
- BBee, Bbee, or bbee ➡ Golden retrievers

Dominant Epistasis
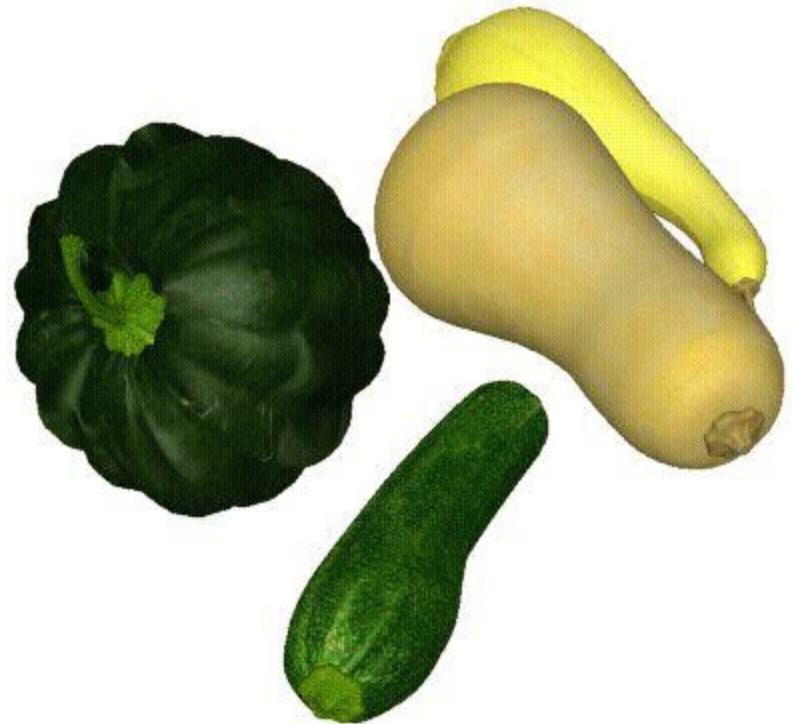

- Summer Squash fruit color is controlled by two genes.

Gene 1 - represented by **W**

Gene 2 - represented by **G**

Summer Squash Fruit Color

- Genotypes and Phenotypes:

W-/G-	white
W-/gg	white
ww/G-	green
ww/gg	yellow

Summer Squash Fruit Color

- Which allele is epistatic in squash color?

  The dominant W allele is epistasis

- How do you know?

  Because every time a dominant W allele shows up in a squash genotype, the squash fruit color is white.

Difference between Dominance and Epistasis

Dominance	Epistasis
❑Involves intra-allelic gene interaction.	❑Involves inter-allelic gene interaction.
❑One allele hides the effect of other allele at the same gene pair.	❑One gene hides the effect of other gene at different gene loci.

Assignment 1 - try this cross…

- You have decided to cross your golden retriever (bbee) with the neighbor's chocolate retriever (bbEe).

What color pups will they have…

Assignment 2 - try this cross…

➢ Cross a green squash (wwGg) with a white squash (Wwgg).

What color are the offsprings…