The gene interactions in the determination of traits.

What is a gene?

- A **gene** is the basic physical and functional unit of heredity. Genes are made up of DNA.

Alleles

- An **allele** is one of the possible forms of a gene. Most genes have two **alleles**, a dominant **allele** and a recessive **allele**. If an organism is heterozygous for that trait, or possesses one of each **allele**, then the dominant trait is expressed. So a gene is a particular region of your DNA that controls a specific trait.

Alleles

- In the real world, genes often come in many versions (alleles). Alleles aren't always fully dominant or recessive to one another, but may instead display **codominance** or **incomplete** dominance.
- Allele pairs may have a variety of dominance relationships (that is, one allele of the pair may not completely “hide” the other in the heterozygote).

Alleles

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In these cases, an organism's **genotype**, or set of alleles, still determines its **phenotype**, or observable features. However, a variety of alleles may interact with one another in different ways to specify phenotype.

The gene interactions

- Sometimes mutations in two **genes** produce a phenotype that is surprising in light of each mutation's individual effects. This phenomenon, which defines **genetic interaction**, can reveal functional relationships between **genes** and pathways.

The dominance

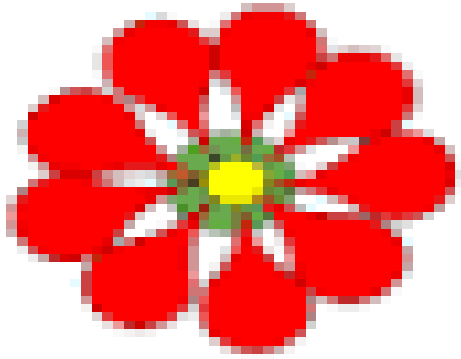
- Complete dominance occurs when one allele – or “version” – of a gene completely masks another. The trait that is expressed is described as being “dominant” over the trait that is not expressed.
- Most organisms are diploid – that is, they get two copies of each gene, one from each of their parents.

The dominance

- **Incomplete dominance** (also called partial **dominance**) occurs when the phenotype of the heterozygous genotype is distinct from and often intermediate to the phenotypes of the homozygous genotypes. Co-**dominance** occurs when the contributions of both alleles are visible in the phenotype.

Incomplete dominance

F1 generation have all pink flowers



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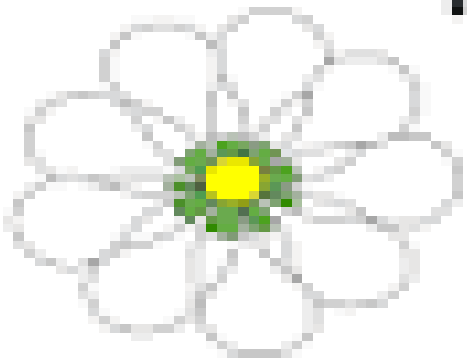

Non-allelic interaction

- **Non-allelic gene** is **alleles** at different position of chromosome loci but can affect one **gene** over the other in different way of intereaction. Different human character are determined not only based on the **allelic gene** but also with the effect to **non allelic genes**. This effect is due to **non allelic interaction**.

Interaction of non-allelic genes

In molecular biology, **complementarity** describes a relationship between two structures each following the lock-and-key principle.

Epistasis is the phenomenon where the effect of one gene (locus) is dependent on the presence of one or more 'modifier genes', i.e. the **genetic background**.

Inheritance of blood groups

The four ABO **blood groups**, A, B, AB and O, arise from inheriting one or more of the alternative forms of this gene (or alleles) namely A, B or O. The A and B alleles are codominant so both A and B antigens will be expressed on the red cells whenever either allele is present.

Inheritance of blood groups

father	mother A	mother B	mother O
A	AA	AB	AO
B	BA	BB	BO
O	OA	OB	OO

alleles	blood type
A+A	A
A+O	A
A+B	AB
B+B	B
B+O	B
O+O	O