Center for Molecular Spectroscopy and Dynamics, IBS-Korea University

IBS Center for Molecular Spectroscopy and Dynamics

Colloquium

- **SPEAKER**
  Prof. Rienk van Grondelle (Dep. of Physics and Astronomy, VU University Amsterdam, Netherlands)

- **TITLE**
  The Quantum Design of Photosynthesis: Ultrafast Energy and Charge Transfer

- **ABSTRACT**
  Three fundamental processes form the basis of natural photosynthesis. The photosynthetic apparatus is constructed of pigments (chlorophylls, bacteriochlorophylls, many different carotenoids) bound to membrane proteins. After the absorption of a solar photon by one of the pigments the electronic excitation is transferred on an ultrafast timescale (10s of femtoseconds to 10 picoseconds) to a special pigment-protein, the photosynthetic reaction center (RC) where a transmembrane charge separation is driven. Under optimal conditions (low light, water, CO2) solar photons are captured and transformed into chemical energy with an efficiency (chemical energy out/solar energy in) of about 10-15%. This of course is not the energy yield of a crop! Under not optimal conditions such as high light and stress (draught, low temperature etc) the risk of photodamage increases and the photosynthetic apparatus must be photoprotected. It is obvious that the successful operation of the photosynthetic apparatus depends on a delicate balance between these three fundamental processes. In this talk I will show that one crucial factor is the precise mixing of electronic/excitonic states with charge transfer states often controlled by resonant vibrations. Basically, the same physical processes control the speed and balance between ultrafast energy transfer in the light harvesting antenna, ultrafast charge separation and photoprotection: excitons, charge transfer states and resonant vibrations

- **DATE AND VENUE**
  September 30, 2019 (Monday, 5:00 - 6:00)
  Seminar Room B (119), KU R&D Center

- **INVITED BY**
  Director Minhaeng Cho

- **LANGUAGE**
  English