

SECTION 1 **Origins of Hereditary Science**

KEY IDEAS

As you read this section, keep these questions in mind:

- Why was Gregor Mendel important for modern genetics?
- Why did Mendel conduct experiments with garden peas?
- What were the important steps in Mendel’s first experiments?
- What were the important results of Mendel’s first experiments?

Who Was Gregor Mendel?

In the 1800s, Gregor Mendel did breeding experiments with the garden pea plant, *Pisum sativum*. Mendel was the first to develop rules to predict patterns of heredity. Modern genetics is based on his explanations for patterns of heredity.

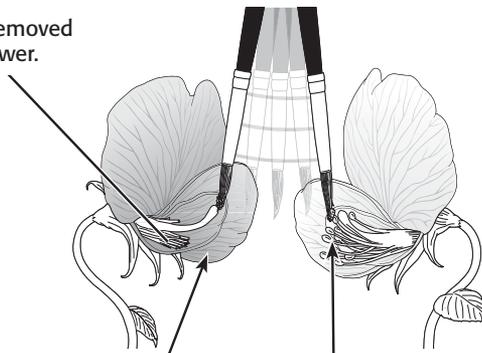
Why Did Mendel Use Garden Peas?

In his experiments, Mendel bred, or *crossed*, different types of garden peas. Mendel used garden peas for several reasons:

- They are easy to grow.
- One cross produces many offspring.
- Every flower has both male and female reproductive structures. Thus, a pea plant can *self-pollinate*, or fertilize itself. It can also *cross-pollinate*, or fertilize another plant. ✓

In some of his experiments, Mendel crossed plants that had purple flowers with those that had white flowers. The plants were *true-breeding*. That is, each produced offspring with all the same traits when it self-pollinated.

Male parts are removed from the first flower.



Pollen from the second flower is brushed onto the female parts of the first flower.

Pollen is taken from the male parts of the second flower.

READING TOOLBOX

List Science Terms Many science terms will appear over and over throughout the book. As you read, list on a piece of paper or in a notebook any science terms and definitions. Add to this list as you read other sections. Refer to this list whenever you need to remind yourself of the meaning of a word.

READING CHECK

1. Explain Why can a pea plant self-pollinate and cross-pollinate?

Critical Thinking

2. Infer Why did Mendel remove the male parts from the first flower?

SECTION 1 Origins of Hereditary Science *continued*

MENDEL'S FIRST EXPERIMENTS

Physical features that are inherited are called **characters**. In pea plants, flower color is a character. A form of a character is called a **trait**. Purple flowers and white flowers are two traits. Mendel studied seven characters of pea plants, each with two traits. ✓

Mendel carried out monohybrid crosses in his first experiments. A *monohybrid cross* studies one pair of contrasting traits. The offspring of true-breeding parents with a contrasting trait are called **hybrids**.

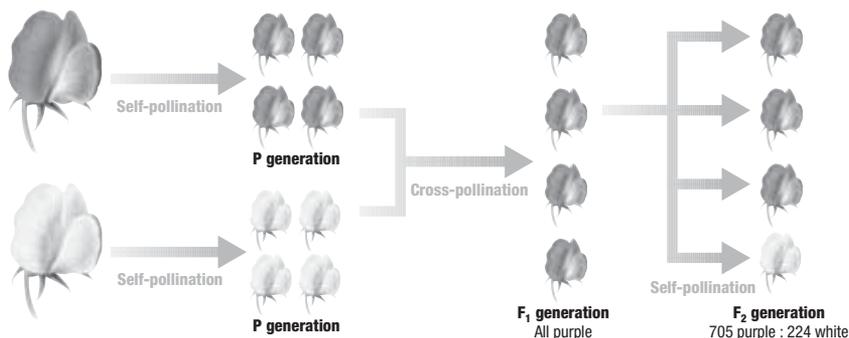
READING CHECK

3. Identify Relationships

What is the relationship between a character and a trait?

Seven Characters with Contrasting Traits Studied by Mendel						
Flower color	Seed color	Seed shape	Pod color	Pod shape	Flower position	Plant height
purple	yellow	round	green	smooth	mid-stem	tall
white	green	wrinkled	yellow	bumpy	end of stem	short

Three Steps of Mendel's First Experiments



LOOKING CLOSER

4. Compare How did the F₂ generation differ from the F₁ generation?

- The first generation that Mendel crossed was called the *parent*, or *P*, **generation**. A **generation** is all the offspring produced by a set of parents. The plants of the P generation were true-breeding.
- Mendel crossed two P generation plants that had contrasting traits. The offspring of the P generation is called the *first filial*, or *F*₁, **generation**.
- Mendel let the F₁ generation self-pollinate. He called the new generation of offspring the *second filial*, or *F*₂, **generation**. He recorded the number of F₂ plants that had each trait.

MENDEL'S RESULTS

All of Mendel's F₁ plants had the same trait for a given character. That is, the contrasting trait had disappeared. However, when the F₁ plants self-pollinated, the missing trait reappeared in some of the F₂ plants. For each of the characters that Mendel studied, he found a 3:1 ratio of contrasting traits in the F₂ generation.

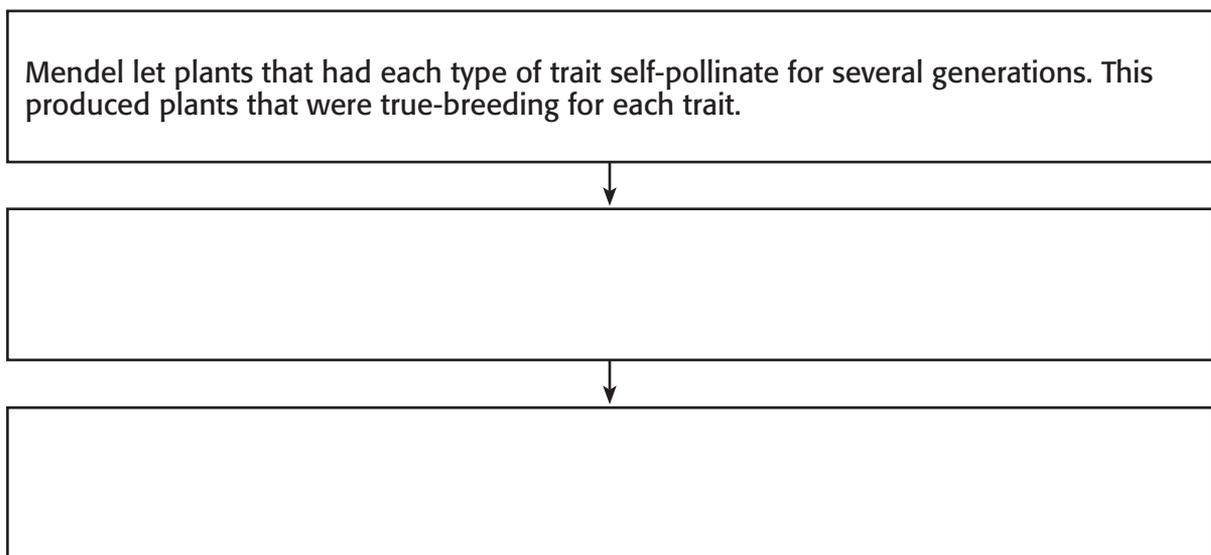
Section 1 Review

SECTION VOCABULARY

<p>character a recognizable inherited feature or characteristic of an organism; in Mendelian heredity, a feature that exists in one of two or more possible variations called traits</p> <p>generation the entire group of offspring produced by a given group of parents</p>	<p>hybrid in biology, the offspring of a cross between parents that have differing traits; a cross between individuals of different species, subspecies, or varieties</p> <p>trait a genetically determined characteristic</p>
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1. Identify What was Mendel’s main contribution to hereditary science?

2. Summarize Complete the process chart below to describe the major steps of Mendel’s first experiment.



3. List Identify three reasons Mendel chose to use garden peas in his experiments.

4. Identify What was the typical ratio of traits in the F₂ generation in Mendel’s first experiments?

5. Analyze Methods Mendel examined thousands of pea plants in his experiments. Why do you think he used so many?
