Nanotechnology – Ethical and Social Implications

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Nanoethics, or the study of the ethical and social implications of nanotechnology, is an emerging but controversial field. Outside of the industry and academia, most individuals are first introduced to nanotechnology through literary purposes that posit scenarios — that scientists mostly refuse — of self-replicating “nanobots” working amok like a pandemic virus. In the mainstream media, we’re starting to hear reports about the risks nanotechnology poses on the environment, health, and safety, with reports from inside the industry.

Given this growing fascination in nanoethics, in addition to related confusion, this guide is devoted to a survey of some of its central topics.

Some people have complained that nanotechnology isn’t a real discipline in the first place, or at least not a clearly comprehensive one, thereby making its integrity equally ill-defined. Others assert that nanoethics isn’t entitled to its own discipline, since it doesn’t raise any new
questions that aren’t already considered by, say, computer ethics or bioethics.

What is Nanotechnology?

First, we will need to be clear on nanotechnology before we can appreciate the ethical and social questions that arise from it and the controversy about it. Nanotechnology is recognized by the US government and business organizations as “The Next Industrial Revolution.” It’s a new category of technology that entails the use of substances at the molecular level or a scale of approx 1 to 100 nanometers. A nanometer equals one-billionth of a meter.

How little is a nanometer? As one journalist stated, “If a nanometer were anyway magnified to look so long as your nose, then a red blood cell would look the size of the Empire State Building a human hair would be about a couple of miles wide. One of your fingers would span the continental US, and an average person would be about as tall as six or seven planet Earth stacked atop one another.

Working at the nanoscale shows that ordinary materials can have exceptional properties, which we're still learning. At the nanoscale, quantum physics starts to play an integral role like materials, and the significant surface-to-volume proportion of elements means they are much more reactive.

For example, things that are brittle at the standard scale may pose super-strength at the nanoscale. Things that don't usually conduct electricity today might at the nanoscale, among other surprising additions to chemical and physical properties.

A particular example of how properties change with scale, aluminum is used ubiquitously to create harmless soda cans. Still, in powder form, it may explode violently when in contact with air. But it isn't just about the dimensions: new materials can be fashioned by scientists, by manipulating elements common in the nanoscale.

For instance, carbon atoms tied together in a relatively-loose configuration may create graphite or coal found in pens. At a tighter setting, carbon makes diamonds; and a much more exact environment produces carbon nanotubes, the most durable materials known to man, estimated to be up to 100 times stronger than steel in one-sixth the weight.

Given these new properties, nanotechnology is called to enable such things as smaller, faster processing processors that will allow computers to be embedded within our clothes or even in our own bodies; medical advances for radically less-invasive operations and more-targeted drug delivery; lighter, more durable materials which make transportation safer and energy-efficient (e.g., allowing us to journey further into space); new military tools like lighter armor, and energy weapons and countless other inventions.

Some believe that nanotechnology will expand our lifespan by hundreds of years or more by allowing cellular repair, which might halt, reverse or slow, the aging process. And since nanotechnology enables us to control individual atoms — the very building blocks of nature — some have predicted that we'll have the ability to create virtually anything we need in the future.

Ethics and Nanotechnology

The ability to make a drastic change is why Nanotechnology is often known as a "disruptive"

technology. What type of challenges would such change provide? For one thing, about all of the possibilities for nanotechnology can help enhance our own lives raise some intriguing ethical topics.

If nanotechnology helps us live longer or produce manufactured products from cheap raw materials, what's the moral importance of making such benefits available? Is there sufficient regulation or understanding of nanotech-based materials to avoid our environment or people?

How can molecular manufacturing have an effect on our global economy? Molecular manufacturing could spawn another shift akin to the industrial revolution, which would completely transform the way we do business and make billions of people out of work. Industries might become obsolete. At the same time improvements could make it easy and economical to make weapons.

What would the replicator, once produced, do to our society as we know it now? If people could simply make many items they want themselves, what would inspire people to work hard for the things they need?

What would happen if nano medication made it possible for us to stop aging by making repairs at the cellular level? If everyone could live hundreds of years, what could happen to our society and economy? Would just an elite few get such treatment, and what effects would that have? If no one ever died, would people have to stop having children to avoid overpopulation?

What are the priorities of nano research? Suppose third world nations could be helped by improvements in water quality or energy production. Should those more basic requirements come before the necessity of a middle-class person only need to charge his laptop once a month or to replicate his own iPhone? Will the attraction of users able to spend money on a product or service outweigh the requirements of starving children or poor countries?

Companies Working on the Ethical Issues of Nanotechnology

More exceptional minds than mine are hard at work, attempting to address the ethical challenges of nanotechnology. Here's a sampling of these groups and their mission

statements:

The Nanoethics Group is a non-partisan organization that studies the societal and ethical implications of nanotechnology. They engage the public and collaborate with research institutes and nanotech ventures on related issues and initiatives.

The Center for Responsible Nanotechnology (CRN) is a nonprofit research and advocacy think tank bothered with the significant societal and environmental implications of innovative nanotechnology.

Latin American Nanotechnology and Society Network (ReLANS) plans to create a forum for exchange and discussion of information that follows the nanotechnology development procedure in Latin America. To this end, ReLANS will establish connections and cooperation agreements with academic institutions, governments, and society, intending to analyze and assess the political, economic, social, legal, ethical and environmental implications of nanotechnologies which are domestically developed, and/or in cooperation with overseas centers and associations, and imported goods that include nanocomponents.

Focus Nanotechnology Africa Inc. (FONAI) was formed in 2006 as a 501c3 not-for-profit educational and scientific organization, particularly in the US, Africa, and the Caribbean to fight brain drain and all sorts of poverty including science and technological poverty.

And many research groups such as the Whitesides Research Group at Harvard University are a significant problem in using first-world science to benefit the welfare of people in developing economies. The Whitesides team is currently utilizing its competencies in biology, engineering, and materials science to attack this sort of global problem, focusing on local energy generation and health diagnostics.

Read the original article on Nano Tech News.