93rd Seminar

Invitation

2023. 12. 7 (Thursday)
17:30 - 18:30

Speaker: **Asst. Prof. Yen-Liang (Allen) Liu**

Master Program of Biomedical Engineering
China Medical University (Taiwan)
Website: https://www.liuscience.net

Title: **Applications of single-particle tracking in visualizing EGFR trafficking and assessing the metastatic potential of cancer cells**

Experimental studies of intracellular processes using single-particle tracking (SPT) are rather scarce due to the lack of 3D tracking technique, trajectory analysis algorithm, and validation. Dr. Liu will present his work on the developments of a 3D tracking technique, a trajectory analysis algorithm, and, eventually, an SPT-based biophysical phenotyping assay named "Transmembrane Receptor Dynamics (TReD)" for assessing metastatic potentials of breast and prostate cancer cells. It's the first time that the dynamics of EG receptor (EGFR) was used to differentiate metastatic cancer cell from less invasive ones. Using deep learning technique, we further improved the accuracy of TReD assay. Most importantly, the TReD assay can be integrated with circulating tumor cell isolation microfluidic chip for a streamlined cancer diagnostic procedure. Thus, we believe that the SPT-based EGFR dynamics can serve as a new biophysical assay to probe the metastatic potential of cancer cells and to monitor their response to anti-cancer drug treatments.

Venue: **OIST Lab4 F01**

References

1. M. Kim, S. Hong, T. E. Yankeelov, H.-C. Yeh*, Y.-L. Liu* *"Deep Learning-Based Classification of Breast Cancer Cells Using Transmembrane Receptor,"* Bioinformatics, 2021.

2. M. Kim, Y.-L. Liu* *"Transmembrane Receptor Dynamics as Biophysical Markers for Assessing Cancer Cells,"* In: Santra T.S., Tseng FG. (eds) *Handbook of Single Cell Technologies*. Springer, 2021

3. Y.-L. Liu*, E. P. Perillo, P. Ang, M. Kim, D. T. Nguyen, K. Blocher, Y.-A. Chen, C. Liu, A. M. Hassan, H. T. Vu, A. K. Dunn, and H.-C. Yeh*, *"Development of three-dimensional two-color dual-particle tracking microscope and its applications in monitoring DNA conformational changes and antibody-conjugated nanoparticle landings on the plasma membrane,"* *ACS Nano* 14(7): 7927-7939, 2020.

4. Y.-L. Liu, A.M. Horning (co-first), B. Lieberman, M. Kim, C.-K. Lin, C.-N. Hung, C.-W. Chou, C.-M. Wang, C.-L Lin, N.B. Kirma, M.A. Liss, R. Vasisht, E.P. Perillo, K. Blocher, H. Horng, J.A. Taverna, J. Ruan, T.E. Yankeelov, A.K. Dunn, T. H.-M. Huang, H.-C. Yeh*, and C.-L. Chen*, *"Spatial EGFR dynamics and metastatic phenotypes modulated by upregulated EphB2 and Src pathways in advanced prostate cancer,"* *Cancers* 11(12), 1910, 2019.

5. Y.-L. Liu, C.-K. Chou; M. Kim, R. Vasisht, Y.-A. Kuo, C. Liu, E.P. Perillo, Y.-A. Chen, K. Blocher, H. Horng, Y.-I Chen, D. T. Nguyen, T. E. Yankeelov, M.-C. Hung, A. K. Dunn, and H.-C. Yeh*, *"Assessing metastatic potential of breast cancer cells based on EGFR dynamics,"* *Scientific Reports* 9, 3395, 2019.

6. Y.-L. Liu, E.P. Perillo, C. Liu, P. Yu, C.-K. Chou, M.-C. Hung, A.K. Dunn, and H.-C. Yeh*, *"Segmentation of 3D trajectories acquired by TSUNAMI microscope: an application to EGFR trafficking,"* *Biophysical Journal* 111(10): 2214-2227, 2016.

7. E. P. Perillo, Y.-L. Liu, K. Huynh, C. Liu, C.-K. Chou, M.-C. Hung, H.-C. Yeh*, and A. K. Dunn*, *"Deep and high-resolution three-dimensional tracking of single particles using nonlinear and multiplexed illumination,"* *Nature Communications* 6, 7874, 2015.