**飛秒電子顯微鏡捕捉電荷在p-n界面和Graphene之**

**動態行為**

**4D Electron Microscopy of Ultrafast Carrier Dynamics in p-n Junctions and Graphene**

演講者: Dr. Jau Tang,California Institute of Technology, Pasadena, CA 91125

**時間: 二月二日 星期二, 10:30 am**

**地點: 國立清華大學台達館 401室**

Four–dimensional electron microscopic imaging techniques such as ultrafast SEM (U-SEM) and TEM (U-TEM), providing femtosecond temporal resolution and nanometer spatial resolution, developed in Caltech has been proven to be powerful tools in probing very fast dynamics in the nanoworld. We will discuss some application examples of U-SEM in the dynamics study of hot charge carriers in p-n junctions and grapheme induced by a femtosecond laser pulse. In contrast to the commonly known diffusive processes, these hot electrons and holes are shown to exhibit ballistic dynamics at short times when they move across the junction. Moreover, at much larger laser fluence, we have also observed plasma blast waves due to strong Coulomb interactions among these charge carriers. In another U-SEM study of a monolayer grapheme, we have observed unusual spatial profiles of the charge carriers, with a crater-shaped spatial density profile at high fluence regime versus a Gaussian-shaped profile at lower fluence. The underlying mechanisms for these novel phenomena in p-n junctions and grapheme films will be explained. Other than U-SEM studies, we will also discuss the application of U-TEM in elucidating the mysteries of crystallization of nanocrystals from the melt, via nucleation to fully grown crystals. We have established experimentally the existence of the ephemeral nucleation intermediate and we have offered theoretical modeling to describe the temporal change of the observable crystal ordering parameter during crystallization.