Mendel and his Peas

Gregor Mendel is described as the father of modern **genetics**. This is because of his intensive study of and experimentation with pea plants. He was born in Austria in 1822 on the 22nd of July. His birth name was Johann Mendel and his family were farmers. He attended a small rural school where his teacher saw great promise in him and his ability to learn, so recommended that he attend a secondary school in another city. Despite the cost to his family being very high, he completed his schooling and graduated with honours. He then went on to study physics and mathematics at University.

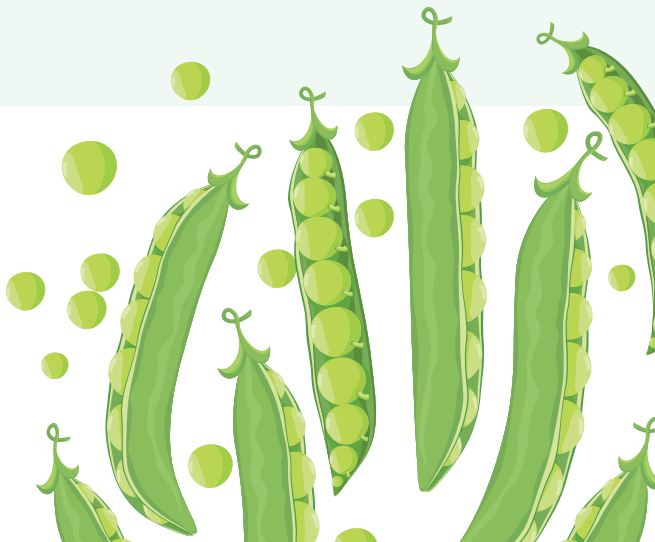
Upon finishing his degree, his father expected him to take over the family farm as he was his only son but Mendel was keen to continue his education. Instead of becoming a farmer, he joined a monastery and started to study to become a monk. It was here that he took the name Gregor as a sign that he had begun a new lifelong dedication to God. During this period in time, churches and monasteries were great learning environments and most of the scientific discovery or research of the time was funded by religion. By joining the monastery, it not only meant that he could access a vast library, work with other scientists and have use of a science laboratory but it also allowed him to continue his education at no cost to himself. The monastery also paid for him to study at the University of Vienna where he continued to learn physics and mathematics. He even studied under the famous mathematician Christian Doppler[1].

Upon graduating university, he went to work in a secondary school attached to the monastery, where he had started his monkship, as a physics teacher. All the while, he continued to conduct various experiments. He grew and experimented with peas over a span of seven years and this gave him a huge amount of data to support his findings. Mendel was interested in how certain features of pea plants were passed on from generation to generation. The current thinking of the time was that the traits of the parents were blended together in the offspring, for example a tall person and a short person would have middle sized children. This idea, called **blending inheritance** had no evidence to support it.

He began looking into **hereditary** features by studying mice but because he was a monk studying and working in a monastery, the Bishop of the time thought it was inappropriate to be studying sex in animals. He then shifted to using plants and made the most of the monastery's large experimental gardens. He found peas to be an excellent test subject because there were obvious differences between them – offspring were produced quickly and easily and it was simple to manually cross one plant with another. Mendel focussed on seven distinct characteristics of peas:

- Plant Height (tall or short stem)
- Pod Shape (full or constricted)
- Pod Colour (green or yellow)
- Seed Shape (smooth or wrinkled)
- Seed Colour (green or yellow)
- Flower/Pod Position (axial or terminal)
- Flower Colour (white or purple)

[1] Christian Doppler proposed the principle now called the Doppler Effect. This is where sounds get quicker, louder and higher pitched as the source of the sound comes nearer to you and becomes quieter, slower and low pitched as the source moves away. Like when a police car or ambulance is driving towards you with its siren on and its siren appears to become higher pitched and louder the closer it gets. His idea was tested by a Dutch scientist who stood by a railway line and got a rail car full of musicians playing a single note to be pulled by a train towards him. The musicians didn't play any louder or differently but the music the scientist heard changed, which was because the sound waves were changing due to the movement of the train and so this proved the Doppler Effect.



His first experiment was with seed shape and over the seven years of experimenting, he grew 2900 pea plants to test his ideas of how these seven 'factors' were inherited. In one set of experiments, he found that when yellow and green pea plants were bred together, all the offspring were yellow. But then if he bred these offspring together, he found a mixture of green or yellow offspring. In order to explain this, he developed the terms **dominant** and **recessive**. He felt that one 'factor' would always overshadow the other one but it didn't mean that the other 'factor' wasn't present, it was just hidden. This explained why the green colour showed up in the next generation of pea plants. Mendel also proposed that like with peas, all living things had these **heritable** '**factors**' that we now understand in greater detail and call **genes**.

He published his work 'experiments on plant **hybridization**' in 1866 and gave two lectures on his findings. He had some success in his local area and people found his work interesting, however it was largely misunderstood and other scientists felt that he hadn't discovered anything new and hadn't come up with any new ideas. This meant that the importance of his work went unnoticed for forty four years and the massive discovery he had made was unrecognised. In 1900, several scientists from different countries reran his experiments and came up with the same results and finally saw the importance of his work. Mendel's system is now one of the **fundamental principles** of biology. Mendel himself never lived to see the impact that his work had on science as we know it, as he died in 1884 at the age of 62 from **chronic** kidney disease.

Below is a diagram showing the seven pea traits of Mendel's experiments.