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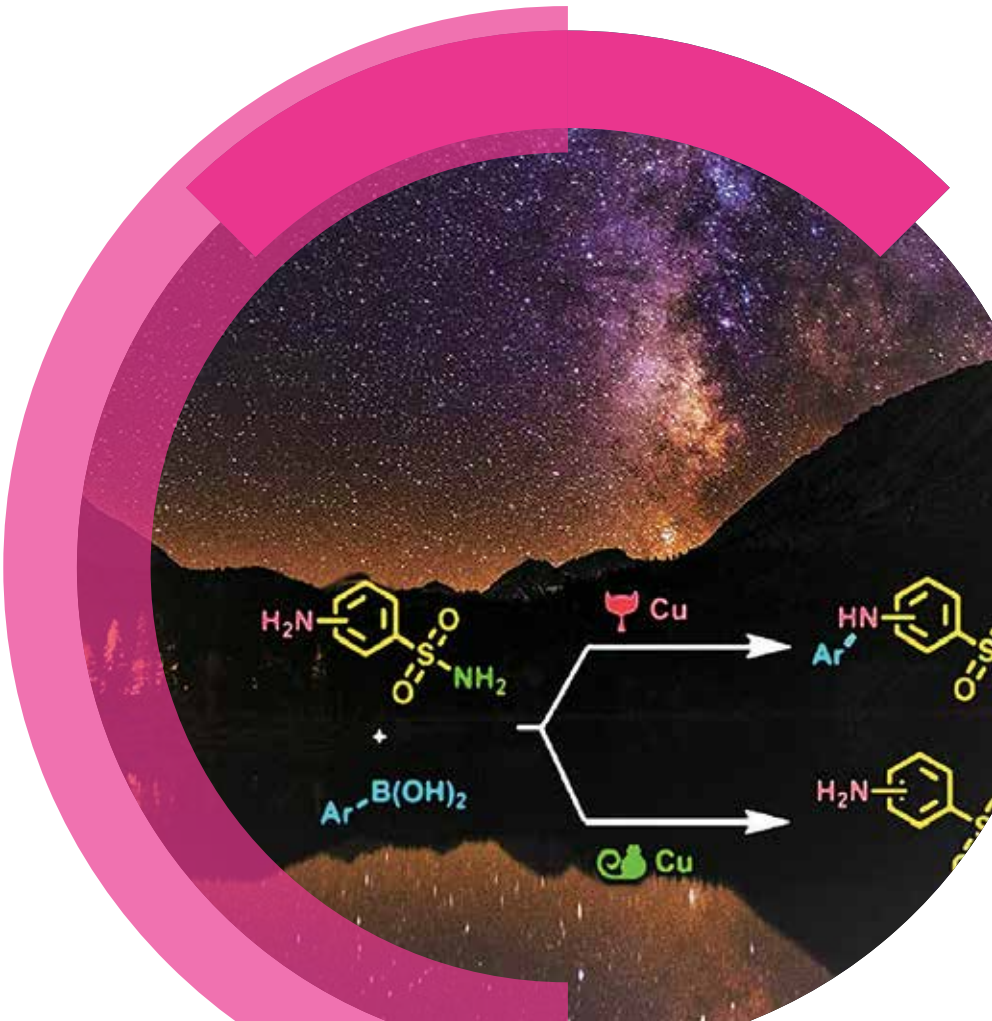
October 16, 2019, Changwon, Korea

The 6th Organic Chemistry Frontiers International Symposium



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ROYAL SOCIETY OF **CHEMISTRY** | CELEBRATING **IYPT 2019**

Welcome from the Organizing Committee

On behalf of the organizing committee, we would like to offer a warm welcome to all of you to the 6th Organic Chemistry Frontiers International Symposium. The symposium is held at Changwon Exhibition and Convention Center (CECO) on October 16 of 2019. Organic Chemistry Frontiers International Symposia are a series of conferences sponsored by *Organic Chemistry Frontiers*, a collaborative journal developed by the Chinese Chemical Society, the Shanghai Institute of Organic Chemistry, and the Royal Society of Chemistry. Previous meetings were held in Shanghai (2014), Zhejiang (2015), Oxford (2016), Kunming (2017), and Lanzhou (2018). The symposia are devoted to recent advances and new trends in contemporary organic chemistry, especially the synthesis of functional organic materials, the development of innovative synthetic methods, and the design of high-performance catalysts as well as their applications to organic synthesis.

This year's OCF symposium is a part of the KCS-RSC bilateral programs and co-organized by the Royal Society of Chemistry, the Korean Chemical Society, and the Organic Chemistry Division of the KCS. We are especially pleased to host the symposium for the first time in Korea. Under the chairmanship of Prof. Chulbom Lee at Seoul National University, the local organizing committee has put together a half-day event featured by the lectures from OCF Editorial Board members and invited local speakers, who are leading experts in the field. We are grateful to the distinguished speakers who kindly agreed to share their latest research with us. Participation of these prominent scholars representing diverse areas of organic chemistry will make this year's program strong and exciting. We would like to encourage graduate students and postdoctoral fellows to participate in the 6th OCF symposium, which will offer opportunities to interact with these scientists. We hope that this symposium will provide a useful forum for exchange of ideas and experiences, fostering new research collaborations between international leaders and Korean organic chemists.

The symposium is open to all who have registered for the KCS National Meeting.

Prof. Hyun-Joon Ha
President, KCS

Prof. Duck-Hyung Lee
Chair, KCS Organic Division

Prof. Chulbom Lee
Organizing Committee

The 6th Organic Chemistry Frontiers International Symposium

Room 301/302, Changwon Exhibition Convention Center, Changwon, Korea

16 October 2019

Time	Event	Session Chair
13:45 - 13:50	**Opening Remarks** Duck-Hyung Lee *(Sogang University, Korea)* *Chair of the KCS Organic Division*	
13:50 - 14:15	**Propargylic Alcohol-Based Allene Syntheses** Shengming Ma *(Shanghai Institute of Organic Chemistry, China)*	**Seunghoon Shin** *Hanyang University, Korea*
14:15 - 14:40	**From Radical Chemistry to Dual Catalysis** Louis Fensterbank *(Université Pierre et Marie Curie, France)*	
14:40 - 15:05	**Visible Light-Induced Site-Selective C–H Heteroarylation** Sungwoo Hong *(KAIST and IBS, Korea)*	
15:05 - 15:20	**Coffee Break I**	
15:20 - 15:45	**Diimine Multi-Purpose Platform for Chiral Ligands** Nicolai Cramer *(Ecole Polytechnique Fédéralde de Lausanne, Switzerland)*	**Bongjin Moon** *Sogang University, Korea*
15:45 - 16:10	**Understanding Photoexcited States of Functional Organic Materials** Lichang Wang *(Southern Illinois University, USA)*	
16:10 - 16:35	**Porphyrin-based Supramolecular Nano-architectures** Woo-Dong Jang *(Yonsei University, Korea)*	
16:35 - 17:00	**Planar and Contorted π-scaffolds for Organic Electronics** Frank Würthner *(University of Würzburg, Germany)*	
17:00 - 17:15	**Coffee Break II**	
17:15 - 17:40	**Catalytic Asymmetric Addition Reaction of Heteroatom Nucleophiles to Alkoxyallene: A De Novo Glycosidic Bond Formation** Young Ho Rhee *(POSTECH, Korea)*	**Sukwon Hong** *GIST, Korea*
17:40 - 18:05	**Automation of Oligosaccharides and Glycopeptide Synthesis** Peng George Wang *(Georgia State University, USA)*	
18:05 - 18:30	**Small-Molecule Fluorescent Sensors for Reactive Oxygen and Reactive Nitrogen Species** Dan Yang *(The University of Hong Kong, China)*	
18:30	**Concluding Remarks** Shengming Ma *(Shanghai Institute of Organic Chemistry, China)* *Editor-in-Chief, Organic Chemistry Frontiers*	

Shengming Ma

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Shengming Ma was born in 1965 in Zhejiang, China. He received his PhD from Shanghai Institute of Organic Chemistry (SIOC) and became an Assistant Professor there in 1991. After postdoctoral research at the ETH with Professor Venanzi and Purdue University with Professor Negishi, he returned to SIOC in 1997. From February 2003 to September 2007, he was jointly appointed by SIOC and Zhejiang University (ZJU). In October 2007, he moved to East China Normal University to help build the research program in organic chemistry. Currently he works as a research professor at SIOC and Qiu Shi Adjunct Professor at ZJU. He received the Mr & Mrs Sun Chan Memorial Award in Organic Chemistry (2004), OMCOS Springer Award (2005), National Award for Research in Natural Science in China (Second-Class, 2006), and Natural Science Awards of Shanghai (First-Class, 2010). He is a member of Chinese Academy of Sciences and TWAS.

Propargylic Alcohol-Based Allene Syntheses

Shengming Ma

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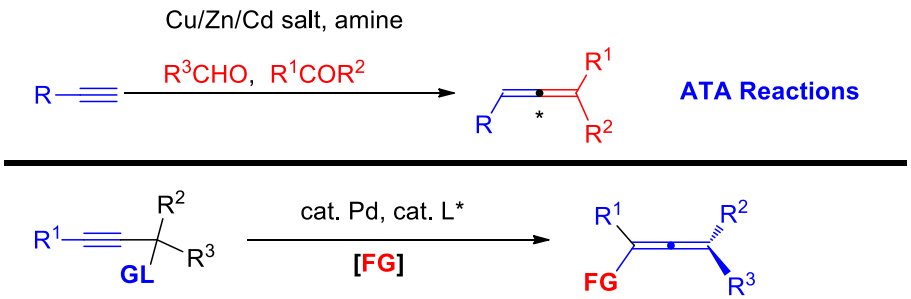
Allenes are becoming more and more important due to their potentials in organic syntheses, medicinal chemistry, and materials science, thus, development of new methodologies for the efficient syntheses of allenes from readily available chemicals are of immediate urgency. Recently, we have developed the **A**llenation of **T**erminal **A**lkynes with aldehydes or ketones reactions (ATA) for the syntheses of allenes.[1] In this lecture, I would like to share with you some of our most recent efforts towards the (enantioselective) syntheses of multi-substituted functionalized allenes using readily available racemic propargylic alcohols as the starting materials.[2-5]



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Biography Notes of Speakers

Louis Fensterbank

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Louis Fensterbank was born in Poitiers in 1967 and raised in Tours. He graduated from Ecole Supérieure de Chimie Industrielle de Lyon in 1990 and obtained his Ph.D. on silicon-tethered reactions in 1993 at SUNY Stony Brook under the supervision of Scott Sieburth. After a temporary lecturer position at UPMC in 1994, he was appointed in 1995 Chargé de Recherche CNRS in Max Malacria's team. In 2004, he obtained a professor position at UPMC and, in 2008, he was nominated junior member at the Institut Universitaire de France. His research interests concern the discovery of new molecular transformations relying on radical or organometallic processes and their applications to the synthesis of substrates with relevant properties (e.g., natural products, probes, ligands). In 2009, he was a Visiting Scientist at the Australian National University, Canberra and in 2017, he was Invited Professor at Osaka Prefecture University. Recently, he was elected Fellow of the Royal Society of Chemistry (2016) and he received the Prix de la Division de Chimie Organique of the French Chemical Society (2016) and the Silver Medal from CNRS (2017).

From Radical Chemistry to Dual Catalysis

Louis Fensterbank

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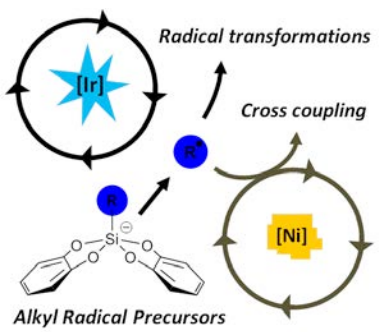
Over the last decade, we have been involved in the implementation of organometallic catalysis to the development of more sustainable synthetic radical chemistry. Whether relying of the use of new organometallic iron or copper complexes,[1] or photocatalytic systems,[2] we have been able to devise efficient homolytic processes with relevant applications in organic synthesis. More recently, we have introduced hypercoordinated bis-catecholato silicon compounds as versatile sources of alkyl radicals upon visible light photocatalysis. Using Ir(III) as catalytic photooxidant,[3] or an organic dye,[4] a series of alkyl radicals, including highly reactive primary ones can be generated and engaged in various intermolecular homolytic reactions. Based on cyclic voltammetry, Stern-Volmer studies and DFT calculations, a mechanism involving a single electron transfer from the silicate to the excited photocatalyst has been proposed. Finally, we have shown this oxidative photocatalyzed process can be efficiently merged with nickel-catalyzed C_{sp2}-C_{sp3} cross-coupling reactions.[3,4] Following our developments in gold catalysis[5], our recent efforts in photoredox/gold dual catalysis will also be presented.[6]



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Biography Notes of Speakers

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Sungwoo Hong is a Professor at the Department of Chemistry at Korea Advanced Institute of Science and Technology (KAIST, Korea) and an Associate Director of the Center for Catalytic Hydrocarbon Functionalizations at the Institute for Basic Science (IBS). He graduated from Seoul National University (Korea), where he gained his BS and MS degrees. He then went on to Pennsylvania State University (USA) for his PhD program. After he had finished his postdoctoral course at Harvard University (USA, 2006), under the supervision of Prof. E. J. Corey, he joined GlaxoSmithKline (GSK, USA) as a Principal Scientist. In 2009, he started independent work at KAIST. His research interests are in the field of development of new reactions and synthesis, medicinal chemistry and bioorganic chemistry.
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Visible Light-Induced Site-Selective C–H Heteroarylation

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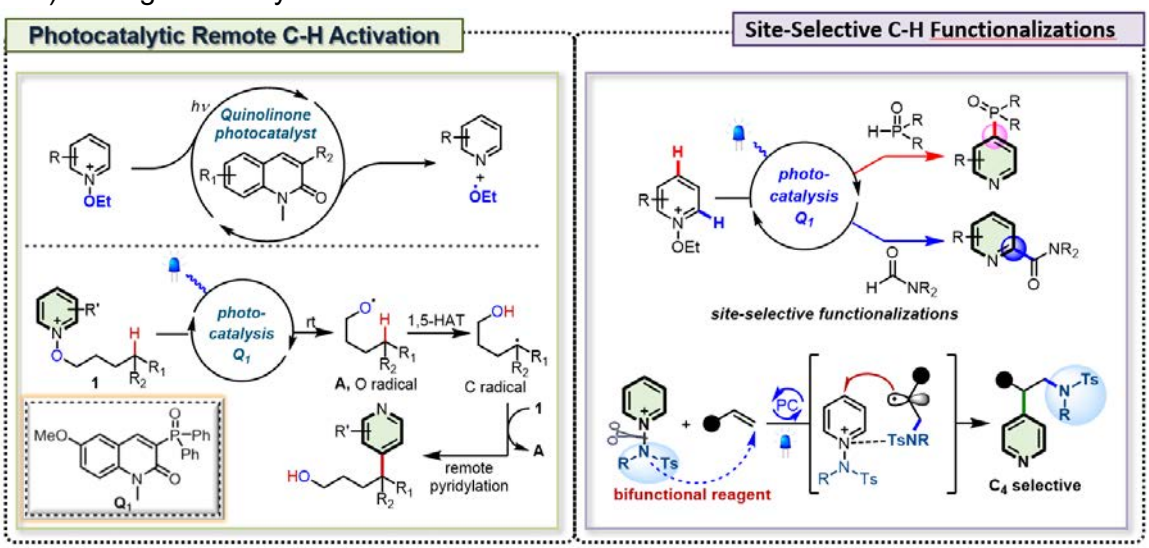
Our current research is focused on studying breakthrough knowledge in synthetic catalytic methods and molecular design that have a high impact on broader scientific fields. The selective C–H bond functionalization has become the favored reaction methods in practical synthetic processes. The new catalytic synthetic methods allow us to perform the unprecedented disconnection of target molecules, affording innovative and imaginative synthetic strategies of so-called "privileged scaffolds". Visible-light-induced site-selective heteroarylation of remote C(sp^3)–H bonds has been accomplished through the design of by a photoexcited quinolinone catalyst (Q_1). This powerful transformation establishes a new synthetic method that allows for site-divergent functionalizations of pyridine derivatives driven by visible light and offers considerable advantages in both simplicity and efficiency. We expect that these new catalytic synthetic methods will be used to prepare privileged building blocks, providing opportunities for the successful implementation of fragment-based drug design (FBDD) in drug discovery research.



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Nicolai Cramer

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Nicolai Cramer studied chemistry at the University of Stuttgart, Germany and earned his PhD degree in 2005 under the guidance of Professor Sabine Laschat. After a short research stage at Osaka University, Japan, he joined the group of Professor Barry M. Trost at Stanford University as a Feodor-Lynen postdoctoral fellow in 2006. From 2007 to 2010, he worked as Habilitant at the ETH Zurich, Switzerland, recieving his *venia legendi* in 2010. Subsequently, he joint the EPF Lausanne, Switzerland as Assistant Professor. Nicolai was promoted to Associate Professor in 2013 and subsequently to Full Professor in 2015. Among other prizes, he received the Novartis Early Career, BASF Catalysis and Bayer Early Excellence in Science Award as well as the Werner and the Latsis Prize.

Diimine Multi-Purpose Platform for Chiral Ligands

Nicolai Cramer

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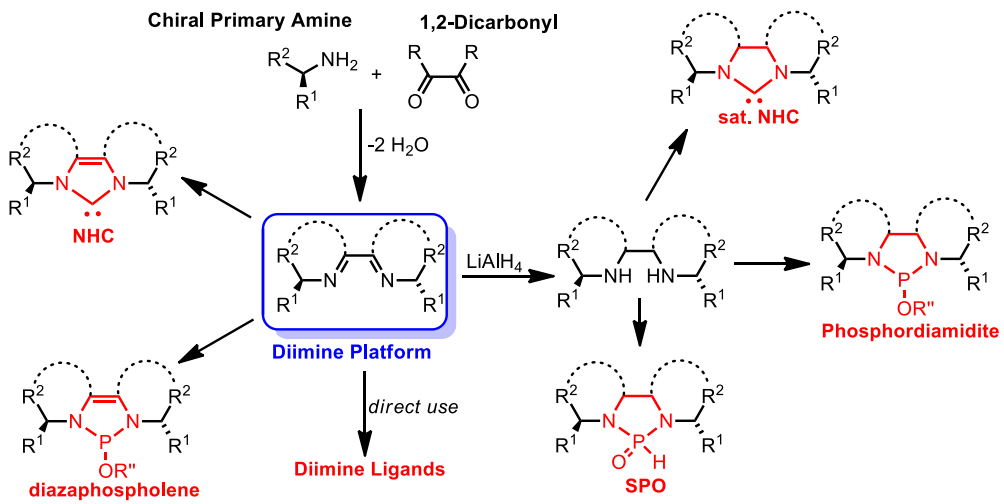
Reactions involving the selective activation and subsequent functionalization of C-H bonds have a high synthetic potential because of their economic and ecological benefits. Despite significant progress in addressing reactivity and selectivity issues, as well as refining mechanistic understanding of the different pathways, catalytic enantioselective transformations remain challenging. The design and development of efficient ligand systems is critical to the success these transformations. In particular, heroic "ligand total synthesis" should be avoided and highly modular approaches involving multi-purpose platform intermediates should be favored. The presentation will focus on recent developments exploiting designer amines as chirality-bearing backbones for phosphordiamidites,[1] *N*-heterocyclic carbenes[2] as well as diazaphospholenes.[3] Applications of these ligands/catalysts for a broad range of enantioselective transformation, including nickel(0)- and palladium(0)-catalyzed C-H activations will be shown.



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Lichang Wang

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Lichang Wang received her B.S. and M.S. in Chemical Engineering from Tianjin University, China, in 1985 and 1988, respectively, and her Ph.D. in Chemistry in 1993 from University of Copenhagen, Denmark. She was a postdoctoral fellow at University of Copenhagen, Denmark (1993-1994), University of Cambridge, U.K. (1994-1998), University College London, U. K. (1996-1997), and The Ohio State University (1998-2001) before joining the Department of Chemistry and Biochemistry at Southern Illinois University, Carbondale in 2001. She is currently the Department Chair.
The ongoing research of the Wang group focuses on organic small molecules as sensitizers and transition metal catalysts for ethanol oxidation as well as developing new computational methods to accurately study these systems.

Understanding Photoexcited States of Functional Organic Materials

Lichang Wang[1], Xueqin Zhou[2], Tianyang Wang[3], Wenhui Feng[2] and Thomas T. Testoff[1]

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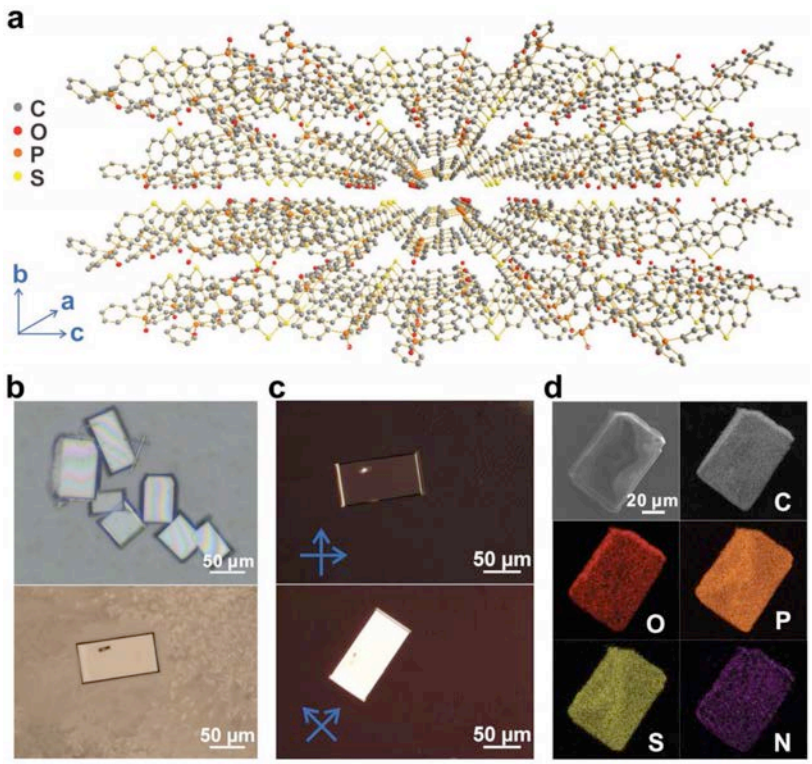
Understanding the correlation between photophysical properties, including excitons being generated or relaxation processes of the excited electrons, of organic materials is essential to design functional organic materials with desired performance. The functional organic materials of our interest include small molecule based photovoltaics[1] and long-persistent luminescence materials[2] (see the picture as an example).



In this presentation we will discuss the findings we have recently made with special focus on (1) the computational techniques we developed to study excitons of molecules; (2) the results of joint experimental and computational studies of excited states in a series organic small molecules and their aggregates.

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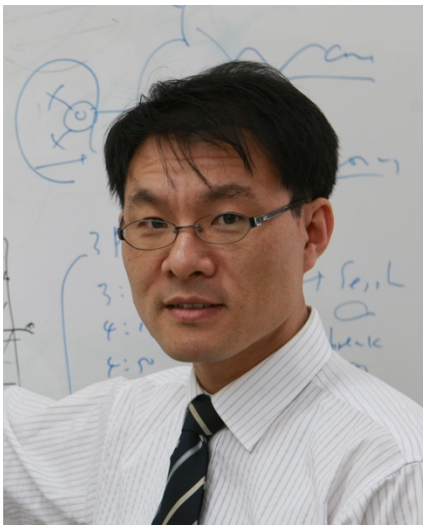

Woo-Dong Jang

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Woo-Dong Jang received B.S. degree from Department of Polymer Science at Kyungpook National University (Korea) in 1997. He carried out his doctoral study as an awardee of Japanese Government Scholarship at the University of Tokyo from 1998 to 2003 under guidance of Professor Takuzo Aida. Then, he worked as a Postdoctoral Fellow of Japan Science and Technology Agency with Professor Kazunori Kataoka in the University of Tokyo for two years. Then, he appointed as an assistant professor of the Department of Materials Engineering in the University of Tokyo at 2005. He joined Department of Chemistry at Yonsei University Korea from 2006 as an assistant professor, where he is currently a full Professor. His research interests are porphyrin-based functional materials, stimuli-responsive materials, and biomedical applications of functional nanodevices. He has authored and co-authored over 100 research publications. He received "*Academic Advancement Award*" (2013) from Macromolecular Chemistry division, "*Shim Sangchul Award*" (2014) from Organic Chemistry division of Korean Chemical Society, "*Best Research Achievement Award*" (2010, 2014) from Yonsei University, and "*mid-carrier researcher Award*" (2016) from Korean Polymer Society. He was invited in many international conference as invited speakers including ICPP, ISMSC, ACS, MSMLG, and so on.

Porphyrin-based Supramolecular Nano-architectures

Woo-Dong Jang, Hosoowi Lee

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Porphyrins are essential pigments in biological systems. Porphyrins and chlorophylls are often self-assembled into nanoscale superstructures to perform many essential functions, such as light harvesting and electron transport. The crystal structure of the light-harvesting antenna complexes (LHC) in purple photosynthetic bacteria shows the presence of a highly symmetric wheel-like supramolecular architecture involving a large number of bacteriochlorophyll pigments. From the inspiration of the natural light harvesting systems, a variety of porphyrin-based nanoarchitectures, such as nanofibers, nanosheets, nanoparticles, and nanorings have been fabricated for applications in various research fields including photonics, catalysis, and electronics. The mimicry of light harvesting system is a very important subject, not only form a scientific viewpoint, but also for its possible contribution to sustainable utilization of energy resources. As mimic of natural light harvesting system, we recently have designed several porphyrin-based artificial models including porphyrin dendrmers, self-assembled nano-ring, and supramolecular receptors. In this symposium, we are going to report recent advances in our research related to the porphyrin-based supramolecular architectures. For example, porphyrin tripod containing triazole bridge showed formation of globular-shaped nanoparticles or linear fibrous supramolecular polymers, which have been further controlled their morphologies by addition of pyridyl guest molecules. These results could pave the way for mimicking biological systems where the macroscopic hierarchical assemblies arise in response to the microscopic changes of biomolecules.

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Frank Würthner

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Frank Würthner received his education in Chemistry at the University of Stuttgart (doctoral degree 1994) and carried out postdoctoral research at MIT in Cambridge/MA (USA). After two years at BASF and five years at the University of Ulm (Habilitation in 2001) he became chair professor of Organic Chemistry at the University of Würzburg in 2002. Here he has served as head of the Institute of Organic Chemistry, dean of the Chemistry Department and founding director of the Center for Nanosystems Chemistry.

His main research interests include the synthesis of pi-conjugated molecules and functional dyes, their application in organic electronics, photonics and photovoltaics, the construction of complex supramolecular architectures composed of pi-scaffolds, the mechanistic elucidation of self-assembly processes, and the investigation of light-induced processes in dye-based nanosystems.

He has published more than 400 papers and is listed since 2014 regularly among the highly cited chemists of the last decade. He is an elected member of the German National Academy of Science Leopoldina and the Bavarian Academy of Sciences, as well as a Fellow of the Royal Society of Chemistry. His awards include the Arnold-Sommerfeld-Prize of the Bavarian Academy of Science (2002), the Elhuyar-Goldschmidt Award of the Royal Society of Spain (2016) and the Ta-Shue Chou Lectureship Award of Academia Sinica (2018).

Planar and Contorted π-scaffolds for Organic Electronics

Frank Würthner

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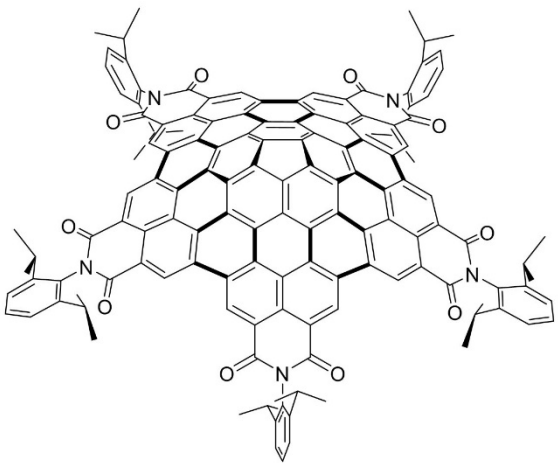
Despite of the fact that many functional properties of π-conjugated scaffolds only originate by the substitution of aromatic hydrocarbons with electron-donating and electron-withdrawing groups, research on larger π-scaffolds has so far been focused on the pristine subunits of graphene, carbon nanotubes or other polycyclic aromatic hydrocarbons. In contrast, driven by our ongoing interest in functional dyes and n-channel organic semiconductors,[1] we recently focused our attention on planar and contorted polycyclic aromatic hydrocarbons with low-lying LUMO levels that are realized by the incorporation of boron centers[2] or functionalization with multiple dicarboximide units[3] in the π-scaffold's periphery. Due to a lack of available synthetic methodologies towards such desirable molecules we developed a new borylation and cross-coupling-annulation cascade reactions for the synthesis of large-sized planar and contorted electron-poor π-scaffolds.[2,4] In this talk I will discuss our new synthetic methodologies and give first insights into the supramolecular and functional properties for a new class of nanosized functional π-conjugated molecules.



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Young Ho Rhee received his bachelor's degree (1990) and master's degree (1992) from Seoul National University. After working for LG chemicals as a research scientist, he moved to United States to study for the Ph.D. degree in 1997. After obtaining his Ph.D. degree from Stanford University in 2003 under the supervision of Professor Barry M. Trost, he worked with Professor Larry E. Overman at University of California Irvine as a postdoctoral fellow. In 2005, he started his independent career at POSTECH (Pohang University of Science and Technology) in Korea. He was promoted to associate professor (2010), and to full professor (2016). His research focuses on the development of new metal-catalyzed reactions and application to the synthesis of new bioactive and functional molecules.

Catalytic Asymmetric Addition Reaction of Heteroatom Nucleophiles to Alkoxyallene: A De Novo Glycosidic Bond Formation

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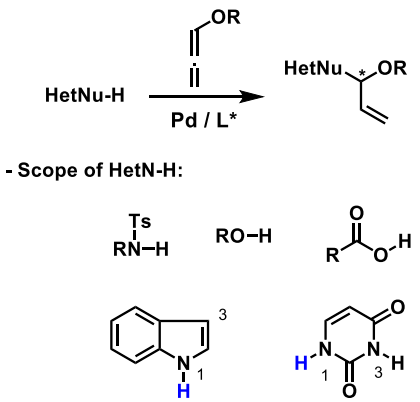
Addition of nucleophiles to allene represents a fundamental reaction in synthetic organic chemistry. Due to the atom-efficient nature and the capability to generate stereogenic centers, this type of reaction has drawn significant attention over the last decades.

Here, we report Pd-catalyzed asymmetric addition reaction of various heteratom nucleophiles to alkoxyallene. The reaction showed complete regioselectivity towards branched product formation. Numerous heteroatom nucleophiles participate well in this reaction (including alcohols, phenols, N-heterocycles, indoles, and carboxylic acids) to generate the corresponding O,O- and N,O-acetals in a stereochemically well-defined manner. Furthermore, this unique reaction was evolved into a de novo strategy towards highly useful O- and N-glycosides. In this context, application of this strategy to the synthesis of challenging targets such as deoxyoligosaccharides and ring-modified nucleosides will also be introduced.



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Peng George Wang obtained his B.S. Degree in Chemistry from Nankai University, China in 1984 and his Ph.D. Degree in organic/bioorganic chemistry from the University of California, Berkeley (UCB) in 1990. He then conducted postdoctoral research in UCB and in Scripps Research Institute from 1991 to 1994. He started his independent academic career at the University of Miami in 1994 and then moved to Wayne State University in 1997, where he was promoted to full Professor. From 2003 - 2011, he worked in the Departments of Biochemistry and Chemistry at the Ohio State University as an endowed Ohio Eminent Scholar on Macromolecular Structure and Function. In 2011, he took his current endowed position as a Georgia Research Alliance (GRA) Eminent Scholar on Glycoscience (glyco = sugar or carbohydrate) in the department of chemistry at Georgia State University. He has been serving as the chair of Department of Chemistry since 2015.
The main research focus in the lab is in Glycoscience on glycobiology, glycochemistry, glycoanalysis, glycomics, medicinal chemistry and chemical biology, with emphasis on cancer immunotherapy, small molecule drug discovery, carbohydrate-based vaccines, as well as glycopeptide and glycoprotein drugs.

Automation of Oligosaccharides and Glycopeptide Synthesis

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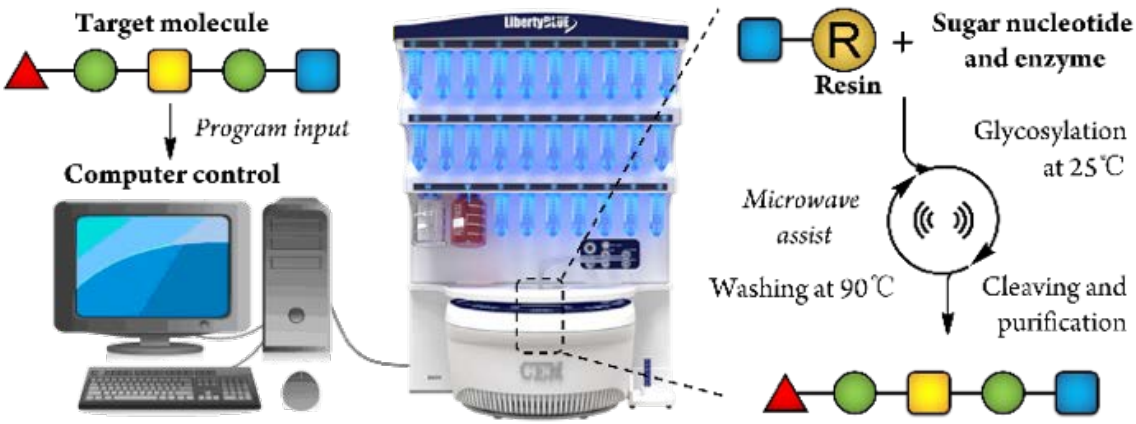
Inspired by the success of automated oligosaccharide synthesis through chemical glycosylation, a machine-driven automated system is reported here for oligosaccharides and glycopeptides synthesis through solid-phase peptide synthesis (SPPS) in organic solution and enzymatic glycosylation in aqueous solution. Thus, chemoenzymatic synthesis of oligosaccharides and glycopeptides can be obtained in an automated manner using a commercially available peptide synthesizer.[1]



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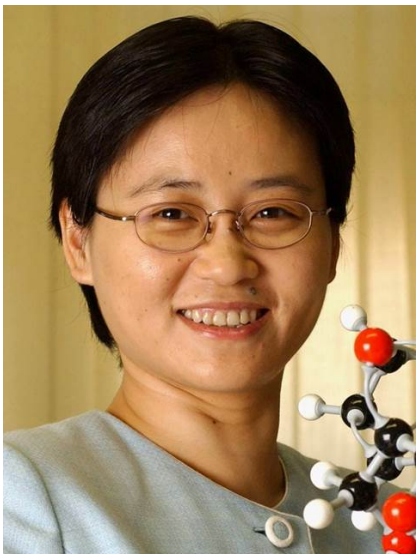

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Dan Yang earned a B.S. in Chemistry with the highest honor at Fudan University in China in 1985. Through the U.S.-China Chemistry Graduate Program, she obtained an M.A. from Columbia in 1988 under the direction of Professor Ronald Breslow. She then joined Professor Daniel Kahne's group at Princeton, and got her Ph.D. in 1991. In the same year, she won a postdoctoral fellowship award from the Cancer Research Institute in New York to support her two-year research in Professor Stuart Schreiber's group at Harvard. In 1993, she joined the faculty at The University of Hong Kong, where she is currently a chair professor of chemistry and the Morningside Professor in Chemical Biology.
Dan Yang's research interests include (1) development of fluorescent sensors for imaging cellular reactive oxygen/nitrogen species and investigating their relevant biological pathways; (2) design, characterization and biomedical applications of self-assembled synthetic ion channels and transporters; (3) using natural products and synthetic compounds as probes to investigate signal transduction processes in inflammation and cancer.

Small-Molecule Fluorescent Sencors for Reactive Oxygen and Reactive Nitrogen Species

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Reactive oxygen and reactive nitrogen species (ROS/RNS) play important roles in redox signaling and oxidative stress, thus serve as key regulators in human health and diseases such as cancer, inflammation, and neurodegenerative diseases.[1] By exploring new sensing strategy and responsive moiety, we have developed a series of small-molecule fluorescent sensors (**HKSOX, HKPerox, HKOCl, HKOH, HKGreen/HKYellow**) for highly selective and sensitive detection of superoxide, hydrogen peroxide, hypochlorous acid, hydroxyl radical and peroxynitrite, respectively.[2–8] These sensors have been widely applied in confocal imaging, flow cytometry analysis, tissue staining, and zebrafish imaging. Moreover, we have extended our sensing strategies onto other fluorescent/luminescent templates to develop more advanced probes with different excitation/emission wavelengths, ratiometric detection, and organelle-targeting properties. Our comprehensive molecular tools could be robustly applied in investigations of redox biology and medicine, facilitating the discovery of new diagnosis and therapeutics.

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