

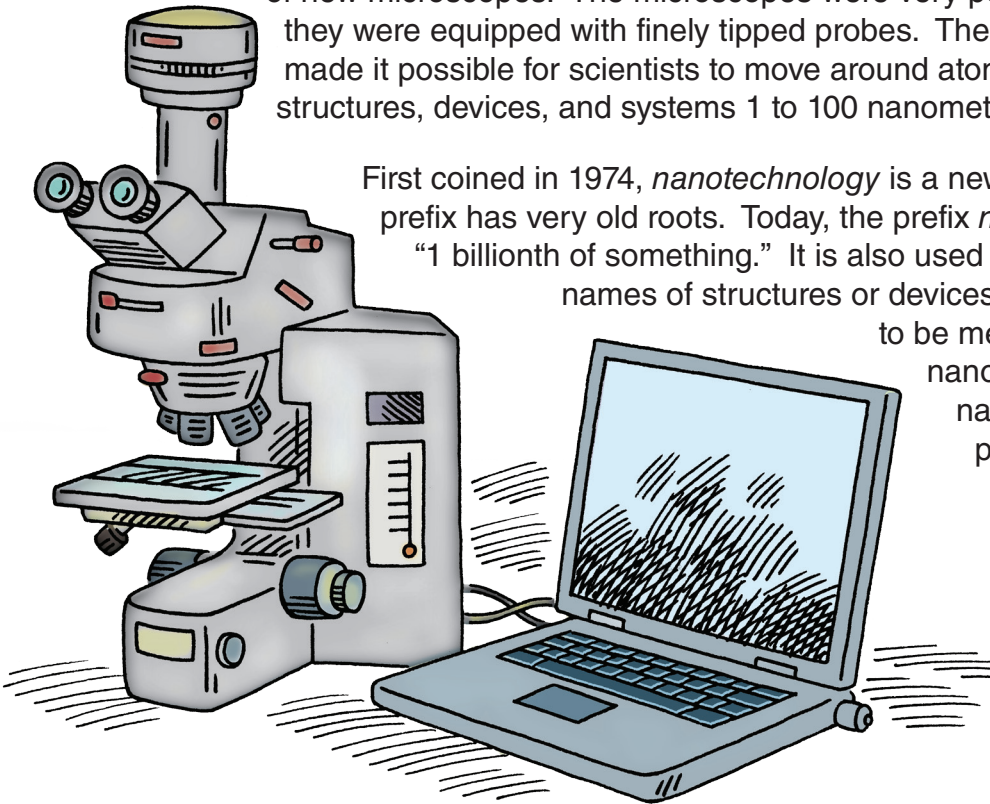
When a Hair Is Big

Nanotechnology is a new scientific field. It is a field that deals with the ultra-small. New things are created by moving individual atoms and molecules around. When something is manufactured with nanotechnology, it is not made from already existing materials such as wood, stone, cotton, metal, leather, or even plastic. When something is manufactured using nanotechnology, the new item or material is built atom by atom, molecule by molecule.

In nanotechnology, scientists use the nanoscale. The unit of measurement in the nanoscale is a nanometer. A nanometer (nm) is 1 billionth of a meter. To get an idea of how small a nanometer is, look at one of your hairs. Most likely, your strand of hair doesn't seem that thick. On the nanoscale, a hair is quite big. How large is it? It is 40,000 nanometers thick! Even a red blood cell is quite big on the nanoscale. How large is it? It measures 7,500 nanometers across!

Until recently, it was thought impossible that people could control how atoms and molecules are put together. The idea of making an object from the ground up was only a topic for science fiction. One reason the field became possible was the development

of new microscopes. The microscopes were very powerful, and they were equipped with finely tipped probes. The microscopes made it possible for scientists to move around atoms and deal with structures, devices, and systems 1 to 100 nanometers in size.



First coined in 1974, *nanotechnology* is a new term, but its prefix has very old roots. Today, the prefix *nano* means “1 billionth of something.” It is also used in front of the names of structures or devices small enough to be measured on the nanoscale, such as a nanoparticle. This prefix’s origin comes from the Greek *nanos*, which means “dwarf.”

Out of the Dark Ages

Dr. Leonardo looked up from the chart of the patient sitting nervously in front of her. “The results of the body scans are in,” she said, “and you have a cranial blood clot that is affecting the blood supply to your brain.”

The patient, already pale, grew noticeably more ashen. “Doctor,” he said, his voice trembling, “this doesn’t sound good.”

Picking up a syringe, Dr. Leonardo walked over to her patient and said, “You’ll begin to suffer extreme and irreversible brain damage if the cranial clot isn’t dissolved immediately. That’s why it’s imperative that we begin treatment now. This is going to sting a bit, but just lie back and try to relax.”

“What’s the injection for?” asked the patient. “Is it to put me to sleep so you can operate?”

“Operate?” laughed Dr. Leonardo as she carefully injected the contents of the syringe into the patient’s right arm. “The time for that is past. I’m injecting a nanoscale robot, or nanobot, into your vein. The nanobot is an advanced nanomachine that will travel through your bloodstream, hitching a ride on a red blood cell and directing it to the blood clot in your cranium. Once the nanobot hits the obstruction, it will dissolve the clot and continue its ride through the circulatory system while it breaks down and is absorbed by the body.”

“But what if before it is absorbed the nanobot mistakenly thinks a vital part of my body is an obstruction and dissolves it?” asked the patient nervously.

“Don’t worry,” laughed Dr. Leonardo. “The nanobot has been precisely manufactured, atom by atom. It can only react to a cranial blood clot. Do you think this is the Dark Ages, when primitive surgeons put people to sleep and used sharp scalpels to make incisions like they did in the year 2015?”

