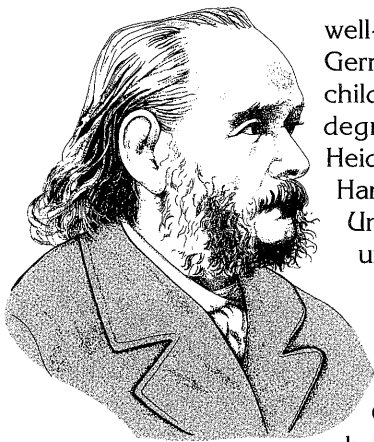


The Cell Theory

As we talk about cells as the basic building blocks of plants and animals, it is hard to realize that there was a time when this wasn't known. In the late 1600s, Antony van Leeuwenhoek saw single-celled "little animals" for the first time under his tiny, primitive lens, but soon this wonderful discovery was nearly forgotten. Then, almost two hundred years later, along came two scientists, a botanist (who studied plants) and a zoologist (who studied animals).

Matthias Jakob Schleiden (*Shly'den*)
(April 5, 1804 - June 23, 1881)



Matthias was born into a well-to-do family in Hamburg, Germany. We know little of his childhood. After earning a law degree at the University of Heidelberg, he went back to Hamburg to open a law office. Unfortunately, he was very unhappy.

His Uncle Johann, a botanist, encouraged him to study natural science at the University of Göttingen. Although it began as a hobby, it soon meant much more to him than his legal career. When his professor and mentor, Johannes Müller, accepted a teaching position at the University of Berlin, Schleiden followed him there. Müller was a physiologist; he studied how plants and animals grow and function. Schleiden greatly enjoyed using his microscope to examine the various parts of plants. Contrary to the practice of the time, he would observe first and then form theories based on the observations.

While he held teaching posts at several universities, he became well-known for writing on a variety of topics beside botany and natural history, including salt, the Isthmus of Suez, and the history of the Jewish people. Because of his original thinking, he was constantly involved in arguments with great thinkers of the time. We could say that he made science—and thinking—popular!

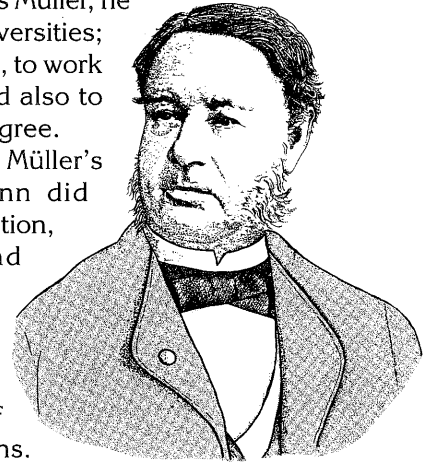
Theodor Ambrose Hubert Schwann (*Shvahn*)
(December 7, 1810 - January 11, 1882)

Theodor was born in Neuss, a small German town on the Rhine River. He was a timid, obedient, and cooperative boy. His teachers said he was bright and hard-working, especially in mathematics and physics. When he went to Cologne to study for the Roman Catholic priesthood, he became fascinated with natural science. As a result, he switched to premedical studies at the University of Bonn. After becoming laboratory

assistant to Johannes Müller, he studied at several universities; then he went to Berlin, to work with Müller again and also to finish his medical degree.

While working in Müller's laboratory, Schwann did experiments on digestion, fermentation, and many other topics. He discovered and named *pepsin*, the substance responsible for digestion of food in our stomachs.

He studied the process of decay in plants. By using his microscope, he established that yeast is made up of organisms like tiny plants, and when sugar and starch ferment (as in the production of alcohol), it is due to the action of these live yeast organisms. Because of his studies, Schwann is considered the founder of the *germ theory of fermentation*. Although his findings were not accepted at the time, years later scientists like Louis Pasteur proved him right.



It was in Müller's laboratory in Berlin that Schleiden and Schwann met. Some say that in a conversation the two discussed their search for the basic unit common to both plants and animals. Whether or not this is true, it could have happened; Robert Brown, who also worked there, had identified the cell nucleus in both plants and animals several years before Schleiden and Schwann joined the staff.

In 1838, soon after leaving Berlin to teach botany at Jena, Schleiden published a journal article explaining his theory that all plants are made up of many different kinds of cells. He said that the cell is the "foundation of the vegetable world." He also described—correctly—the conditions under which cell division (or growth) can take place. The following year Schwann read his friend's article and extended the theory to include animals; he also said that all growth and development is due to the division of cells. Although this *cell theory* sounds elementary to us, it was considered a historic discovery at that time.

In examining Schwann's work, we see that he based some of his discoveries on the work already done by Schleiden. This is good scientific research, building on what others have done, raising new questions, and trying to find the answers. Schwann might not have discovered what he did if it had not been for Schleiden. Even after scientists start working to answer their questions, they raise new ones and continue to read about the latest research. In this way they make discoveries, providing ideas for others to test and build upon.

—by Gretchen Winkleman