UNIVERSITY of HOUSTON

CULLEN COLLEGE of ENGINEERING

Department of Civil & Environmental Engineering

Distinguished Lecture Series

Professor Ken P. Chong

The George Washington University

Nano Technology in Civil Infrastructure and Materials

Friday, November 16, 2012

12:00 – 1:00 p.m. Seminar

Room L2D2 Engineering Lecture Hall, UH

Abstract

Sustainability is defined as the "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" according to the Brundtland Commission, 1983 in "*Our common futures*". Sustainability includes all aspects of the society, such as civil infrastructural systems, energy, environment, health, safety, life-cycle analyses, etc. New technologies like nano science and engineering play a key role in achieving sustainability.

Nano science and engineering is one of the frontiers in transformative and translational research. Nano technology is a very efficient way in the creation of new materials, devices and systems at the molecular level - phenomena associated with atomic and molecular interactions strongly influence macroscopic material properties with significantly improved mechanical, structural, optical, chemical, electrical and other properties. National Science Foundation former Director Rita Colwell in 2002 declared, "nanoscale technology will have an impact equal to the Industrial Revolution". The transcendent technologies include nanotechnology, microelectronics, information technology and biotechnology as well as the enabling and supporting civil infrastructure systems and materials. These technologies are the primary drivers of the twenty first century and the new economy in a modern society as well as achieving optimal sustainability.

Nano science and engineering has many useful applications in all aspects of our lives, improving the qualities and sustainability of everyday life. In 2008, Mike Roco of NSF et al estimated that in the U.S. alone, based on the 1.5B Federal R&D funding combined with the 1.9B from industry, it will translate to 70B in products, 140,000 new jobs and 14B in taxes. Structural materials, structural sensing and control, hazard mitigation, bio-inspired materials, fire proofing materials, coatings, modeling and simulation, environmental and health concerns are also some of the research and challenging areas. The translational research and impact of nano science and engineering on civil infrastructure and materials will be presented and discussed.

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* Opinions expressed are those of the author's only not necessary that of the NSF, NIST or GWU.

About the speaker:

Professor KEN P. CHONG, P.E. earned his AM, MSE, Ph.D. in Mechanics from Princeton University. He is a *Research Professor* at the Mechanical & Aerospace Engineering Dept. of the George Washington University, and an Associate at NIST, finishing a text book on Elasticity; editing an Elsevier structures journal, a new Taylor & Francis journal of Smart and Nano Materials and a Spon book series on structures and mechanics; serving on university boards, doing lectures, teaching, research, and consulting. He has been the Engineering Advisor and Director of Mechanics and Materials for the past 21 years at the National Science Foundation (NSF). He was the Interim Division Director at NSF in 2005. He retired from NSF in 2010. He specializes in solid-mechanics/materials, nano-mechanics, and structural mechanics.

At NSF in addition to managing 120 university research projects in mechanics/materials, he was involved in the development of civil infrastructure systems, model-based simulation, non-destructive evaluation, structural control, durability and accelerated tests, life-cycle engineering, nano science and engineering, and other initiatives; established the NSF Summer Institute on Nano Mechanics/Materials at Northwestern U.; co-created a new NSF program in Nano- & Bio-Mechanics and founded the Engineering Distinguished Lecture Series involving numerous Nobel laureates and distinguished speakers. Under his leadership the NSF Blue Ribbon Panel on Simulation-based Engineering Science [SBES, chaired by Tinsley Oden] was formed in 2005 and came up with bold recommendations in computational mechanics, simulation and related areas. This effort is continuing at NSF, etc.

Dr. Chong has published 200+ technical papers and authored several books including 2 textbooks on mechanics by Wiley. He has given 50 keynote lectures, received awards including the fellow of AAM, ASME, SEM, USACM and ASCE; Edmund Friedman Professional Recognition Award; Honorary Doctorate, Shanghai Univ.; Distinguished Member, ASCE; NCKU Distinguished Alumnus Award; ASME 2011 Ted Belytschko Applied Mechanics Award, and the NSF highest Distinguished Service Award. He has been a visiting professor at MIT, U. of Washington – Seattle, U. of Houston, Dalian U. of Technology, Tsinghua U.; honorary professor at U. of Hong Kong, Hong Kong Polytech U., Shanghai U. and other universities.