



THE CHINESE UNIVERSITY OF HONG KONG
Department of Physics
COLLOQUIUM

**The Decision to Live or Die in Response to DNA Damage
Regulated by Differential p53 Pathway Dynamics**

by

Professor Jue SHI (史珏教授)
Department of Physics
Hong Kong Baptist University

Date: November 18, 2011 (Friday)
Time: 4:00 - 5:00 p.m.
Place: L2 Science Centre, CUHK

(Light refreshments will be served 20 minutes prior to the colloquium.)

ALL INTERESTED ARE WELCOME

Abstract

The tumor suppressor protein, p53, and its downstream effectors play a central role in mediating process of cellular repair or cell death in response to a wide variety of cellular stress. Cell fate varies, depending on the type of stress, its level and the genetic background of individual cells. By using quantitative time-lapse microscopy to track dynamics at the single cell level, we investigate molecular origin of cell-type variation in stress response, in particular DNA damage response, and how it is differentially regulated by p53 pathway dynamics. Preliminary results showed that at low DNA damage, most cells entered cell-cycle arrest with continuous oscillation of p53 level at the nucleus, while at high damage cells died rapidly with monotonous elevation of p53. Contrary to common hypothesis, the alternative cell fate of arrest (i.e. to live) and death did not appear to correlate with the transcriptional activity of p53 or its pulsing behavior. Our data so far pointed to dynamics of p53 level at the nucleus and its non-transcriptional pro-death activity in the cytoplasm as the likely decision makers. Based on the single-cell kinetic data, we constructed a mathematical model of p53 pathway dynamics that correlate with cell fate choice of life or death, and identified essential variables as well as modules in the p53 pathway that are essential for the decision-making process.