NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

School of Physical and Mathematical Sciences
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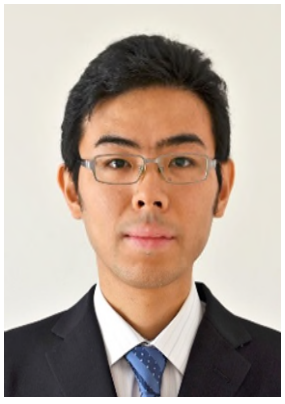

Dr Takuya TERAI

Saitama University, Japan

Chemical Biology Tools for Studying Crowding Multimolecular Biosystems: Fluorescent Probes and Peptide Ligands

Cells and tissues are crowding multimolecular biosystems wherein various biological molecules miscellaneously and densely co-exist in different compartments. Although traditional biochemistry extracts and purifies each component from the cells and reconstitutes the system of interest in a test tube, this approach cannot really understand dynamic and complex behaviors of biomolecules in real living systems. So, the ultimate purpose of my research is to establish a new and interesting chemical/biochemical molecular tools for functional analysis and artificial regulation of biomolecules in living systems. This will contribute to progress in chemical biology, drug discovery, and disease diagnosis.

With this in mind, I have mainly worked on the development of two kinds of molecular tools so far: fluorescent probes and functional peptides. As to the former, I developed several fluorescent probes based on lanthanide complexes,[1,2] organic small molecules,[3] and small molecule-protein conjugates.[4,5] These probes were rationally designed using the photochemical principles including intramolecular photoinduced electron transfer, and could be applied to cell imaging or drug discovery research. As to the latter, I focus on a molecular evolution technology called “cDNA display”, where a peptide and a nucleic acid that encodes it is covalently coupled via a specially designed puromycin DNA linker.[6] I have recently identified peptides that associate with lipid membrane,[7] an organic dye,[8] and drug target proteins (unpublished). In this seminar, I will present these works and also discuss my future plan, where organic chemistry of small molecules and directed evolution of polypeptides are bridged in a true sense.

References

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2. H. Ito, T. Terai* *et al.* "Detection of NAD(P)H-dependent Enzyme Activity with Dynamic Luminescence Quenching of Terbium Complexes" *Chem. Commun.,* **51,** 8319-8322 (2015).
3. T. Terai *et al.* "TokyoGreen Derivatives as Specific and Practical Fluorescent Probes for UDP-Glucuronosyltransferase (UGT) 1A1" *Chem. Commun.,* **49,** 3101-3103 (2013).
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5. R. Taguchi, T. Terai* *et al.* “A protein-coupled fluorescent probe for organelle-specific imaging of Na^{+}” *Sensor Actuat. B —Chem.,* **265,** 575-581 (2018).
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7. S. Kobayashi**, T. Terai**, *et al.* “In vitro selection of random peptides against artificial lipid bilayers: a potential tool to immobilize molecules on membranes” *Chem. Commun.,* **53,** 3458–3461 (2017). ** equal contribution
8. T. Terai* *et al.,* “Selection of Peptides that Associate with Dye-Conjugated Solid Surfaces in a pH-Dependent Manner Using cDNA Display”, *ACS Omega,* **4,** 7378-7384 (2019).

Biography

Dr. Takuya Terai graduated from the University of Tokyo (Department of Pharmaceutical Sciences) in 2004, and obtained Ph.D. from the same university under guidance of Prof. Tetsuo Nagano and Prof. Yasuteru Urano. After working as Assistant Professor of the University of Tokyo, he moved to Saitama University and now is a Project Associate Professor there. His research interest lies in the development and application of molecular tools based on chemical biology, such as fluorescent sensors and protein ligands.

Date: **7th February 2020 (Friday)**
Time: **11.00am to 12.30pm**
Venue: **SPMS Research & Graduate Studies Conference Room**
Host: **Professor Xing Bengang**