

Our mission is to create sustainable nanotechnologies that improve human health and the environment.

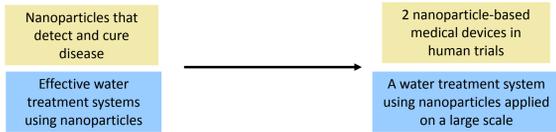
CBEN's Technology Goals

Strong Interactions Between Themes

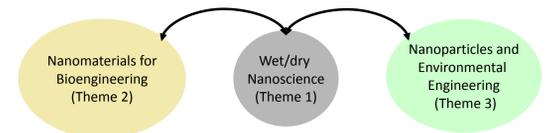
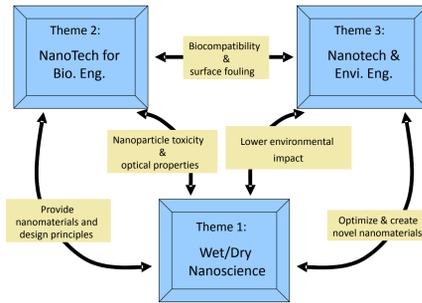
CBEN's Research

Center Goals

2011 Outcomes



- Long-range technology goals drive all center projects
- All efforts involve engineered nanoparticles in water
- Three theme areas – Theme 1 is science of bionanointerface



Dr. Jennifer West

Dr. Vicki Colvin

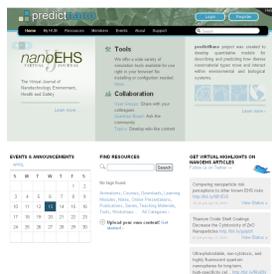
Dr. Pedro Alvarez

Shared needs and enabling technologies provide added value for CBEN

CBEN Researchers lead US Universities in Creation of Risk-Management Tools for Nanomaterials

Goals

- Investigate how local environmental chemistry influences nanomaterial availability
- Create "plug-and-play" tool for regulators and environmental managers to use in risk assessment and management



US Partners

- Rice University (US lead)
- UC Davis

United Kingdom Partners

- Birmingham University (UK lead)
- Exeter University
- Napier University
- Nottingham University

CBEN and it's activities

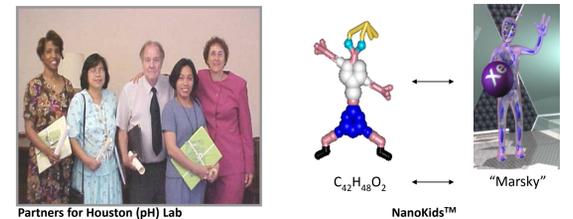
To create sustainable nanotechnologies that improve human health and the environment

We do this by:

- Exploring the wet/dry interface.
- Solving biomedical & environmental problems.
- Nurturing sustainable nanotechnologies.
- Training future nanotechnologists.

Educational Programs are Effective

Using nanotechnology as a means—not an end—to science education



We have reached >6000 students, 200 teachers and 3000 citizens since 2001

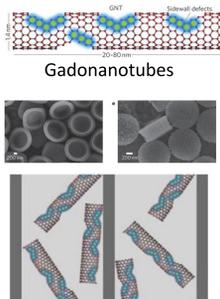
- Flagship teacher training program now fully funded by local school district
- NanoKids™ materials available free of charge on web for all students, teachers
- CBEN faculty and students now exceed national averages in diversity

Silicon microparticles, gadonanotubes promise big advance for medical imaging

Trapping gadonanotubes inside nanoporous silicon increases medical imaging contrast up to 50 times

Results

- Silicon microparticles trap gadonanotubes inside nanoscopic pores
- The geometrical confinement enhances the MRI signal by altering the paramagnetic behavior of the Gd³⁺ ions
- The gadonanotube-SiMP construct showed 4 to 50 times enhancement over clinically available gadolinium-based agents



Silicon microparticles (SiMPs)

Gadonanotubes trapped within nanopores of SiMPs

Nature Nanotechnology 5, 815–821 (2010)

Team

- Lon Wilson (CHEM, CBEN)
- Mauro Ferrari (BIOE)
- Paolo Decuzzi (University of Texas Health Sciences Center)

The Shared Equipment Authority

The SEA provides campus-wide oversight of shared equipment planning and administration, raises federal and private funds for shared equipment acquisition and maintenance, and revises institutional policy on cost centers to more efficient management shared research equipment.

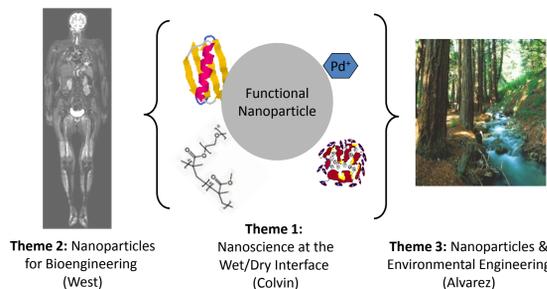


Decision-making Across Departments

- 15 faculty from science and engineering (volunteers)
- Members have critical interest in shared equipment
- Ongoing evaluation of financial health of shared facilities
- Consensus building and negotiation:
 - Sale of underused equipment
 - User fee pricing structure
 - Priorities for campus wide grants
 - Training and access policies
 - Personnel priorities

CBEN's Organizing Principle

Nanoscience and Technology at the Wet/Dry Interface



Theme 2: Nanoparticles for Bioengineering (West)

Theme 1: Nanoscience at the Wet/Dry Interface (Colvin)

Theme 3: Nanoparticles & Environmental Engineering (Alvarez)

Extends Water Treatment Pilot Project to More Nanoparticle Types



Nanomagnetite removes arsenic.

CBEN scientists have signed an agreement with the University of Guanajuato and the Municipal Water and Sewerage Authority of Guanajuato (Simapag) to pilot test the use of nanotechnology to clean contaminated water in Guanajuato, Mexico. The agreement is the first known test of nanoparticles for water treatment in a municipal water treatment plant. The groundwater that Guanajuato uses as a partial source for drinking water contains arsenic, and this test bed will explore the possibility of using a nanomagnetite-packed column for the removal of arsenic either during or after sand filtration. Nanomagnetite is also known as "nano-rust" due to its small particle size and iron oxide chemical composition. Laboratory tests have demonstrated that nano-rust is very effective at removing arsenic from water. A second study is being conducted to determine if C60 and titanium dioxide nanoparticles can improve the efficiency of ultraviolet-light based disinfection systems which could permit the use of more energy-efficient light-emitting diodes as the excitation source. In March 2010, the team of researchers recently completed a nine-day field test of both the nanomagnetite and UV-disinfection systems at the SIMAPAG municipal water treatment plant in Guanajuato.

International Council on Nanotechnology Launches Global Research Needs Assessment

As nanotechnology has moved out of the laboratory and into commercial products, many have begun to question the impact of nanoscale materials on health and the environment. Learning more about such impacts, however, presents a daunting task, given the number of potential products, the pace of innovation, and the need to share information and leverage costs toward a more efficient, timely international research effort. A major challenge has been to produce a global research strategy for predicting the interactions between engineered nanoparticles and biological systems so that biocompatible nanomaterials can be developed and applied safely. In 2007, more than 70 experts from 13 countries – in academia, industry, government and non-governmental agencies – accepted that challenge. In an unprecedented international collaboration, the International Council on Nanotechnology (ICON) convened two workshops aimed at defining a set of research needs for assessing potential nanotechnology impacts. A report published in May 2008 identified and prioritized 26 critical research areas into 2-, 5- and 10-year needs. The report, Towards Predicting Nano-biointeractions: An international assessment of nanotechnology environment, health and safety needs, has been downloaded over 1000 times.

