UC SANTA BARBARA

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UCSB Researchers Part of $24 Million Center to Study Environmental Risks of Nanoparticles

UC Santa Barbara faculty members will join colleagues from other universities within the UC system in playing key roles in a five-year, $24 million nanotechnology risk-assessment project funded by the National Science Foundation (NSF) and the U.S. Environmental Protection Agency (EPA). The UC Center for the Environmental Implications of Nanotechnology (UC CEIN) will be the nation's first such large-scale study of the potential ecological effects of nanomaterial forms.

Headquartered at UCLA, the UC CEIN will have as its two pillars teams of researchers at UCLA and UCSB. UCLA professor Andre Nel, who will serve as center director, said of the collaboration, "I look forward to interacting with the distinguished faculty at UCSB on a nationally important and exciting endeavor that reflects the excellent environmental science at UCSB."

Arturo Keller, professor in the Bren School of Environmental Science & Management, will be the associate director, working in collaboration with other UCSB faculty members. Bren professor Patricia Holden and associate professor Hunter Lenihan will lead two of the seven Integrated Research Groups. They'll collaborate with UCSB environmental studies (ES) professor and chair Josh Schimel and ES professor William Freudenburg; and Barbara Herr Harthorn, associate professor of feminist studies and director of the NSF Center for Nanotechnology in Society at UCSB (CNS-

UCSB), who will also lead an Integrated Research Group. Other UCSB project researchers include Roger Nisbet, professor and vice chair, Department of Ecology, Evolution, and Marine Biology (EEMB); EEMB assistant professor Bradley Cardinale; and Galen Stucky, professor, Chemistry and Material Research Labs.

Funding for the center is part of the National Nanotechnology Initiative (NNI), a multi-agency federal program created to encourage development of nanotechnology in the U.S. economy.

"The NSF and the EPA jointly initiated this research program because the government has too little scientific basis to determine regulatory policy in this area right now," said UCSB Vice Chancellor of Research Mike Witherell. "A powerful team of researchers from UCLA and UCSB developed a compelling proposal showing how they would cover the broad landscape of research issues."

"It's great seeing the Bren School and UCSB so well represented in this important project," said Bren School Dean Ernst von Weizsäcker. "As a practical, solution-focused collaboration involving cooperation across several disciplines, the UC CEIN is a perfect example of the best kind of environmental science and research."

The pace of nanotechnology development is outpacing what is known about potential risks of synthesized nanoparticles, which are found in a variety of commercial products, according to Holden. With new engineered nanoparticles emerging at a rapid and accelerating rate, scientists are only now beginning to study how they behave in the environment, with an eye to preventing problems of the kind encountered with asbestos.

"The field is changing so rapidly and the landscape of different particles is nearly infinite," says Holden, who will lead a research group investigating cellular interactions of nanomaterials and ecological effects in soils. "We need to rationally but rapidly approach this new field: rationally in a way that distinguishes effects of engineered versus natural nanomaterials, but rapidly to deliver guidance into the future for environmentally responsible synthesis."

Keller, who will lead a research group investigating the fate and transport of nanoparticles in water, says, "We want to know how nanoparticles bond with other particles, how long they last, if and how they accumulate, how they move through the environment, and how and at what levels of concentration they might affect living things."

"NSF and EPA decided to look at these questions," Keller adds. "Nanotechnology started to pick up in the 1990s, and now it's beginning to explode. Yet, we have very little information about what happens to the nanoparticles when they get into the environment. We don't want to repeat the mistakes of the past."

Lenihan says, "This is also an excellent opportunity to develop truly interdisciplinary ecotoxicology science. Integrating environmental chemistry, biochemistry, and biomedicine into our approaches to the ecotoxicology of nanoparticles will advance scientific knowledge and our ability to manage nanotechnology safely."

The UC CEIN evolved in part from an ongoing UCLA-UCSB collaboration funded by the UC Toxic Substances Research and Teaching program, in which Bren and UCLA faculty co-presented courses on the principles of nanotoxicology and from which several Bren Ph.D. students have received fellowship support for their research in nanotoxicology. CEIN will also have an education and outreach component to create new courses –– for instance, on the safe handling of nanoparticles –– that will be broadcast to the UC system, industry, government agencies, and other audiences that would find the information useful. In addition, says Keller, "We plan to have journalist/scientist workshops once a year to share information and gauge perceptions. In training students, we have a chance to develop more of a preemptive mindset for new technology to avert unexpected negative environmental consequences."

The collaboration will also include researchers at UC Davis, UC Riverside, Columbia University, Germany's University of Bremen, Nanyang Technological University in Singapore, and the University of British Columbia.

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collaboration that is responsive to the needs of our multicultural and global society. All of this takes place within a living and learning environment like no other, as we draw inspiration from the beauty and resources of our extraordinary location at the edge of the Pacific Ocean.