

BIOEN 509 – DEPARTMENTAL SEMINAR SERIES

Thursday, Feb. 2nd 2012, 12:30-1:20 PM
Foege Bioengineering Building N130A

Highly Multiplexed, Quantitative Single Cell Proteomics for Clinical and Fundamental Applications in Oncology

Prof. Jim Heath

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Over the past few years we have developed an enabling microfluidic technology called the Single Cell Barcode Chip (SCBC). For this platform, single cells are isolated into 1-2 nanoliter volume microchambers, and each microchamber is equipped with a miniaturized antibody array in the form of a barcode. The platform permits 20 or more cytoplasmic, membrane, and/or secreted proteins to be quantitatively assayed from individual cells, with up to 1500 single cells analyzed in parallel. We have applied this technology in both fundamental and clinical applications, and I will discuss examples from each area. The clinical work involves separately profiling the engineered and acquired T cell immune responses in melanoma cancer patients participating in an engineered T Cell Receptor adoptive T cell immunotherapy trial being run by Dr. Toni Ribas at UCLA. For this study, we characterized the functional performance of several tumor-antigen-specific T cell phenotypes. We find that the assembled single cell data provides a compelling picture of the individual patient responses to the therapy, and that picture correlates well with clinical observations, and is helping inform a next-generation clinical trial.

On the side of fundamental biology studies, we have investigated the transition from normoxia to hypoxia in single glioblastoma multiforme cancer cells. We have found that the transition is not continuous, but instead actually appears as a first order phase transition. This result makes several significant predictions regarding to how hypoxic tumors would be expected to respond to targeted therapies, and those predictions appear to be validated through tests on bulk cell systems.

Dr. Jim Heath is the Elizabeth Gilloon Professor and Professor of Chemistry at Caltech, and Professor of Molecular and Medical Pharmacology at UCLA. He serves as the Director of the NSB Cancer Center, an NCI-funded Cancer Center for Nanotechnology Excellence. He received his Ph.D. in 1988 from Rice University, was a Miller Fellow at UC Berkeley between 1988 and 91, and joined the research staff at IBM Watson Labs in 1991. He took an faculty position at UCLA in 1994, and was the founding director of the California NanoSystems Institute (CNSI) prior to moving to his current position at Caltech in 2003.



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