Rice University –Center for Biological and Environmental Nanotechnology

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Main Activity

Rice University's world renown nanotechnology focus is highly integrated into a number of disciplines ranging from policy making decisions to fundamental physical – chemical processes. Rice has two outstanding centers that highlight current nano-based research, development and education: The Center for Biological and Environmental Nanotechnology (CBEN) and The Smalley Institute (SI).

CBEN

The US National Science Foundation supported Center for Biological and Environmental Nanotechnology (CBEN) mission is to discover and develop nanomaterials that enable new medical and environmental technologies.

The mission is accomplished by the following:

· Fundamental examination of the 'wet/dry' interface between nanomaterials, complex aqueous systems, and ultimately our environment (Theme 1).

· Engineering research that focuses on multifunctional nanoparticles that solve problems in environmental and biological engineering (Themes 2, 3).

· Educational programs that develop teachers, students, and citizens who are well informed and enthusiastic about nanotechnology.

· Innovative knowledge transfer that recognize the importance of communicating nanotechnology research to the media, policymakers, and the general public.

This mission is inspired by the observation that because of their small size and unique properties, nanomaterials interact with and control biological systems in entirely new ways. Our research exploits these novel capabilities to develop innovative biomedical and environmental technologies. To ensure that our technologies flourish, our outreach addresses broader issues such as technology transfer, public acceptance, and workforce training.

The Center for Biological and Environmental Nanotechnology fosters the development of this field through an integrated set of programs that aim to address the scientific, technological, environmental, human resource, commercialization, and societal barriers that hinder the transition from nanoscience to nanotechnology. Please visit the website for more information: http://cben.rice.edu/

CBEN Research

The Center's research focuses on investigating and developing nanoscience at the "wet/dry" interface. Water, the most abundant solvent present on Earth, is of unique importance as the medium of life. The Center's research activities explore this interface between nanomaterials and aqueous systems at multiple length scales, including interactions with solvents, biomolecules, cells, whole-organisms, and the environment. These explorations form the basis for understanding the natural interactions that nanomaterials will experience outside the laboratory, and also serves as foundational knowledge for designing biomolecular/nanomaterial interactions, solving bioengineering problems with nanoscale materials, and constructing nanoscale materials useful in solving environmental engineering problems.

CBEN Education

Given the goal of transforming nanoscience into a strong, vital discipline, the Center must draw new talent into the field. Educational outreach efforts develop programs to identify, recruit, and train the nanoscience workforce of the future. As a centerpiece program, 9th grade teachers in the minority-rich Houston school district are being trained to engage in the more successful but challenging discovery-based teaching style. The Center provides content lectures and tutoring to these educators and offers a meaningful experience in research laboratories. These teachers also identify students to participate in a Center science academy. New curriculum and textbook development, a summer Research Experience for Undergraduates program, and research in Center-funded laboratories extend the Center's educational outreach activities to the undergraduate and graduate levels.

CBEN-ICON Industrial Connections
In addition to a more traditional industrial affiliates program, the Center embraces the increasing importance of small and startup companies in high technology development by partnering with Rice's Jones Graduate School of Management in an entrepreneurial education program. This provides Center members with the skills needed for the more active interactions such organizations demand, and through associated activities brings scientists, students and business experts together to ensure the formation of successful startups based on Center research. The interactions with industry have led to understand that among the greatest barriers to successful commercialization of nanotechnology are concerns over safety, environmental impact, and public education. In addition to scientific research in these areas, CBEN is addressing these issues more comprehensively through ICON, the International Council on Nanotechnology, a broad-based coalition including representatives of industrial, governmental, academic, and public concerns.

Smalley Institute:
The Smalley Institute at Rice University has dedicated to leading the world in solving humanity's most pressing problems through the application of nanotechnology. As Professor Richard E. Smalley so aptly put it, "Rice's research reputation comes from solving the hardest problems in science. Others can work on the easy ones, the applied problems. Focus on the grand challenges, the holy grails in nanotechnology. Professor Smalley identified the Top Ten Problems Facing Humanity over the next 50 years as energy, water, food, environment, poverty, terrorism & war, disease, education, democracy, and population.
The Smalley Institute currently focuses on 5 Grand Challenges: energy, water, environment, disease, and education. Rice University researchers endeavor to impact each Grand Challenge through the application of nanotechnology which we categorize into eleven Nanotechnology Disciplines.

- Analytical Nanotechnology
- Nanotechnology in Biology, Health, and Medicine
- Nanotechnology enhanced Devices
- Nanotechnology Education
- Nanotechnology in Energy
- Environmental Nanotechnology
- NanoMaterial
- NanoPhotonics
- NanoPhysics
- NanoScience/NanoEngineering
- Sociological Nanotechnology

Because of the multidisciplinary nature of nanotechnology, many Smalley Institute researchers work in 3 or more of these focus areas. The University invite to Learn More about the specific Grand Challenges and Nanotechnology Disciplines through the Smalley Institute website (http://cnst.rice.edu).

Sector

NANOTECHNOLOGY

-Enviroment
-Monitoring
-Metrology
-Protection
-Remediation