**Fluorescence Microscopy of Cyclic Radical Pair Based Photochemical Reactions**

*Noboru Ikeya, Xu Tao, Onkar Gulati and Jonathan R. Woodward*
*Graduate School of Arts and Sciences, The University of Tokyo, Komaba, Meguro, Tokyo, Japan.*
*jrwoodward@g.ecc.u-tokyo.ac.jp*

Fluorescence microscopy comprises a large number of very sensitive and flexible methodologies with a wide range of applications in many fields including biology and nanoscience. In recent years, fluorescence microscopy has been applied as a tool to study cyclic photochemical reactions, in particular those of flavins [1,2], which proceed through the formation of radical pair intermediates. Under continuous photoexcitation, such reactions create an equilibrium between the chromophore-containing precursor ground state and the radical pair. If the ground state molecule can also undergo fluorescence on photoexcitation, then the amount of fluorescence emitted depends on the position of this equilibrium. As the ratio of radical pairs returning to the ground state through spin-selective reaction (fast) and non-spin selective reaction (slow) can be influenced using static and / or oscillating magnetic fields, the fluorescence intensity can be used to probe the radical pair dynamics. Indeed, we have recently demonstrated magnetic field responses in the natural autofluorescence of living cells using this approach [3].

Fluorescence microscopy of radical pair based cyclic reactions is a method with important applications in studying biological magnetosensitive processes, in investigating the spin-dynamics of radical pairs at very low concentrations (including individual radical pairs [4]), and for developing and applying magnetic field sensor probe molecules for use in biosensing. In this lecture we present our group's most recent progress in the development and application of fluorescence-based microscopy to radical pair processes, considering instrumental and theoretical aspects, along with the development and applications of model reaction systems.

**References:**

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