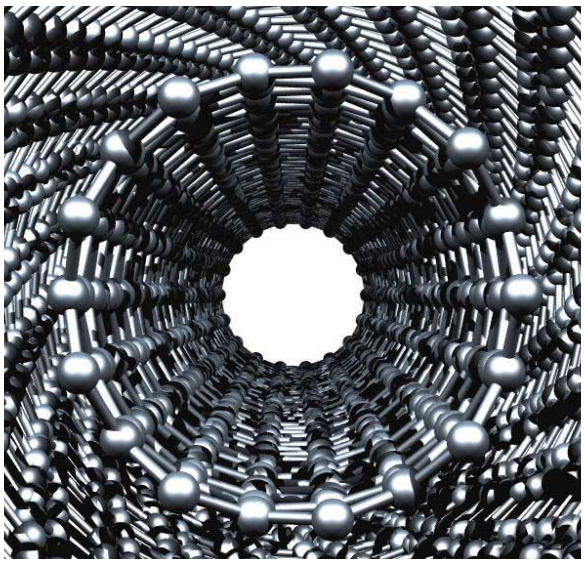
Nanotechnology

Nanotechnology is the science of the small; the very small. It is the use and manipulation of matter at a tiny scale. At this size, atoms and molecules work differently, and provide a variety of surprising and interesting uses.



The prefix of nanotechnology derives from 'nanos' – the Greek word for dwarf. A nanometer is a billionth of a meter, or to put it comparatively, about 1/80,000 of the diameter of a human hair. The image[1] shows a further size comparison.

Nanotechnology should not be viewed as a single technique that only affects specific areas. It is more of a 'catch-all' term for a science which is benefiting a whole array of areas, from the environment, to healthcare, to hundreds of commercial products.

Although often referred to as the 'tiny science', nanotechnology does not simply mean very small structures and products. Nanoscale features are often incorporated into bulk materials and large surfaces.

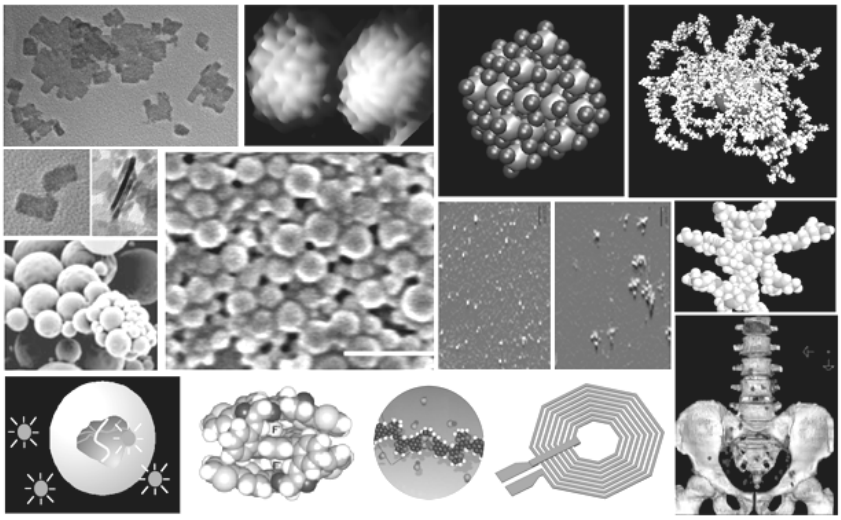
Nanotechnology is already in many of the everyday objects around us, but this is only the start. It will allow limitations in many existing technologies to be overcome and thus has the potential to be part of every industry:

Health and medicine - With advances in diagnostic technologies, doctors will be able to give patients complete health checks quickly and routinely. If any medication is required this will be tailored specifically to the individual based on their genetic make-up, thus preventing unwanted side-effects. As a result, the health system will become preventative rather than curative.

[1] "Double Walled Nanotube", **Homepage of Dr. Chris Ewels**, www.ewels.info/img/science/gallery/DWNT.jpg

Society and the environment - Renewable energy will become the norm. For example, solar cells based on quantum dots could be as much as 85% efficient. Wind, wave, and geothermal energy will also be tapped more effectively using new materials and stored or delivered more efficiently through advances in batteries and hydrogen fuel cells. New ambient sensor systems will allow us to monitor our effect on the environment and take immediate action, rather than "waiting to see". Nanotechnology will also help us clean up existing pollution and make better use of the resources available to us.

New materials - Nanomaterials such as quantum dots, carbon nanotubes and fullerenes will have applications in many different sectors because of their new properties. So quantum dots can be used in solar cells, but also in optoelectronics, and as imaging agents in medical diagnostics. Carbon nanotubes can be used in displays, as electronic connectors, as strengthening materials for polymer composites, and even as nanoscale drug dispensors. Fullerenes can be used in cosmetics, as "containers" for the delivery of drugs, in medical diagnostics, and even as nanoscale lubricants.



Nanoscale materials and devices hold great promise for advanced diagnostics, sensors, targeted drug delivery, smart drugs, screening and novel cellular therapies.[1]

The future of nanotechnology has great potential. However, it also has the potential to change society more than the industrial revolution. It will affect everyone and so should be developed for everyone.

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[1] "[Nanotechnology] ", **Harvard University. Massachusetts General Hospital. Center for Molecular Imaging Research**, cmir.mgh.harvard.edu/imgs/nano/main.png.

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