Nanotechnology a tiny world of mystery and possibility

Scientists in the classic sci-fi movie “Fantastic Voyage” were miniaturized and traveled through the bloodstream to destroy a life-threatening blood clot in a human’s brain. While miniaturizing humans is likely to remain the stuff of science fiction, using tiny molecules to prevent blood clots in humans and eat away cholesterol deposits is a real possibility. So says Paul Burrows, manager of the Pacific Northwest National Laboratory’s Nanoscience and Nanotechnology Initiative.

“Nanoscience and nanotechnology bring a new dimension to advancing medicine, solving environmental problems and reaching new heights in technical achievements,” Burrows said.

At the next Community Science and Technology Seminar Series on Wednesday, Dec. 5, Burrows will take the audience on a fantastic voyage through the world of the very small and describe a few of the many possibilities of this revolutionary science. His presentation, “Big Possibilities from Tiny Technologies,” will be at the Columbia Basin Advanced Technology Center on the Columbia Basin College Pasco campus starting at 7 p.m. Wednesday. The presentation, sponsored by PNNL and CBC, is free and open to the public.

Burrows is an internationally recognized expert in the science and technology of organic semiconductors, a type of material that potentially can transform the world of electronic circuit and video display technology. He is fascinated with what may be the ultimate in electronic miniaturization — functional circuits based on single molecules. This interest has broadened into the study of a wide range of organic thin-film and bulk materials for optoelectronic applications.

Burrows

“Nanotechnology is the first major change in manufacturing philosophy since the Stone Age,” Burrows said. For more than two million years, the idea in manufacturing has been to take lumps of a material and whittle them down to build the desired object. While the tools have changed from granite axes to silicon microchips, top-down manufacturing still dominates. “Nanotechnology turns that view upside down,” he said. “Nanotech-nology is designing at the molecular level and building these molecules into useful tools from the bottom up.

“The ability to precisely combine and manipulate single atoms and molecules presents tremendous opportunities to address a wide range of society’s critical challenges,” Burrows said. “We are contributing scientific and technical resources to the nation’s knowledge and understanding of the phenomena that occur at the nanoscale. For example, we’re growing nanoscale magnetic semiconducting oxides that could be used in future-generation computing systems.”

Researchers also are studying materials on the nanoscale to see how they can be manipulated and how they might be useful. In biological applications, studies are being conducted to understand the properties of individual biomolecules and their functions in living cells. And, using leading-edge equipment at the William R. Wiley Environmental Molecular Sciences Laboratory, scientists and engineers are designing, creating and testing nanoscale systems.

Burrows earned a doctorate in physics from Queen Mary College at the University of London. He was a research scholar at Princeton from 1995 to 2000, after which he joined PNNL. He previously held research positions at the University of Southern California and the Riken Institute for Physical and Chemical Research in Saitama, Japan. ■