集中講義　**『化学生命理工学特論 III』（学部 2 年生以上対象）**

＊ 2 人の先生に 4 コマずつ講義をしていただき，1 科目（1 単位）とします！

第 1 部（4 コマ）：
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9/15（火）3 限 ～ 9/16（水）1 限

9/16（水）2 限は，セミナー
（誰でも聴講できます！）

Dynamics of ultra-long-range enhancer-promoter communication in early embryos

Enhancers regulate gene expression over large genomic distances, yet the mechanisms linking 3D genome organization to transcriptional output remain unclear. To address this question, we combine quantitative live-imaging, genome-editing, and super-resolution microscopy to directly visualize enhancer-promoter communication and transcriptional activity in living *Drosophila* embryos at single-cell resolution.

We recently developed a high-resolution live-imaging framework that enables direct visualization of inter-allelic, ultra-long-range enhancer-promoter communication (*i.e.,* transvection) in living *Drosophila* embryos. Our analyses reveal a stepwise mechanism of gene activation. Distal enhancers and target promoters first establish a tight physical association, forming a 3D chromosomal configuration permissive for activation. This is followed by dynamic clustering of transcriptional activators, which drives transcriptional bursting and induces a transition from tight to more relaxed enhancer-promoter physical proximity. These findings reconcile seemingly conflicting “looping” and “hub” models by showing that proximity-dependent and proximity-independent mechanisms are not mutually exclusive, but instead act sequentially to modulate long-range regulatory communication in living cells.

In this seminar, I will discuss how direct visualization of enhancer-promoter dynamics provides new insights into the interplay between 3D genome organization and transcriptional control during animal development.

講義に関するお問い合わせは藤原（ tatataa@kochi-u.ac.jp ）まで
参考資料（ https://top-researchers.com/?p=2721 ）