

The Bookshelf

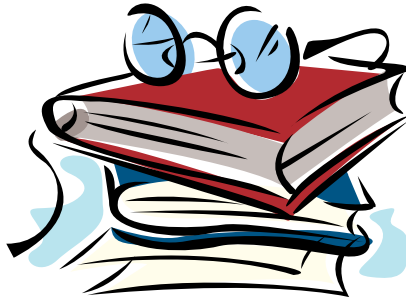
Book Review Editor: Theodore J. Weidner, Ph.D., P.E., AIA

Nanotechnology: Environmental Implications and Solutions, by Theodore, Louis and Robert G. Kunz, Wiley-Interscience, New York, 2005. 366 pages, \$99.95, hardcover.

Universities are all about research and instruction. The research is usually cutting-edge. It can be exciting and attract a great deal of interest. Research can also be a challenge for the facilities organization. One of the research areas to challenge higher education facility and safety officers is nanotechnology.

Rising to the challenge of dealing with a new technology often requires the facility officer to do some significant research in order to address the challenge adequately. In the 1980's research into semiconductors lead facility officers to understand how to deal with very hazardous chemical and gasses. There were gasses that ignited when exposed to oxygen and others where the researchers joked if you could smell almonds you would be dead. As we designed the facilities we met with local code officials and explained why the local building code actually made the laboratory more dangerous; we got variances and developed new safety devices. We installed sophisticated air and gas detection systems, tied them to alarms and the buildings automation system, and set aside a room as an emergency management center in the event

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something went wrong in our new, expensive, sophisticated laboratory.

Now, to assist with the management of facilities and nanotechnology research, among other things, Theodore and Kunz have compiled an important and dense reference to assist the university facility and safety

officers with the challenges of nanotechnology. *Nanotechnology: Environmental Implications and Solutions* begins with what nanotechnology will do for society. Imagine a spray for paper that makes it water-proof yet you can still write on it. Those khaki slacks you may be wearing resist spills and stains thanks to nanotechnology; it's a little like Alec Guinness in *The Man in the White Suit*. But what happens if the nano materials don't end up where they are supposed to? How do we deal with them?

Nano-sized particles are small, extremely small. The average human hair is about 10,000 nanometers (nm) in diameter. Some bacteria are 1,000



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nm in size while the common cold virus is 20 nm. Nano-particles are anything 100 nm or less. Their small size means they fit into the cracks and crevices of most common materials. That size also means they behave differently. Controlling nano-materials is a challenge because normal air filters might not work. If not floating in the air, nano-materials might be suspended in water or an apparent solid form

like very fine sand. How can they be managed to prevent accidental exposure, inhalation, ingestion, etc. What will happen to someone with nano-materials in the lungs?

I'll be the first to say this book is not an easy read so I don't recommend it to people who don't have to deal with nanotechnology researchers unless you like science. Even then, the "Cliff Notes" version might be pre-

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ferred. However, the authors do a good job introducing the positive aspects of nanotech first, then address the potential environmental and health implications and the physics behind our 'standard' environmental management systems and how nano-materials will behave as we attempt to filter, trap, sequester, or manage these materials. In addition to the physical issues the authors discuss risk assessment for health and the environment. Lastly, there are several scenarios presented to pose ethical questions for professionals. Each scenario then poses several questions which go unanswered and clearly require discussions with others and ethicists.

Does this book tell the reader everything needed when a new nanotechnology laboratory or facility is constructed on your campus? No. But it will help the determined reader grasp many of the implications, challenges, and opportunities presented by the management of nanotechnology materials. It is my intent to keep this book and study it more as my university makes plans for a nanotechnology research building. If you have a similar situation, this book may be for you.

This is one of the first books on the subject and it will not be the last. Nano-materials form a vast research area with many possible benefits. We'll have to develop means and methods to deal with these materials so we can avoid, as best we can, situations similar to asbestos, PCBs, and other materials. Chief Seattle said, "Continue to contaminate your bed and you will one day lay [sic] in your own waste." Learning how to manage these new materials is essential for our future. 🏠



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