DEPARTMENT OF BIOLOGY | UNIVERSITY of WASHINGTON

Biology Seminar

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Adventures in cell herding: understanding and controlling collective cell migration

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We are working to accomplish for cells something like what a shepherd and sheepdogs bring to flocks of sheep: control over large-scale collective cellular motion. As coordinated cellular motion is foundational to many forms of multicellular life, being able to 'herd' or program large-scale cell migration raises exciting possibilities for accelerated healing, tissue engineering, and novel biomaterials. By treating tissues as complex communities, we can combine approaches from cell biology, physics, engineering, and even urban planning to better understand the rules of cellular crowds and to build new tools to 'herd' groups of cells. Here, I will compare two disparate approaches: electrically herding cell migration and using cell-mimetic biomaterials to trick cells. In the first case, we use a unique bioelectric cue—electrotaxis—to literally program large-scale collective cell migration, enabled by our 'SCHEEPDOG' bioreactor. In this case, ionic currents manipulate cellular signaling allowing control of both cell direction and speed, allowing us to: accelerate the 'healing' of gap injuries with in vitro tissues; investigate how cell-cell interaction mechanics modulate 'controllability'; and manipulate the growth of 3D tissues and organoids. In the case of cell-mimetic materials, we build biomaterials that cells interact with as if the biomaterials were also cells, and this allows us to regulate cell behavior from the inside-out.

Seminar Speaker Host: Mugdha Sathe & Amy Platenkamp