Johns Hopkins University

Department of Biology Seminar Series

Thursdays, 4:00pm

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Zoom link: https://zoom.us/j/97925356454?pwd=bjNuTlY1dU9BcXcvRFdleis2TVNadz09

June 22nd, 2023 - Mudd 100

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Host: Mark Van Doren

"Extended live-Imaging and modeling the cycle and wave dynamics of mouse spermatogenesis"

In long-lived animals such as mammals, cycling tissues are maintained for long times, relying on the continual turnover of mature cells replenished by younger cells supplied from the stem cells. Here, the collective behavior (division, differentiation, migration, and death) of numerous cells, comprising multiple generations, must be ordered spatiotemporally across extensive time and spatial scales, depending on unsolved mechanisms. Mouse spermatogenesis provides a good model to tackle this issue, exhibiting characteristic rhythmic dynamics with a periodicity of about 8.6 days, called "seminiferous epithelial cycle" and "spermatogenic wave." First described as early as 1871, the detailed dynamics, underlying mechanism, and biological significance of the cycle and wave remain to be fully understood. In this seminar, based on our long-held study about mouse sperm stem cell dynamics using intravital live imaging and other studies, I will discuss our recent study about cycle and wave dynamics. Developing live imaging in vivo, enabling filming for about ten days; and ex vivo organ culture imaging for about a month, we could film the cycle and wave using mice expressing GFP in germ cells at a specific phase of the cycle. These provide unexpectedly irregular patterns, but were found to be predicted by minimal mathematical modeling. The results suggest that the cycle and wave are self-organized as a compilation of cell behaviors across scales. I would also discuss the potential molecular mechanisms underpinning the cycle and wave.