

**Symposium on Undergraduate Nano-Education:
"Addressing the Challenges of Nanoscale Science & Engineering Education"**

Presentation: "Integration of Scale into Physical Chemistry and College Chemistry"

Weijie Lu and Princilla Evans-Morris, Fisk mUniversity Department of Chemistry, Nashville, TN 37208

R. P. H. Chang, Northwestern University, Dept. of Materials Science & Engineering, Evanston, IL 60208

Presenter Biography:

Weijie Lu is an Associate Professor of Chemistry and Physics at Fisk University, Nashville, TN. He has received Ph.D. in Materials Engineering (major) in 1996, and M.S. in Chemical Engineering (minor) in 1993 from Brown University, M.S. in Physics in 1991 from the University of Memphis, M.S. in Surface Chemistry and Catalysis in 1988 from China University of Science and Technology, China, and B.S. in Chemical Engineering in 1985 from Zhejiang Institute of Technology, China. His research interests are in the areas of fundamental issues in growth and characterization of low dimensional carbon nano-materials, SiC surface and interface science, composite fabrication and characterizations, and science education. He has received the Excellence in Teaching Award in 2006 at Fisk University, and has about 70 publications and 100 presentations, including patents, book chapter, and invited reviews.

In the NCLT program, he has successfully organized a NCLT workshop for science teachers at Fisk University each summer in the past four years, and coordinated and assisted the science teachers for the nano-science implementation activities at six public middle and high schools at Nashville. About 2000 students have participated in the NCLT program.

Abstract:

In the traditional undergraduate chemistry courses, the chemical and physical properties of matter are discussed at the atomic and molecular and the marco-scale levels only. The nano-modules such as "scale" and "size" from the NCLT can be perfectly fitted in the gap of the nano-meter scale, and integrated into these courses. From the viewpoint of the scale, the properties of matter are discussed from three levels: the atom/molecules, nano-meters, and microns.

In the Physical Chemistry course, low-dimensional carbon nanostructures (C₆₀, nanotubes, and graphene) are introduced to demonstrate material structures from the atomic scale, to nano-meter, and to micron scale. Quantum dots are applied as the example to explain the relationships of structures-properties. The nano-science lectures are inserted after the introduction of quantum mechanics. In the College Chemistry course, two NCLT modules "Surface area and volume", and "Powers of 10 and Scales" are inserted after the atomic and molecular structures. The preliminary evaluation has shown that the nanoscience lectures are effective, and welcomed by the students.