

# SEMINAR



# SERIES

北京大学工学院

力学与工程科学系

湍流与复杂系统国家重点实验室

Probing and controlling mechanical properties of  
biological nano-thin films

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时 间：12月7日 周四 10:30—11:30

地 点：北京大学工学院1号楼212

## 内容简介：

Biological thin films such as lipid membranes and boundary water thin films are nano systems that are ubiquitous in biological systems and play various roles in physiological processes, for example, by providing excellent lubricating interfaces between cartilage surfaces, or by controlling the hemifusion processes of drug-delivery vesicles. Many of these processes are localized, either at a micro-scale asperity in the scenario of cartilage lubrication or initiated through a nano-scale contact point as in the case of hemifusion. Within the complex biological environments where localized instantaneous disturbance is persistently affecting these thin films, rich dynamic behaviors are expected to be observed. Experimentally, we have observed and characterized the macroscopic properties of thin films using the state-of-art technique—surface force balance, where the viscosity of a nano-confined liquid film and the friction coefficients and threshold pressure to hemifusion of lipid membranes were measured. The effects of external stimuli such as low electric fields that are biologically compatible were also investigated, which presents as a platform for in-situ manipulation of the membranes' mechanical properties. Theoretically, we interpret these results using equilibrium and non-equilibrium all-atom and coarse-grained molecular dynamics simulations, which allow us to quantitatively relate the measured macroscopic properties to the structures of the membrane's composition molecules. We also seek to systematically investigate the correlation of lipid membranes' compositions to their mechanical properties, and by using cutting-edge techniques such as machine learning, we seek to predict and design lipid membranes with macroscopic properties designated for biomedical applications.

## 报告人简介：

金迪，以色列魏茨曼研究所副研究员。2013年于麻省理工大学获得学士学位，2014年于加州大学伯克利分校获得硕士学位，2018年于剑桥大学卡文迪许实验室获得博士学位。2018至今在以色列魏茨曼研究材料与界面系Jacob Klein教授组担任高级博士后/副研究员。主要从事生物物理学、纳流体、生物纳米薄膜水合润滑性质的高精度测量和分子动力学模拟等理论分析。

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