



## **The New World of Materials Science & Engineering: Nano & Bio Technology**

Robert L. Snyder

School of Materials Science and Engineering  
Georgia Tech, Atlanta GA USA 30309

The two most important events in Materials Science and Engineering in the past 50 years have been the introduction of surface free energy as a tool for creating new materials and the cracking of the genetic code of the entire biosphere which is underway and is creating a tidal wave of information that is going to transform our technology to the core. These two events are intertwined at the most fundamental level in that the key to the assembly of complex nanomachines lies within each of our cells. The ribosome has done its evolutionary job of getting us to 2010 and its now time to turn this marvelous machine loose to manufacture materials and machines that have nothing to do with evolution.

In this talk I will start with a fundamental examination of the nature of nanomaterials and show how many beautiful structures of ZnO may be made. We will then turn to the applications of nanowires, nanobelts and carbon nanotubes to the making of field-effect transistors, lasers, self-cleaning surfaces and nano-sized electrical generators.

I would then like to explore applications of using the machinery of the living cell to manufacture nanostructures via biomimetics to use structures that already exist in nature – collecting the low hanging fruit. Nature provides elegant examples of organisms that generate three-dimensional structures with complex patterns from the macro-scale to the nanoscale. Lastly we will look at methods to take genes from species producing desirable structures, perhaps modify them, and then retrofit them onto a compliant single celled bug who will become a manufacturing unit. By mid 21<sup>st</sup> century I believe that we will know enough genetics, biochemistry and materials science to computer design genes to produce devices from nanomachines to complete computer systems, using the machinery in each of our cells..



ROBERT L. SNYDER is Professor and Chair of the School of Materials and Engineering at The Georgia Institute of Technology. He is the author of two textbooks, has edited nine technical books and has contributed chapters to nine books and encyclopedias. He holds eight patents and has published over 285 papers on materials and materials characterization which have been cited by other authors more than 2000 times. He has presented over 1,000 talks around the world with over forty plenary and keynote lectures and has graduated more than 50 graduate students. He is a Fellow of the American Society of Metals, The American Ceramic Society and Distinguished Fellow of The International Centre for Diffraction Data.

He is a Principal Editor for the Journal Materials Research and the Journal of the American Ceramic Society. He serves on the organizing committees of a number of international conferences and chairs the annual Denver X-ray Conference. He has been named the American Ceramic Society Outstanding Educator and has received the State University of New York Chancellor's Award for Excellence in Teaching, the 2002 TMS Award for Materials Leadership, the 2004 Hanawalt Award for X-ray analysis and received the 2008 TMS Educator Award.