JOHNS HOPKINS
BIOMEDICAL ENGINEERING

BME Seminar Series Student Presentations

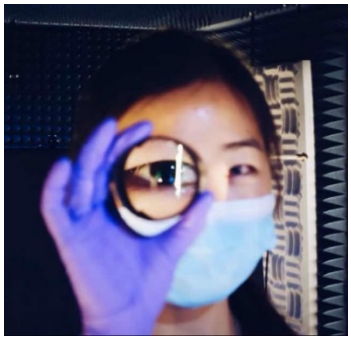
Monday December 10, 2018 from **11:00 am – 12:00 pm**
Talbot Library, Traylor 709, East Baltimore Medicine Campus
with Video-teleconference to Clark 110, Homewood Campus

Michael Blatchley, Predoctoral Student

Department of Biomedical Engineering
Johns Hopkins University

"Hypoxia and matrix viscoelasticity sequentially regulate cluster-based vasculogenesis"

Abstract: Understanding how blood vessels develop and regenerate is critical for designing novel therapeutics for treatment of both cardiovascular diseases and cancer, as well as for engineering vascularized tissues. Extensive studies have identified key regulators of classically defined angiogenesis and vasculogenesis. However, several animal models have revealed an alternative, parallel mechanism termed cluster-based vasculogenesis, which has not been studied towards a mechanistic understanding. Here, using O_2-controllabe hydrogels, we unveil the mechanism by which hypoxia and matrix viscoelasticity regulate endothelial progenitor cell (EPC) vasculogenesis. We found that when EPCs are subjected to a 3D hypoxic gradient ranging from <2% to 5%, they rapidly produce reactive oxygen species that upregulate proteases, which degrade the surrounding extracellular matrix. EPC clusters form and expand as the matrix degrades, then cell-cell interactions stabilize the endothelial clusters. Subsequently, EPC sprouting into the stiffer, intact matrix, leads to vascular network formation. In vivo examination further corroborated hypoxia-driven clustering of recruited endothelial progenitors. Overall, this is the first description of how hypoxia mediates cluster-based vascular morphogenesis, advancing our understanding towards regulating vascular development as well as postnatal vasculogenesis in regeneration and tumorigenesis.



Yueqi Guo, Predoctoral Student

Department of Biomedical Engineering
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"Seeing the listening brain"

Abstract: The auditory system does amazing work transforming complex sound signals into information that can be understood and evoke emotions, such as speech and music. However, how such a system achieves the complicated computations is not well-known. We are interested in revealing neural coding mechanisms operating in the auditory cortex with optical imaging which is emerging as a powerful tool to observe neuronal activities directly. The animal model we used is the common marmoset, a highly vocal new-world primate species that shows human-like cognitive abilities.
In this seminar I will present how we developed procedures to perform multi-scale and multi-modal optical imaging (wide-field intrinsic and Calcium imaging, two-photon Calcium imaging) in the auditory cortex of awake marmosets over a long period of time. The multiscale imaging approach provides a new experimental paradigm for functional mapping of the marmoset auditory cortex in awake condition in a high throughput way over conventionally electrophysiology methods.