

GUEST EDITORIAL

NANOTECHNOLOGY: HOPES AND EXPECTATIONS

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The word nano means “one billionth part”. One nanometer is thus one billionth part of a meter. Technology developed at the nanometer length scale is known as nanotechnology. Materials developed using this technology are called nanomaterials. Nanotechnology literally means any technology performed on a nanoscale that has applications in the real world. Some common names that one comes across, while getting familiar with nanotechnology are nanofibers, nanowires, nanotubes, nanorods, nanodots, nanospheres and nano composites etc. Nanomaterials show superior chemical and physical properties compared to their bulk counterparts¹. Understanding, controlling and manipulating materials at the nanoscale and using them for the common good of people is thus the ultimate goal of nanotechnology.

Nanotechnology is everywhere around us. The day-to-day life example is a human body that fundamentally carries all its functions at the nanoscale. Numerous developmental and manipulative techniques can be borrowed from Human body that will enrich nanotechnology in so many ways.

In 1959 at a conference of the American Physical Sciences at California Institute of Technology (Caltech), Richard Feynmann suggested “*There is plenty of room at the bottom*”, which implies that we need to understand everything at the nano-level to bring new technologies and innovations.

Applications of nanomaterials are numerous. These cover a whole range of utilities such as fabric, cosmetics, sunglasses, computer screens, computer chips, TV screens, sport goods and so on. In medical sciences, custom made nanomaterials are used in tissue engineering, bone and teeth implants, controlled drug delivery, and biosensors². Nanofibers with optimized water and stain resistance properties along with their sensitivity to certain stimuli/agents such as light, certain gases and chemicals have revolutionized the fashion industry on one hand and the army defense strategies in the battlefield on the other.

Nanotechnology is considered to change global dynamics. The United Nations (UN) has set some goals for this Millennium which includes eradicating poverty and hunger, achieve universal primary education, combat diseases such as Malaria, HIV/AIDS and ensure environmental sustainability. These goals cannot be achieved without focusing on science and technology at the nanoscale.

Scientists have twofold expectations from nanotechnology.. One, it will reshape the existing technologies, known as the “evolution of technology”. Second, it will bring new technologies into existence known as creation of technology. Under the circumstances, the developing world is curious and confused how and where to contribute in nanotechnology. Salamanca-Buentello et al.³ has identified top 10 nanotechnologies for the developing world. The list is

1. Energy storage, production and conversion
2. Agricultural productivity enhancement

3. Water treatment and remediation
4. Disease diagnosis and screening
5. Drug delivery systems
6. Food processing and storage
7. Air pollution remediation
8. Construction
9. Health monitoring
10. Vector and pest detection and control

The above mentioned top 10 nanotechnologies belong to case one, the evolution of technology. In this case, the developed world such as US, JAPAN, UK, FRANCE etc have a huge edge and are the world leaders with several monopolies and regulations. They will lead the whole world and leave minimum or no chance for the developing world to make a mark. The above list also reminds us of the fact that the developing world will lack the high-tech industry and will be restricted as a global consumer market. Chances are that the developing world will never jump into high-tech as unlike the developed world, they do not have the infrastructure, human resources/skills and financial and political stability crucial to the realization of their technological dreams.

In the second part, creation of technology, the developed and developing worlds are equal. Here no one knows what is next, the same way 1000 years ago people didn't know about TV, computer, cell phone etc. They emerged and prevailed and are now integral parts of our lives. So new technologies may emerge which will change our lives. For example, if there is breakthrough in control fusion at the nanoscale, the energy crisis will be over or if there is breakthrough in bio-interfaces, humans may possibly be benefited with learning things without reading books. The course materials could be copied to human brains if brain and its function is well understood at the nano level. Or new kind of lives can emerge if the sequence of atoms and molecules is well understood that how life came into existence. There are thousands of human curiosities and questions that can be answered if materials at the nanoscale are understood. And these are the areas where the developing world cannot only compete with the developed world but also has a chance to take lead.

Apart from other expectations, Nanotechnology has a call for the developing countries. These countries need to focus on science and technology and should invest more in research. Understanding the fundamental problems in science will pave ways to different new technologies where these countries and nations will be the leaders.

References:

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