

Center for Quantum Science and Engineering (CQSE)

Weekly Seminar
May 28, 2010 (Friday)

Time: May 28, 2:30pm ~ 3:30pm

Title: Charge Transport in Disease-Related Genes and a Possible
Mechanism of Early Pathogenesis

Speaker: Prof. Chi-Tin Shih (施奇廷)

Dept of Physics, Tunghai University

Place: Rm716, CCMS & New Physics Building, NTU

Abstract

We report on theoretical studies of point mutations effects on charge transfer properties in various DNA sequences related to genes from cancer databases, in particular the tumour-suppressor gene p53. On the basis of effective single-strand or double strand tight-binding models which simulate hole propagation along the DNA, we perform statistical analysis of charge transmission modulations associated with all possible point mutations. We find that in contrast to non-cancerous mutations, mutation hotspots tend to result in significantly weaker changes of transmission properties. This suggests that charge transport could play a significant role for DNA-repairing deficiency yielding carcinogenesis. The data for p53 is corroborated by another 160 disease-related genes, with known genotype and phenotype analyzed. There are strikingly many properties of charge transport for these disease-related genes which behave similar to the p53 gene. These new results strongly suggest that the aforementioned scenario of early pathogenesis related to charge transport can be applied to a wide range of disease-related genes.

