

# PHYSICS COLLOQUIUM

WITH

**WONPIL IM**

DEPARTMENTS OF BIOLOGICAL SCIENCES AND BIOENGINEERING  
LEHIGH UNIVERSITY

## “Mechanisms and Energetics of Protein/Peptide Interactions in Biological Membranes”

Understanding the delicate balance of forces governing helix interactions in transmembrane proteins is central to understanding membrane structure and function. These membrane constituent interactions play an essential role in determining the structure and function of membrane proteins, and protein interactions in membranes, and thus form the basis for many vital processes, including transmembrane signaling, transport of ions and small molecules, energy transduction, and cell-cell recognition. “Why does a single transmembrane helix have specific orientations in membranes?” “What are the roles of hydrogen bonds, close packing, and helix-lipid interactions in helix associations in membranes?” “How do these interactions change the membrane structures?” “How do transmembrane domains transmit signals across membranes?” These are fundamentally important biophysical questions that can be addressed by understanding the delicate balance of forces governing helix interactions in membranes. Recently, we have published novel methods and their applications that begin to address the complicated energetics and molecular mechanisms of these interactions at the atomic level by calculating the potentials of mean force (PMFs) along reaction coordinates relevant to helix motions in membranes, and dissecting the total PMF into the contributions arising from physically important microscopic forces. I will summarize our research accomplishment so far, and present recent on-going research activities to elucidate aforementioned questions. If time allows, I will briefly mention about other research activities in my lab, such as the CHARMM-GUI development including recent developments of Membrane Builder, Glycan Reader, Ligand Binder, and GCMC/BD Simulator.

*Wonpil Im received in bachelor's and master's degrees from Hanyang University in Seoul. He then earned his Ph.D. in Biochemistry from Cornell University. He did his post-doctoral research at the Scripps Research Institute in La Jolla, California. In 2005, he was hired as an assistant professor in the Center for Computational Biology and Department of Molecular Biosciences at the University of Kansas, Lawrence. In 2011, he was promoted to associate professor and then professor in 2015. In 2016, he joined the Faculty in Departments of Biological Sciences and Bioengineering at Lehigh University, and he has been named the Presidential Endowed Chair in Health - Science and Engineering. Wonpil was recently awarded the Friedrich Wilhelm Bessel Research Award from the Humboldt Foundation and was named a KIAS Scholar from the Korea Institute for Advanced Study. Prior to Lehigh, he was awarded the Alfred P. Sloan Research Fellowship (2007), ACS HP Outstanding Junior Faculty Award (2011), J. Michael Young Undergrad Advisor Award (2011), Meredith Docking Scholar (2013), and University Scholarly Achievement Award (2015).*

**Thursday, August 31, 2017 in Lewis Lab. 316 at 4:10PM**

*Refreshments at 3:45PM*