**Seminar Title and Abstract**

**Lung Homeostasis, Regeneration, and Diseases**

Jinwook Choi, Ph.D.

Assistant Professor at School of Life Sciences, Gwangju Institute of Science and Technology, Korea

Tissue regeneration is a multi-step process mediated by diverse cellular hierarchies and states that are also implicated in tissue dysfunction and pathogenesis. Alveolar type 2 (AT2) cells function as stem cells by self-renewing and differentiating into alveolar type 1 (AT1) cells that are essential for gas-exchange in the lung. However, how AT2 cells are activated from the quiescence and which trajectory they follow to differentiate into AT1 cells remain unknown. Here, we leveraged single-cell RNA sequencing in combination with *in vivo* lineage tracing and organoid models to finely map the trajectories of alveolar lineage cells during injury repair and lung regeneration. We identified how injury remodels immune system and inflammatory niches driven my macrophage dynamics orchestrate tissue regeneration during injury repair in the lungs. We also identified a distinct AT2-lineage population, Damage-Associated Transient Progenitors (DATPs), that arises during alveolar regeneration. Further, we found that chronic inflammation prevents AT1 differentiation, leading to aberrant accumulation of DATPs and impaired alveolar regeneration in chronic human lung diseases. Overall, my study reveals how inflammation coordinates the lung tissue regeneration by directly reprogramming stem cell activity or regulating neighboring niches to modulate the plasticity of lung stem cells.