Osaka University Humanware Innovation Program

OSAKA UNIVERSITY

FBS Graduate School of Frontier Biosciences Osaka University

Humanware Innovation Program co-hosted

FBS Seminar

Date : January 31st (Tue), 2017
Time : 4 – 5 pm
Place : 2F Seminar room, BioSystems Building, Graduate School of Frontier Biosciences, Osaka University

Prof. Peter R. Cook

Professor of Cell Biology,
The Sir William Dunn School of Pathology,
University of Oxford

Transcription factories: genome organization and gene regulation

I will argue that transcription 'factories' are central organizers of the human genome during interphase, and that proximity to an appropriate factory determines the activity of a gene. The nucleolus is the prototypic factory; it is a place where many rRNA genes are efficiently co-transcribed by local concentrations of RNA polymerase I. Analogous clusters of RNA polymerase II in nucleoplasmic factories make protein-coding transcripts. I begin by describing new forces able to drive genome organization uncovered using Brownian dynamic simulations. For example, a diffusion-based "osmotic ratchet" can force bound "slip-links" like cohesin to "convergent" CTCF sites without the need for any motor activity. Additional simulations point to an unforeseen 'bridging-induced attraction' that can assemble factories and organize interphase chromosomes at all scales. This organization leads naturally to an explanation of how gene activity is regulated: a promoter is only likely to initiate if tethered near a factory containing appropriate factors. As motifs like enhancers, silencers, insulators, barriers, and boundaries are transcription units, they would work by tethering target promoters close to, or distant from, suitable factories; although we might name the motifs differently, they are all just transcription units influencing promoter-factory distance (and so initiation frequency).

Registration not required. Anyone can join.

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