

MAR11-2011-020279

Abstract for an Invited Paper  
for the MAR11 Meeting of  
the American Physical Society

**Shedding light on molecular dynamics: The role of physicists in the age of biomedical science**

FU-JEN KAO, Institute of Biophotonics, National Yang-Ming University, Taipei, Taiwan

Fundamental discoveries of the physics of imaging in the areas of microscopy, MRI, and CCD image sensing have produced innovations throughout the 20th century and continuing into the 21st. Not only have these fundamental discoveries received recognition from the Nobel Foundation in 1953, 1986, 1986, 2003, and 2009, but they have also revolutionized basic interdisciplinary research in areas such as biophysics and biomedical physics to the point at which applied physicists, engineers, and medical clinicians are working together to design experiments and develop tools for use in a broad range of areas including clinical diagnosis and pharmaceutical clinical trials. In this presentation, I will describe several innovative approaches in physics combined with engineering that have revolutionized the frontier in the biomedical sciences. Specifically, I will present examples of basic research as well as design, development, and commercialization of photonics research in the biomedical area within the context of biophotonics and molecular imaging. These examples will include the use of optical, photonics, and imaging techniques to (1) understand and elucidate the fundamental physics and chemistry of biological functions; and (2) understand and describe the critical role of these techniques for disease diagnosis, prognosis, prevention, and treatment with novel noninvasive (or minimally invasive) procedures.