B is a dominant gene (green) and b is a recessive gene (yellow).

The way in which he meticulously planned his experiment to generate testable, rather than observational data, is a shining example of experimental design. Mendel's law of segregation is based on one of the benchmark scientific experiments in genetic research. The Mendel Pea Experiment and the discovery of the Law of Segregation has shaped the way genetic research has developed and it has been shown that this law applies to all sexually reproducing organisms.

For the Mendel Pea Experiment he chose pea plants, because they had some measurable characteristics. Mendel noticed that certain characteristics appeared to be passed on from parents to offspring, in many species, and wondered why this was so. He also wanted to establish what rules dictating how characteristics are passed down through the generations.

Initially, he cross-fertilized plants with the same characteristics to ensure that the plants were true-breeding, giving a good baseline for the research. However, all but one quarter had at least one 'g' allele and so this would continue to be important, all had a 50% chance of passing on the recessive g allele to the next generation.

The best way to express what happens in the F2 generation is with a type of diagram known as a Punnett Square. (Fig 1)

In the case of pod color, the Mendel Pea Experiment showed that a cross between a green pod plant and a yellow pod plant produced only green pod plants for the F1 generation. It was a stroke of genius considering that it was performed in the 19th century. For example, the green pod gene is 'G', the yellow gene 'g'.

When the alleles are different, one is fully expressed and the other is masked, now known as a dominant and recessive genes. There are alternative forms of genes, the units determining heritable characteristics. Segregation is the process by which generations end (Fig 1).

An organism inherits one allele from each parent. The F1 generation inherited one green pod allele from each parent, this combination is GG and all the F1 generation had green pods.

The next stage was to cross-pollinate plants with different characteristics, such as one with green pods and one with yellow pods. This is now known as an F2 generation. The F2 generation is the result of the segregation of the parental gene combinations. Offspring with a dominant G gene will always have green pods and those with only the recessive g allele will have yellow pods. (Fig 1)

To conduct the experiment, he cross-pollinated the selected pea plants by removing the anthers from one flower, to prevent self-fertilization, and dusting pollen from another plant onto the flower. To prevent mutations from occurring, he used only plants that were true-breeding, meaning that they had inherited the same genes for at least a few generations.

In the case of pod color, he observed that some pods of the F2 generation were green and some were yellow. This is what Mendel called the segregation of genetic factors. He cross-pollinated the selected pea plants by removing the anthers from one flower, to prevent self-fertilization, and dusting pollen from another plant onto the flower. This allowed a quick experimental turn-around.

Figure 1: A Punnett Square showing gene combinations and pod colors in the F2 generation. (Fig 1)

Figure 1 - Law of Segregation

These initial plants are called the P (Parental) generation. The resulting offspring, the F1 generation, is the result of the combination of the P generation. The F1 generation all had the Gg combination and so were all green pod variants although, clearly, some thing strange was going on and, in an inspired piece of thinking, Mendel came to the conclusion that each F1 pea plant must contain both a G and a g allele.

This is why Mendel only found that one quarter of the F2 generation had yellow pods. The yellow pod characteristic had not disappeared, it had been masked by the dominant G gene. However, in the F2 generation, the G and g alleles were combined to form the Gg combination, which produces yellow pods.

Mendel's law of segregation is based on one of the benchmark scientific experiments in genetic research. The Mendel Pea Experiment and the discovery of the Law of Segregation has shaped the way genetic research has developed and it has been shown that this law applies to all sexually reproducing organisms.

http://en.wikipedia.org/wiki/Punnett_square

http://en.wikipedia.org/wiki/Mendelian_inheritance


Gregory Mendel was an Austrian monk studying at the University of Vienna. Like many pioneering scientists, his discoveries were largely ignored until long after his death.

Summary

The Mendel Pea Experiment really was a ground-breaking piece of research. The observational data, is a shining example of experimental design. The Law of Segregation is based on one of the benchmark scientific experiments in genetic research. The Mendel Pea Experiment and the discovery of the Law of Segregation has shaped the way genetic research has developed and it has been shown that this law applies to all sexually reproducing organisms.

Bibliography
