Abstract
Despite numerous studies devoted to the T cell receptor (TCR), due to its vital importance in the adaptive immunity, our understanding of how it interacts with peptide-histocompatibility complex (pMHC) in situ and how such interaction drives T cell function and development is incomplete. In this talk, I will tell two stories about two-dimensional (2D) analysis of TCR–pMHC interactions. The first story shows how 2D analysis reveals differential T cell function and fate as governed by tissue compartmentalization. The second story shows how tumor microenvironment induces impairments of 2D kinetic parameters as related to T cell recognition of melanoma antigens. These stories highlight the usefulness of mechanical-based analysis of cross-junctional molecular interactions at the membrane of live T cells and the impact of physical forces on these interactions.

Bio
Dr. Cheng Zhu received his B.S. from Zhejiang University, China, in 1982 and M.S. and Ph.D. from Columbia University in 1985 and 1988, respectively. He was Postgraduate Bioengineer and Assistant Bioengineer of the University of California, San Diego in 1988 and 1989, respectively. He joined the faculty of Georgia Tech in 1990. Dr. Zhu’s research interest is in the molecular biophysics of the immune and vascular systems, with focuses in the mechanobiology of T cells and platelets. He pioneered the analysis of interactions at the junctional interface between molecules anchored to two apposing surfaces, i.e., the so-called two-dimensional interaction. His lab conceptualized and/or demonstrated several types of mechanical regulations of protein unbinding and unfolding (catch bonds, force-history, cyclic mechanical reinforcement, and dynamic catch) in a variety of receptor–ligand systems.