

## **Establishment of Novel Photo-functional Tools for Life Science Researches**

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Fluorescence imaging is the most powerful technique currently available for continuous observation of dynamic intracellular processes in living cells. Suitable fluorescence probes are naturally of critical importance for fluorescence imaging, but at present design is largely empirical. Recently, we demonstrated that the fluorescent properties of fluorescein, BODIPY, rhodamine, and cyanine derivatives, which have been widely employed as cores of fluorescence probes, could be precisely and rationally controlled by intramolecular photoinduced electron transfer (PeT) process. Based on these photophysical findings, we could establish several rational design strategies, and developed novel fluorescence probes for various targets such as singlet oxygen, nitric oxide, and peroxynitrite. Further, we found that the purportedly indispensable carboxylic group of fluorescein could be replaced with other substituents, and could develop novel fluorescein derivatives, called TokyoGreens (TGs). Using the TG scaffold, we could develop a novel fluorescence probe for beta-galactosidase, named TG-betaGal, which was far more sensitive than FDG and X-gal. Based on the same strategy, we also succeeded to develop a sensitive fluorescence probe for alkaline phosphatase which could be applied to the Western blot technique. Thus, the concept of PeT is quite useful, however, it is not restricted to the development of fluorescence probes. Recently, we also found that the concept of PeT is efficiently applicable to the development of novel photosensitizing probes and bioluminescence probes. Development of some novel and useful photo-functional tools for life science researches will also be presented in this symposium.