



量子物理学・ナノサイエンス第 193 回セミナー

Statistical mechanics of skin homeostasis

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日程 : 8 月 2 日 (水) 16:00–17:30

場所 : 本館 1 階 H155B 理学院セミナー室

概要

Adult tissues undergo rapid turnover as mature cells are continuously lost, and new cells arise through cell division. The balance between gain and loss of cells must be finely orchestrated to maintain tissues, but how this balance is achieved remains largely unknown. For the skin, it had been assumed that the fate choices of stem cells (division or differentiation) are made strictly cell-autonomously. Here we recorded every stem cell fate choice within mouse skin epidermal regions over one week and found that, far from being cell-autonomous, stem cell loss by differentiation was compensated by direct neighboring division [1]. Furthermore, division events were triggered by neighbor differentiation and not vice versa, showing differentiation-dependent division as the core feature of homeostatic control.

In this presentation, we will formalize the problem of tissue homeostasis using a macroscopic nonequilibrium model setup [2]. Starting from an interacting particle system with Brownian motion, we show how the coarse-graining of our model will lead to the effective dynamics of the Voter model (DP2). We will then explain the pitfall in two-dimensions of using scaling relations of the type used before for the clonal fate trace of cells, and illustrate the workaround used in the new data analysis to definitively show the existence of cell-to-cell fate correlation.

[1] Mesa, Kawaguchi et al., Biorxiv (2017) doi: <https://doi.org/10.1101/155408>

[2] Yamaguchi, Kawaguchi, and Sagawa, Phys. Rev. E **96**, 012401 (2017)

※英語によるセミナーとなります。 / Seminar will be given in English.

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