

**NUS Graduate School for Integrative Sciences and Engineering
Research Project Write-up**

Title of Project : Bioimaging probe development using Diversity Oriented Fluorescence Library Approach (DOFLA)

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Short Description

My main research interest lies in novel chemical probe development for in vitro and in vivo bioimaging. The intrinsic inter-disciplinary nature of my research will be a good platform to nurture NGS students and to meet the goal of NGS.

I recently joined NUS (September 2007), and I have worked at NYU for the last seven years in Chemical Genetics field. During the time, I have developed “diversity oriented fluorescence library approach (DOFLA)” and demonstrated its feasibility in broad range of analytes from macromolecules including DNA, RNA and proteins, to signaling small molecules. Empowered by combinatorial technique in dye field, our dye collection is already bigger than what Invitrogen (the dominating fluorescence company) has prepared for the last 30 years. Using the developed platform, my future research plan will focus on universal fluorescence probe toolbox generation for live cell / animal / patient imaging. The specific aims are as follows:

1. Universal fluorescence probe toolbox generation by diversity-oriented synthesis comprising more than 10,000 compounds which
 - cover all range of visible/near IR wavelength (400-900 nm)
 - respond to broad biological pH change (pH 4-8)
2. Development of dynamic live cell imaging probes for
 - intracellular organelles and cytoskeletal structures
 - stem cell maintenance and differentiation
 - cancer detection and new marker discovery
3. Application of above developed probes into pre-clinical imaging agents and diagnosis system including
 - Alzheimer plaque imaging in live animal brain
 - target / tissue selective staining in embryo systems

The end products of this project are fluorescent molecules as bio-probes. With the superior speed and scope of our approach, the toolbox of fluorescence molecules will be a goldmine for novel sensors and bioimaging probes. Collaborated by the bioimaging and stem cell research groups in local institutes, this project will make Singapore the hub of hot research field.