The genomes of plants and animals consist of several long DNA molecules that are called chromosomes. Most organisms carry two copies of each chromosome: one inherited from mother, and one from father. This means that an individual has two copies of each gene. Some of these gene copies may be identical (known as 'homozygous'), but other gene copies will have sequence differences (or be 'heterozygous').

The sex cells (eggs and sperm) that pass half of each parent's genes on to its offspring are made in a process called meiosis. Before the pairs of each chromosome are separated to make two new sex cells, sections of genetic material can be swapped between a chromosome-pair to produce chromosomes with unique combinations of genetic material. This process is called 'crossover'.

We previously found that crossovers are more common between heterozygous regions that are close to homozygous regions on the same chromosome. The boundaries between these identical and non-identical regions are important for determining where crossovers take place. The experiments also show that the heterozygous regions have higher levels of interference—where one crossover event prevents other crossover events from happening nearby on the chromosome. In future, using chromosomes with varying patterns of heterozygosity may shed light on how this interference works.

In this project we will try to find the mechanisms that are responsible for this biased distribution of crossovers. We will test several different hypotheses by using mutant plants which have selected genes, which we suspect to be involved in this control mechanism, switched off. This type of experiments may prove whether the gene under question is indeed important for the observed effect, and therefore will indicate the possible mechanism. In the course of the project we will also further characterize how crossovers are distributed between homozygous and heterozygous regions. We believe that this knowledge will help to understand the very complex process of meiosis and crossover. In the future, the discovery of this mechanism may be useful for directing crossover in crop breeding.