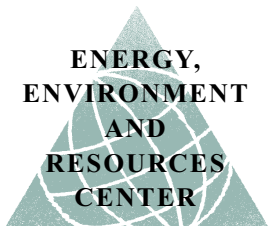


HIGHLIGHTS and INITIATIVES



EERC

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Clean Technologies
Jack Geibig,
Acting Director

Office of Communications
David Brill, Director

Center for Geography and
Environmental Education
Rosalyn McKeown, Director

Oak Ridge Technology Research
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and edited by David Brill
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The EERC conducts unbiased,
analytical, and multidisciplinary
research designed to promote real-
world solutions to problems in the
fields of energy, environment, tech-
nology, and economic development.

NEW OUTREACH MATERIALS. EERC's Office of Communications and Publications, under the direction of **David Brill**, has released a video and new eight-page brochure that present EERC's projects, programs, and staff to external audiences, including potential funders and collaborators. Graphic artist **Bonnie Morris** designed the brochure, and **Rosemary Walker** of UT's Television-Video Services, produced the video. We've enclosed a copy of the brochure for your review. Contact **David Brill** <dbrill1@utk.edu> if you would like to receive a copy of the video on CD.

NEW STAFF. EERC welcomes several new and returning staff members and projects to its offices.

Tim Ezzell and **Eric Ogle**, director and program coordinator respectively of UT's Community Partnership Center (CPC), have moved from Aconda Court to EERC's suite in the Conference Center Building. Established in 1994, CPC works to create equitable partnerships between the University of Tennessee and low- and moderate-resource communities and creates service-learning and volunteer opportunities for UT faculty and students. Under a Collaborative Research and Teaching Project funded by the Appalachian Regional Commission, CPC initiated an environmentally sustainable community planning and decision-making process in Cocke County, Tennessee. The process resulted in creation of decision-making guidelines and a plan for recruiting "green" industries to the county. CPC hopes to introduce the process to other rural counties in Tennessee.

John Peine, an adjunct professor in UT's Forestry, Wildlife, and Fisheries Department and former Chief Scientist for Great Smoky Mountains National Park, has relocated from Hoskins Library to EERC offices. **Peine**, a scientist with the U.S. Geological Survey's Biological Resources Division, is an ecosystems and human-dimensions specialist whose more than 20 years of research on the Southern Appalachians has explored ecosystems management, sustainable development, land use and sprawl, environmental education, visitor use, and recreation planning, among other themes. **Peine's** current research focuses on establishment of a network for conducting environmental inventory and monitoring along the 2,100-mile Appalachian Trail.

Rosalyn McKeown, director of EERC's Center for Geography and Environmental Education and co-director of the Tennessee Solid Waste Education Project, has resumed her activities at EERC following a two-year leave during which **McKeown** entered the classroom as a public high school teacher. **McKeown** serves as secretariat for the United Nations Educational, Scientific, and Cultural Organization's (UNESCO) Chair on Reorienting Teacher Education to Address Sustainability and secretariat to the United Nations University Chair on Education for Sustainable Development. **McKeown**, the former president of the Tennessee Environmental Education Association and former secretary of the North American Association for Environmental Education, created the Environmental Literacy and Citizenship Assessment Instrument and the Education for Sustainable Development Toolkit. She has received requests for permission to translate the toolkit, which is distributed globally via the World Wide Web, into 11 languages. You can find the toolkit here <<http://www.esdtoolkit.org>>.

Nanotechnology: The Next Big/Little Thing



Each *Highlights and Initiatives* back page presents a closer look at one of our current projects or activities. This edition focuses on nanotechnology and presents details on a upcoming workshop on this rapidly advancing field of science.

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Nanotechnology: *The Next Big/Little Thing*

Social oversight of nanotechnology needs to keep pace with the technology's growth and development. BY JACK BARKENBUS, EERC EXECUTIVE DIRECTOR

“The pharmaceutical industry hopes to see the development of ‘smart pills’ that can circulate in the body longer than conventional pills and deliver precise therapeutic doses at precise times.”

TECHNOLOGICAL DEVELOPMENT, which has transformed the human condition so remarkably, shows no sign of abating. In fact, the pace of development is likely to accelerate during this, the 21st, century. At the forefront of this movement stands nanotechnology, described as the ability to work at the molecular level, atom-by-atom, to create materials and systems with fundamentally new functions and characteristics. Materials and structures produced are at the 1 to 100 nanometer scale—a nanometer being one billionth of a meter.

Nanoscience and nanotechnology are being made possible by breakthroughs in the use of newly developed tools that allow humans to view individual atoms and then manipulate them purposefully to create customized products containing unique and novel properties. *The New York Times* (6/17/03) heralded, for example, carbon nanotubes for possessing the strongest fibers known to man—four times tougher than spider silk and 20 times tougher than steel.

It is important to understand that nanotechnology is in its earliest days of commercial development and that there are very few (albeit a growing number of) products of nanotechnology on the market today. For now, these products focus primarily on making existing or familiar products better in some marginal way. Nano-composite sealants, for example, are extending the life of tennis balls. Nanoparticles can also be found in fabrics, which makes them more stain- and water-resistant. While these developments are useful and intriguing, they're not transformational from a societal perspective.

Yet, not too far in the wings looms the possibility of life-changing advances in the electronics and pharmaceutical industries. For example, electronic circuits, based perhaps on carbon nanotubes, hold the promise of taking the electronics industry well beyond where current technologies can go.

Meanwhile, the pharmaceutical industry hopes to see the development of “smart pills” that can circulate in the body longer than

conventional pills and deliver precise therapeutic doses at precise times. Other potential breakthroughs could emerge in energy (such as generation through cheap, but efficient, photovoltaic cells), environmental cleanup, and the military.

The outlook for product development is more obscure but also potentially more revolutionary when looking beyond the next 10 years. For instance, scientists may create nanobots (extremely small robots) that could be inserted into human bloodstreams, not only to monitor the body for early signs of disease, but to deliver cell-directed treatment. Considerable controversy already exists as to whether molecular manufacturing is possible, and, if possible, whether it is ultimately desirable.

Phillip Bond—a chief “cheerleader” for nanotechnology in his position as undersecretary for technology in the Department of Commerce—is said to have claimed in a *Washington Post* article, “This technology is coming, and it won't be stopped.”

Well, before Mr. Bond and other enthusiasts get carried away, perhaps a little historical background is in order. Other technologies have come along for which scientists and entrepreneurs have shown equal enthusiasm but which the public has come to view with extreme caution. Three technologies immediately come to mind: asbestos, nuclear power, and genetically modified organisms. Each of these has failed to live up to its promise (as yet), because of inadequate attention to public concerns. With greater prosperity, we have become a more risk-averse society, and no technology, no matter how spectacular its potential, will get a free ride. Grave concerns have already surfaced over toxicological, privacy, and human control issues associated with nanotechnology.

Historically, the Energy, Environment and Resources Center has examined the public-technology interface, and this expertise will again be brought to bear on the emerging field of nanotechnology. Nanotechnology's future is too important to be left solely to commercial entrepreneurs.

Workshop. On October 26, in the Science and Engineering Research Building, EERC and UT's Center for Environmental Biotechnology will host a day-long workshop devoted to the exploration of nanoscience and nanotechnology. The workshop, which is free and open to UT faculty, staff, students, and others interested in this burgeoning field of science, will address nanotechnology's potential, ways to boost the profile of nano research and development in East Tennessee, and environmental and public policy concerns. A special 12-page edition of EERC's quarterly newsletter *InSites* is devoted to nanotech research and development taking place at UT. You can access the newsletter here <<http://eerc.ra.utk.edu/insites/ins12-2.html>>.

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