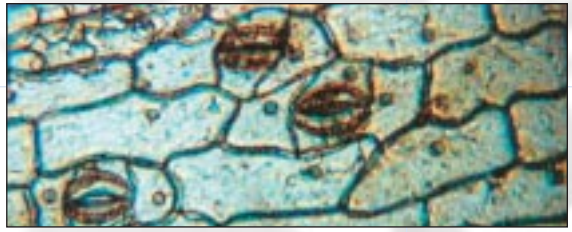
What the Pioneers Could See

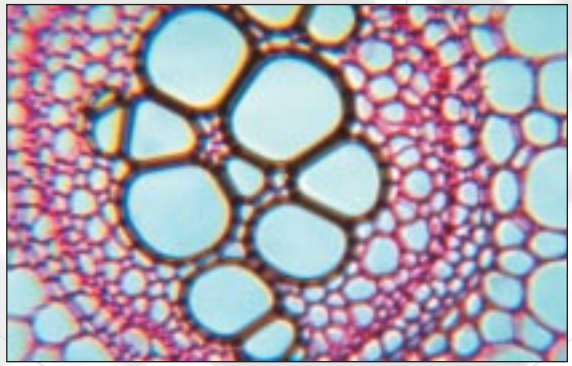
This microscope made in the 1820s was used by Robert Brown to study the nucleus inside living cells.

The type of microscope used by Robert Brown in the 1820s was made by Robert Bancks & Son of London.

For years people have doubted whether the early scientists could really see what they claimed, and Leeuwenhoek has often been thought to be someone with a vivid imagination who invented things. We've been able to repeat his discoveries and I have shown how he really did see bacteria with a single lens. It was the same story with Robert Brown. His microscope was far too crude for serious scientific work, many people have said. Actually, his microscopes were beautifully made and gave amazingly clear images. Brown saw that very tiny particles suspended in water were incessantly moving. Einstein showed how this was due to molecules in continuous movement, and we now call it Brownian Movement in memory of Robert Brown. With a good microscope you can see this in milk, or diluted ink, on a microscope slide. He had an even clearer view of the cell nucleus, and the photos on this page show how clearly specimens can be seen through his original microscope. One of the most exciting pieces of work we did was to re-create exactly how Leeuwenhoek saw blood cells, using his original microscope at Utrecht in the Netherlands. That's a remarkable achievement for such a small instrument. Nobody taught these people how to make discoveries. They were enthusiasts who were excited by observing nature. In more recent times the man who discovered the polymerase chain reaction (PCR) that allows us to amplify DNA was working in a restaurant until he was tempted to do research. Crick and Watson worked out the structure of DNA in their spare time, and not as their main job, and the first person to do embryo transplants was a businessman who had biology as his hobby. Most of the computer pioneers were independent individuals and few of them had degrees, yet their innovations have led to the digital microscope. The Intel® Play™ QX3™ computer microscope is the first digital microscope for youngsters, and with it you can to find out how discoveries were made. Then you can use it to make discoveries of your own.



Here are three breathing pores (stomata) from an orchid leaf, viewed through Brown's microscope. He observed a rounded body inside each of the cells, and decided to call it the nucleus.



A section of fern root from a *Phyllitis* plant shows well under Brown's microscope. The large cells in the middle are the xylem vessels carrying sap up to the leaves.

This is how Leeuwenhoek saw human blood in 300 years ago. These are red cells seen through his own hand-made microscope.

The nucleus at the top left shows beautifully in these cells from a *Tradescantia* flower, just as Brown viewed them in the 1820s. This photo was taken through Brown's original microscope at the Linnean Society, London.