A Sustainable Environment: Our Obligation to Protect God's Gift

by

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Convergence of Sustainability and Nanotechnology

Environmentalists and industry have focused on the issue of sustainability for some time. Recently, however, the media has started to address this notion and has given increased coverage to environmental issues, particularly issues related to energy, global warming, and water. Some of this coverage has addressed whether nanotechnology may aid in resolving these issues.

One of the greatest environmental concerns on a worldwide basis is global warming. Scientists have positively concluded that this event has and continues to occur, and that it is the result of human activity. Carbon dioxide emitted from numerous sources, primarily electrical power plants and automobiles, has increased the atmosphere's retention of heat generated by the sun's rays. This is the result of a thick carbon dioxide layer in the atmosphere that is expected to remain, possibly forever. However, there may also be another phenomenon caused by pollutant particles in the atmosphere that produces an opposite cooling effect called global dimming. Separate studies measuring the amount of sunlight passing through the atmosphere and also measuring the rate of evaporation of water. Each of these two studies indicates that there has been a change in the measurements over a period of time causing global dimming. If this is truly the case, the warming effect from carbon dioxide must be greater than we thought. And, if these particles are the result of power plant emissions, and if some of these power plants are replaced by renewable energy sources, the resulting reduction in particles could subsequently increase global warming. So, perhaps, the real answer to these opposing phenomena can be found if we examine them at the nanoparticle level.

Another critical environmental issue is the depletion of our natural resources. In a book entitled Biomimicry, Janine Benyus suggests that we take a more careful look at nature's amazing processes to become more efficient in the manufacturing of our products. An example of biomimicry is how spiders produce several different kinds of silk for various functions, such as forming webs or rappelling from drop-offs. The properties of these spider-produced silks are astounding when compared to man-made materials. Compared on an equal weight basis, some of these spider-produced silks are five times stronger than steel and five times tougher than Kevlar, the material used in bulletproof vests. At the same time, the silk can be very elastic and stretch up to 40% of its original length, something that steel wire is incapable of doing. Just imagine if someone could learn to do what the spider does, taking a renewable, soluble material and making an extremely strong water-insoluble fiber using very little energy and generating no toxic waste. By analyzing the spider's process and reproducing it, the entire fiber industry would change dramatically. This may be another role for nanotechnology.

Ms. Benyus provides other examples of natural phenomena that are extremely interesting. These include the abalone shell that is stronger than any known ceramic. If we look at the natural design of the inner coating of these shells, we may learn how to manufacture stronger materials and more sustainably. Still another example is the adhesive created by mussels and other bivalves, allowing them to attach to almost anything, and these adhesives are waterproof. By examining these natural phenomenon at the nanoscale, new doors may be opened in our continuous search for a more sustainable environment.

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