青山学院大学第 25 回機能物質化学講演会のお知らせ

主催：青山学院大学理工学部化学・生命科学科　機能物質化学研究室

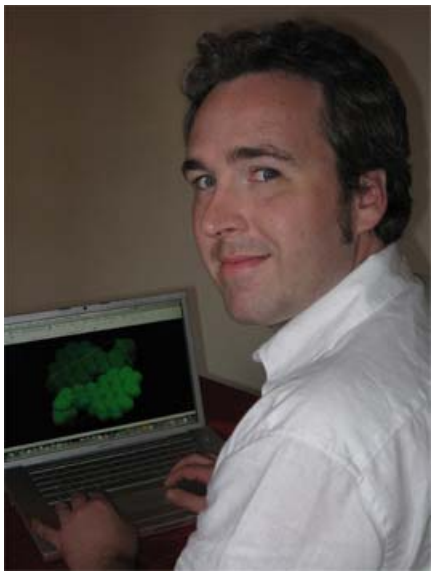
日時：2016 年 3 月 31 日（木）午前 9 時 30 分～午後 0 時 30 分
場所：青山学院大学相模原キャンパス J 棟 505 室
概要：青山学院大学機能物質化学講演会では、機能性分子科学の研究でご活躍されている世界的に著名な先生方をお招きして最先端の研究をご紹介して頂いております。今回は、権威ある CNRS bronze medal の受賞者であり、光化学分野でご活躍されている CNRS Researcher の Michel Sliwa 博士と Nathan McClenaghan 博士をお招きし、最新の研究成果についてご講演して頂きます。

【プログラム】

09 時 30 分～11 時 00 分　Michel Sliwa　リール第 1 大学（フランス）
Advanced ultrafast spectroscopies to reveal the structure to function relation in emissive bio-molecular systems

11 時 00 分～12 時 30 分　Nathan D. McClenaghan　ボルドー大学（フランス）
Designer photoactive functional molecules: Energy shuttling, molecular machines and highly photostable fluorophores

Dr. Michel Sliwa



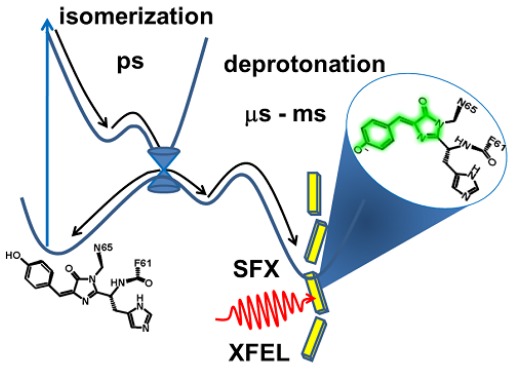
Dr. Nathan D. McClenaghan

世話人：化学・生命科学科　阿部二朗（内線：46225）

Advanced ultrafast spectroscopies to reveal the structure to function relation in emissive bio-molecular systems

Michel Sliwa

The observation of emission of light after a specific excitation, found for GFP's fluorescent proteins, or the generation of cold light by living organisms, known as bioluminescence, has fascinated and puzzled mankind for centuries. For the latter case one of the most studied bioluminescent reaction systems currently are bioluminescence beetles, particularly fireflies. To understand dynamics of the emitter we undertook thoroughly stationary and ultrafast time resolved studies of oxyluciferin and its derivatives in different environment. For the first time, the disentanglement of the complex dynamics and the emission spectra involved in Japanese fireflies was achieved and will be firstly discussed here [1].



As a second example photo-switchable fluorescent proteins will be considered due to their applications in advanced fluorescence microscopy of live cells. We investigated two different photoswitchable fluorescent proteins IrisFP and rsEGFP2 to study photo-switching from the non-fluorescent (off) to the fluorescent (on) state. We will report here for the existence of several intermediate states on the pico- and microsecond time scales that are attributed to chromophore isomerization and proton transfer, respectively. We will also discuss here the use of serial femtosecond crystallography (SFX) at an X-ray free electron laser to solve the structure of photo-switchable proteins [2].

References

[1] M. Rebarz, B.-M. Kukovec, O.V. Maltsev, C. Ruckebusch, L. Hintermann, P. Naumov, M. Sliwa, **Chem. Sci. 2013**; A. Ghose, M. Rebarz, O.V. Maltsev, L. Hintermann, C. Ruckebusch, E. Fron, J. Hofkens, Y. Mély, P. Naumov, M. Sliwa, P. Didier, ***J. Phys. Chem. B* 2015**.

[2] J-P. Colletier, M. Sliwa et al. ***J. Phys. Chem. Lett.* 2016**, DOI: 10.1021/acs.jpclett.5b02789.

Designer photoactive functional molecules: Energy shuttling, molecular machines and highly photostable fluorophores

Nathan D. McClenaghan

Supramolecular approaches to new photoactive supramolecular systems are developed in the Bordeaux laboratory (see McClenaghan group homepage: http://mcclenaghan.ism.u-bordeaux1.fr), and a selection of recent examples will be shown.[1-4] Reversible Electronic Energy Transfer (REET) can be followed with time-resolved spectroscopies, and unlike unidirectional energy transfer, can induce delayed luminescence and improve phototosensitizer properties in molecular dyads and assemblies. Now we show that REET can intervene in molecular machines in terms of assembly and signaling the state of the system.[1]

BF_2-dipyrromethene boron dyes (BODIPY) are well-known highly performant fluorophores. Replacing the BODIPY *meso*-carbon with a nitrogen atom pushes emission into the NIR therapeutic window, and simultaneous incorporation of heavy atoms leads to potential photodynamic therapy (PDT) agents. Here we equally show our findings on benchmark members of this series of BF_2-azadipyrromethenes as NIR imaging and PDT agents, providing photodynamics and revealing photostabilities over 3-orders of magnitude higher than conventional BODIPYs.[3]

Equally, proof-of-principle of compartimental effects in guiding photodriven chemical communication between functional molecules in dynamic and non-dynamic nanodomains has recently been demonstrated. As well as studies in solution, communication between distant sites / molecules considering the use of photoejected ions in nanocapsules and organized media including micron-sized polymersome hosts will be presented.[4]

References

1 L. Scarpantonio, A. Tron, C. Destribats, P. Godard, N. D. McClenaghan, *Chem. Commun.*, **2012**, *48*, 3981; S. A. Denisov, Q. Gan, X. Wang, L. Scarpantonio, Y. Ferrand, B. Kauffmann, G. Jonusauskas, I. Huc, N. D. McClenaghan, *Angew. Chem. Int. Ed.* **2016,** DOI: 10.1002/anie.201508611.

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