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INTRODUCTION TO THE NANOWORLD

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We can hear the prefix “nano” all around us – in science, media and economy. We find out about new applications of these particles all the time. A whole new world for science and technology was created with the discovery of nanoparticles. The development of nanoscience began in 1980, when a team of researchers reported the discovery of “Bucky Ball” – a round molecule of 60 atoms of carbon. It was named fullerene. This in turn led to the discovery of a related molecular shape known as “carbon nanotubes”.

Nanotechnology and its importance lies in its statement that everything in this whole world is made up of atoms – the food we eat, the clothes we wear, the buildings and houses we live in and even our own bodies. The properties and structure of the materials used are all determined by the specific arrangement of atoms in those materials. But if we were to rearrange the atoms or modified the material with other nanoparticles we would make it fit our specific needs and requirements. In simpler words – nanotechnology is defined as processing and rearranging of atoms and molecules to develop materials having nano-specifications (nm). The whole science of nanotechnology deals within the range of 1-100 nm. The study of objects at the nanoscale – a dimension 10 thousand times thinner than a human hair – is intriguing. Unusual physical, chemical, and biological properties can emerge in materials at this scale. Properties of nanoparticles may differ in important ways from the properties of bulk materials and single atoms or molecules. Gold particles change color; molecules can conduct electricity without loss.

Nowadays there are a lot of fields, in which nanotechnologies are used. Here are just some of them: nanomaterials, nanoelectronics, nanorobotics, molecular mechanics, nanoengineering, nanobiotechnology, nanofluids, nanometrology, nanoscale networks. "Nanotechnology" products that are on the market today are mostly improved products where some form of nanotechnology enabled material or process is used during manufacturing. In the quest to improve existing products by creating smaller components and better performance materials, all at a lower cost, the number of companies that will manufacture "nanoproducts" is growing very fast.

But what a lot of people don't know, is that when the word “nanotechnology” was first popularized in the 1980's, it had been just about building machines on the scale of molecules, a few nanometers wide – motors, robot arms, and even whole computers, far smaller than a cell. It has since been achieved in a lab, where they created nanovehicles that could carry particles to their destination and therefore create a new structure of the material. This means we wouldn't need to cut down a tree to make a toothpick – we could just form one out of atoms with these machines.

Nanotechnology is the type of science, where we are only limited by our imagination. The opportunities are endless: we could produce cotton clothes that would repel water and don't get wet, we could build a bridge that would be robust, as well as flexible and so indestructible by vibration, we could create flexible electronics, like TVs and phones and we could even cure cancer.

Even though there are some risks with the rapid development of this science, we have to move forward and hope that humanity is smart enough to not let these amazing new opportunities harm our environment and other people.