青山学院大学 物理科学科 コロキウム

2025年度 第1回

下記の通りコロキウムを企画致しました。学生や分野の違う方にもわかるレベルから始めて下さるようにお願いしてあります。どなた様もご自由に是非ご聴講ください（事前参加登録なし）。

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「主催：物理科学科、基礎科学コース、機能物質創成コース」

講演者 Chan Lim 氏 (Pohang University of Science and Technology (POSTECH))

日　時 6月26日（木）16:00 − 16:30から

場　所 青山学院大学　理工学部　L棟6階　L 603室

講演題目 From Fractal Mitotic Packing to Co-Condensate Self-Reptation: How DNA-Binding Proteins Orchestrate Chromatin Structure and Dynamics

With growing interest in DNA-binding proteins in both chromosome structure formation and liquid–liquid phase separation (LLPS), we demonstrate that stochastic protein–DNA coalescence underlies chromatin architecture and mobility. Cryogenic X-ray diffraction imaging of mitotic chromosomes reveals scale-invariant fractal density, which coarse-grained polymer simulations recapitulate when proteins form shear-rigid hubs bridging DNA. On decondensed bare DNA, a distinct class of DNA-binding proteins undergoes LLPS to form fluid co-condensates that sequester long polymer segments. Strikingly, these droplets diffuse along the DNA despite compaction; we uncover a self-reptation mechanism via a worm-like-chain free-energy model and simulations. Together, these findings underscore how DNA-binding proteins leverage versatile stochastic coalescence—from rigidity-dependent hub formation to liquid droplet assembly—to orchestrate chromatin organization and dynamics across cellular states.
