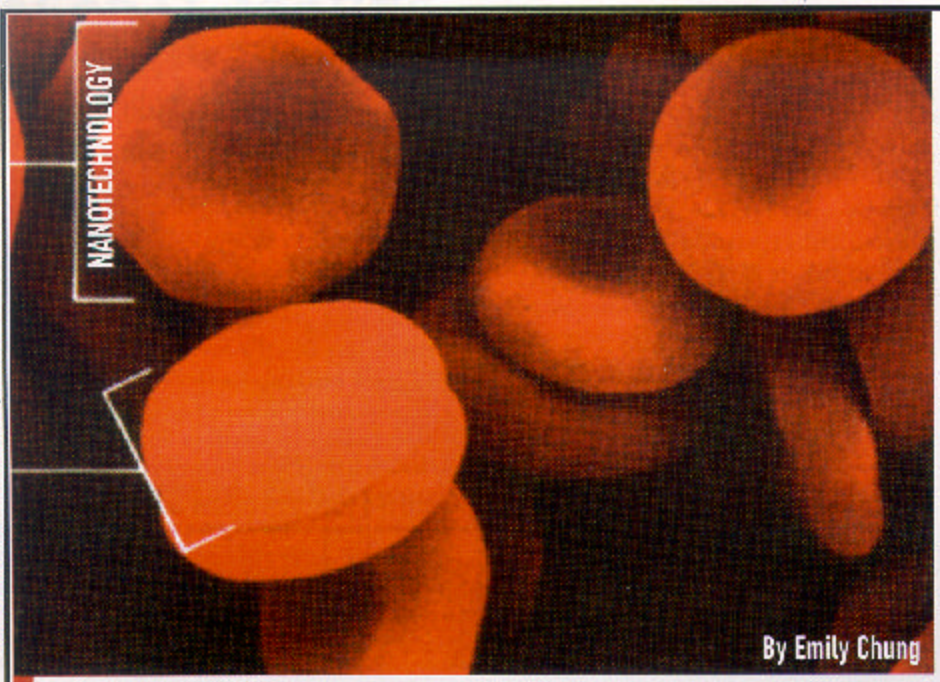

Red Blood Cells: 7.5 micrometre average side diameter. 8 micrometre average diameter.

Jody Mandeville and Christina Kaiser spend their days drawing patterns too small to see with anything but a very powerful electron microscope.

By Emily Chung

The size of their work is no indication of its importance since these patterns could soon be used to precisely control the colour, direction and movement of light waves within optical cables and networks. It is technology that will allow the Internet to transmit multiple video and audio streams to your computer simultaneously at ultra-high speeds. Nanolab is what Kaiser and Mandeville call their workspace at the University of British Columbia (UBC) in Vancouver. Their minuscule works of science are part of a growing field known as nanotechnology. Nanotechnology is the science of making, studying, and working with things on a nano-scale - in other words, really, really small. A nanometre is a millionth of a millimetre. A single human hair is almost 100 000 nanometres wide. "The idea is, if you deal with materials and structures on that scale, they don't behave like traditional things that are larger because new phenomena occur," explains Harry Eugen Ruda, Professor and Director of the Energenius Centre for Advanced Nanotechnology (ECAN) at the University of Toronto. We are all familiar with the behaviour of objects our size and the Newtonian rules of physics they follow but when things get really small and quantum rules take over, entirely new possibilities open up. To illustrate this, if you threw a ball against a wall it would probably bounce off and come back to you. However, if the ball were less than a nanometre in diameter things would be quite different: when it hit the wall it would tunnel in the quantum scheme. That means it could actually disappear through the wall and come out the other side. Too weird to be true? Maybe not. Devices have already been invented to take advantage of electron tunnelling. One of them is the Scanning Tunnelling Microscope (STM), one of the most valuable tools available to nanotechnology researchers. Gerd Binnig and Heinrich Rohrer won the Nobel Prize in physics in 1986 for having invented this simple but amazing machine only four years earlier. With the STM, researchers can look at individual atoms, and pick them up and move them around. It all sounds like the stuff of science fiction novels, but much of it is close to becoming reality. Nanotechnology is in the process of revolutionizing communications, computing, and medicine. "Small devices could have applications well beyond simple computing, and one of the most exciting areas in which it has great potential is in medicine. There are a few functions which I think are obviously on the horizon in the medical area," Ruda says optimistically, "for example, artificial senses: artificial noses, the artificial retina, the artificial eye." He also agrees with predictions that the technology to make computer chips smaller and self-assemble small numbers of molecules on a surface will soon make diagnostic sensors and biosensors available to doctors. In fact, he suggests that it's not unrealistic to imagine that these chips could actually be sent through our blood vessels to target areas of the body and transmit their findings back to a computer in the doctor's office via radio waves. It seems obvious that nanotechnology is the wave of