量子技術を適用した生命科学基盤の創出
2019 年度採択研究者

2021 年度
年次報告書

Lewis Martyn ANTILL

埼玉大学大学院理工学研究科／科学技術振興機構
特定プロジェクト研究員／さきがけ専任研究者

動物磁気感受のためのクリプトクロム時空間計測

§1. 研究成果の概要

Our current research focuses on cryptochrome radical pair dynamics, structural changes, and protein-protein interactions. A home-built fluorescence-based microspectroscope designed for investigating the above focal points of our research is fully operational. The novel fluorescence fluctuation spectroscopic technique (M-FFS, magneto-fluorescence fluctuation spectroscopy) was developed for observing magnetic field sensitive protein-ligand (flavins) dynamics approaching the single photon level (SPAD detection). This technique allows fluorescence correlation spectroscopy (FCS), Förster resonance energy transfer (FRET), fluorescence anisotropy, and magnetic field effects on 65 molecules in a 0.54 fL volume, moreover, magnetic field effects revealed hidden interactions between proteins and flavins whilst controlling the rate of photodegradation with sample flow under continuous irradiation. This work is now being revised for publication. An experimental/theoretical investigation into *Er*Cry4a (*Erithacus rubecula*) homo-oligomerisation incorporating native-mass spectrometry and proteomics experiments (with collaborators in Oxford and Oldenburg) and molecular dynamics simulation (L M Antill and Oldenburg) is near submission. Other work includes model protein-ligand complexes for investigating low field effects for better understanding magnetoreception, which is also near submission. Cryptochrome oligomerisation and structural changes expressed in HeLa cells are currently being investigated with the above techniques (both SPAD and EMCCD detection). Protein synthesis is now reaching the final stages of purification.