NANOTECHNOLOGY: A NEW WORLD BUILT FROM SMALL THINGS

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Project Description:
Nanotechnology, including nanoscale science, engineering, and technology, holds the ability to manipulate individual atoms and molecules and to create large structures with fundamentally new properties and functions. These emerging fields are leading us to unprecedented understanding and control over the basic building blocks and properties of all natural and man-made things. The success of nanotechnology could revolutionize the 21st century in the same way that the transistor and Internet led to the information age.

Nanostructures with critical dimensions less than 100 nm endow materials with unique and often superior mechanical, electronic, magnetic and optical properties, which can open a new avenue to numerous advanced applications. The method of self-assembly that spontaneously assembles and organizes various building blocks into hierarchical structures via non-covalent interactions has emerged as one of the most promising techniques to the efficient fabrication of nanostructured materials.

The research projects proposed for the LS-LAMP Summer Research Training Program will be the synthesis of the nanostructured materials using self-assembly and their applications in high-efficiency solar cells, fuel cells, catalysts, sensors, and thermoelectrics. More specifically, the research will be focused on the synthesis of nanowires with diameters less than 10 nm to convert solar energy, hydrogen, and heat from car engines into useful electricity. The use of hydrogen as fuels will allow one to build cars with zero emission, which is critical for our environmental protection.

Project Objectives:
Objectives of the research are to motivate students, in particular minority students, to participate research and education in nanotechnology, to broaden their scopes in materials science, and to develop their capabilities in learning new knowledge and solving problems. The ultimate goal is to blossom the field of nanotechnology through educating students, in particular, the under-representative minority students.

Prerequisites:
Some background in chemistry or materials science.