

2018 有機生命・物理化学セミナー01

Prof. Malcolm D. E. Forbes (*Director, Center for Photochemical Sciences and Department of Chemistry, Bowling Green State University*) 講演会

主催/ Organizer: 東北大学多元物質科学研究所 (IMRAM, Tohoku University)

共催/Co-organizer: 物質デバイス領域共同研究拠点、ダイナミックアライアンス 他

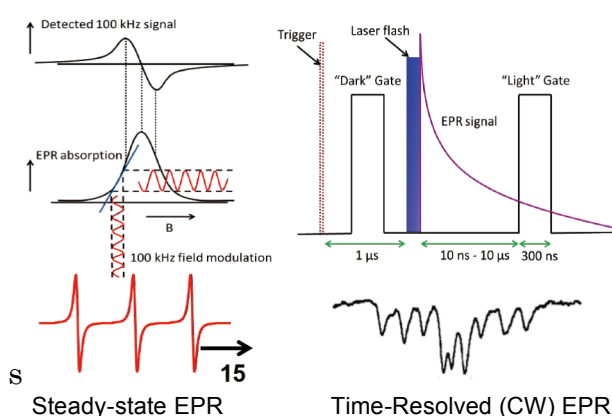
日時/ Date: 2018年5月14日(月)16時~17時30分/ from 4pm to 5:30pm on May 14(Mon)

場所/ Venue: 多元物質科学研究所東研究棟 1号館 3階会議室/Tohoku Univ. IMRAM Meeting room

題目/ Title: **Photons, Radicals, Bubbles and Beer: Using Photochemistry and Electron Paramagnetic Resonance Spectroscopy to Understand the Universe**

講師/ Speaker: Prof. Malcolm D. E. Forbes (*Director, Center for Photochemical Sciences and Department of Chemistry, Bowling Green State University, Bowling Green, Ohio, USA*)

概要/ Abstract: Our laboratory has a long-standing interest in the structure, reactivity, and dynamics of free radicals in both homogeneous and heterogeneous media. In this lecture, the basic tenets of steady-state and time-resolved (CW) electron paramagnetic resonance spectroscopy (SSEPR and TREPR) are explained, and their use in understanding the physical and chemical behavior of free radicals is outlined. Examples to be presented include the use of stable nitroxide spin probes to investigate the drying and curing of architectural coatings, and to probe the physical properties structured (non-Newtonian) fluids at the molecular level. Chemical reactivity involving free radicals can be studied directly using TREPR, for example in the study of the mechanism for the lightstruck flavor (so-called "skunking") of beer. Reactivity can also be investigated using spin trapping techniques. Two different trapping methods will be presented: nitrones can be used to confirm the mechanism of action of biocompatible polymer initiators, and the reaction of hindered amines with singlet oxygen can be used to quantify the kinetics and topology of such reactions in confined media. Finally, two applications of EPR spectroscopy to study molecular dynamics are presented: modulation of the exchange interaction in two Cu-Cu porphyrin dimers, and long-range radical-triplet state pair interactions in acrylic polymers in liquid solution. The role of molecular motion (rotational and translational) in confined spin-correlated radical pairs will also be explained.



Malcolm D. E. Forbes was born in Belfast, Northern Ireland in 1960. After two years of study at American International College in Springfield, MA, Malcolm completed his university training at the University of Illinois at Chicago, receiving a double major B.S. degree in Chemistry and Mathematics in 1983. He undertook doctoral studies at the University of Chicago, where he worked with the late Gerhard L. Closs on the study of unstable spin-polarized biradicals using time-resolved electron paramagnetic resonance spectroscopy. In 1988, his accomplishments in this area were recognized with the Bernard Smaller Prize for Research in Magnetic Resonance. After receiving his Ph.D. degree, Malcolm was awarded a National Science Foundation Postdoctoral Research Fellowship. From 1988 to 1990 he worked at the California Institute of Technology with Nathan S. Lewis on interfacial charge transfer kinetics at silicon/liquid junctions.

In July 1990, Malcolm joined the Department of Chemistry at the University of North Carolina at Chapel Hill and was promoted to Professor of Chemistry in 1999. From 2011–2014 he served as a Program Officer in the Chemistry Division of the U. S. NSF in Arlington, VA. In July 2015, Malcolm accepted the position of Professor of Chemistry and Director of the Center for Photochemical Sciences at Bowling Green State University in Ohio.

Malcolm has received a number of awards and honors for his research: a National Science Foundation Young Investigator Award (1993–1998), a JSPS Foreign Fellowship Award (1998–1999), the 2000 Sir Harold Thomson Award from Elsevier, and most recently a J. W. Fulbright Senior Scholar Award (2007–2008). Malcolm was co-Chair of the 2008 GRC on Electron Donor–Acceptor Interactions, and co-Chair of the 2015 GRC on Photochemistry. He is the immediate past President of the Inter-American Photochemical Society (2014–2016).

Malcolm's research interests span a wide area of physical organic chemistry. His primary focus is studying free radical structure, dynamics and reactivity using a variety of magnetic resonance techniques. Current projects include the fundamentals of "spin chemistry," proton-coupled electron transfer reactions, singlet oxygen topology in heterogeneous media, drying and curing processes in thin films and coatings, and the photodegradation and chain dynamics of polymers. Malcolm has published more than 115 papers and book chapters, and has presented more than 170 invited lectures.

問合せ/Contact: 和田健彦教授 (多元研/IMRAM) : Prof. Takehiko WADA (hiko@tohoku.ac.jp)