



For thousands of years cotton growers have worked to develop cotton with the best **traits**. A **trait** is a characteristic like **color** or **leaf size** or the ability to **survive harsh environments**. Today, growers want cotton with fibers that are **STRONG & long** to make good denim.

Where do traits come from?



The **traits** of any living thing come from its **genes**. **Genes** are the smallest units in an organism that hold the instructions for how that organism will grow. **Genes** control the many different **traits** of an organism. Cotton has **genes** that control fiber length, strength and fineness. Cotton fibers are made of 2.5 cm cells. Thousands of these unusually long cells grow together to form fibers. Fibers cluster into fluffy white cotton bolls. All fibers in a single boll are identical. This means they have the same **genes**.

The complete set of genes for an organism is called its genome. Scientists identify individual genes and then map the entire genome of an organism.

How are the best traits developed?

Cross-breeding combines the best traits in two different plants. For example, one plant with long fibers is crossed with another plant that withstands harsh conditions. They produce a new generation of sprouts. The plants with good traits are selected and then cultivated. Weaker plants or plants with short fibers are weeded out. This is not an exact process. Sometimes the genes of two great plants may combine into sprouts that do not have the right traits. Also, weather and insects make it impossible to control all pollination. So even with good specimens better crops don't happen right away. Eventually, careful selection over a lot of generations will produce a cotton crop with most shrubs usually having the right traits.



Transgenic breeding can be a more precise way to combine cotton's best traits. Scientists study the cotton seeds to identify the genes that control length, strength, fineness and resistance to climate and pests. If they can find the genes in the seeds that control these traits, then they can develop ways to adjust them. If they can improve the genes in the seeds, then every fiber that grows from those seeds will have the identical improvements. Refined genes help produce high quality denim fabric.



In other words, the best jeans are full of the best genes.

Scientists look at spots of genetic material stuck to a glass, plastic or silicon chip. Using a microarray microscope, they determine what's in the genetic material. Other microarray tools let them change specific genes.

Now, use the visual cues to create questions or a summary about the genes in your jeans.