

2019

兴大报告年报

XINGDA LECTURE
YEARBOOK



Preface

At the turning point to reform and boost its research and education system in 1995, College of Chemistry and Molecular Engineering (CCME) at Peking University, China, proposed to set up a science forum to foster idea refreshments and brainstorming between its faculty and outside scientists, aiming at broadening its collaborations with institutions of chemical sciences and educations all over the world. Against all odds, CCME and Beijing Xinda Scientific Systems hit it off instantly to jointly establish the Xingda Lecture Series. Thanks to its enthusiasm for science, Beijing Xinda Scientific Systems has been financially supporting this lecture series ever since then. From the very beginning, Prof. Chunhua Yan had been serving as the organizer of this lecture series until 2015 after which Prof. Kai Wu was named as the successor.

The Xingda Lecture Series is held on every Friday throughout the academic year. Up to the time this booklet was edited, about 500 scientists had been invited to give talks at the Xingda Lecture Series which nearly cover all the research areas in chemistry and related disciplines. Needless to say, this lecture series won't be able to last without great contribution from these scientists.

With the great success of the Xingda Lecture series that has already benefited the faculty and students at CCME and the science communities inside and outside PKU as well, CCME in 2015 made the decision to upgrade this forum to the Xingda Lectureship that would be held by invited renowned and distinguished scientists from all over the world. This is also echoing the mission of Peking University in the new century which is to advance sciences and cultivate next-generation scientists for the betterment of humanity. To do this, a searching committee chaired by Prof. Kai Wu was established to select and invite scientists, normally one year in advance, to spend a period of time at CCME to share their latest achievements and exchange ideas with the faculty and students at CCME through both the Xingda Lectureship and in-lab discussions.

As a thank-you gift and historical document, we have edited this booklet to record the invited speakers and their biosketches as well as the titles and abstracts of their presentations delivered at the Xingda Lectureship in the last academic year. We'll continue to do this on a yearly basis in the future.

Last but not least, we are grateful to all who have been involved in the Xingda Lectureship and helped us in one way or another.

Kai Wu



Organizer, the Xingda Lectureship
May, 2017

2019 Xingda Lecture schedule

Issue	Time	Speaker	Institution	Title
562	March.15	Prof. Jonathan L. Sessler	Department of Chemistry, The Univ. of Texas, Austin	Texaphyrins as Drug Candidates
563	March.22	Jianping Gong (龚剑萍)	Hokkaido University	Molecular design of tough hydrogels with sacrificial bonds mechanism
564	March.29	Takashi Kato	The University of Tokyo	Supramolecular Functional Liquid Crystals for the Next Generation of Materials
565	April.12	Wonwoo Nam	Ewha Womans University	Biomimetic Metal-Oxygen Intermediates in Dioxygen Activation Chemistry
566	April.19	Vivian W.W. Yam (任咏华)	The University of Hong Kong	From Simple Discrete Metal Complexes to Ensembles, Conjugates and Nano-Assemblies for Sensing, Molecular Imaging and Bioassays
567	April.26	Herbert Waldmann	Max-Planck-Institute of Molecular Physiology	Pseudo Natural Products
568	May.10	Todd O. Yeats	UCLA	Learning from Nature How to Build Beautiful Structures from Protein Molecules
569	May.24	Peter Schultz	The Scripps Research Institute	Playing with the Molecules of Life
570	Jun.1	Ashutosh Chilkoti	Duke University	Translating Molecular Bioengineering from the Lab to the Patient
571	Sep.20	Phillpe Saute	University of California Los Angeles	Catalytic active sites are dynamical and metastable
572	Sep.27	Suljo Linic	University of Michigan	Plasmonic chemistry: opportuniteis challenges and unresolved questions
573	Oct.25	Michael Wasielewski	Northwestern University	Exploiting Photogenerated Radical Pairs as Spin Qubits for Quantum Information Science
574	Nov.1	Benjamin G. Davis	University of Oxford	Sugars & proteins: towards a synthetic biology

575	Nov.8	David Baker	University of Washington	De novo design of protein therapeutic candidates, nanomaterials, and logic
576	Nov.15	Piotr Piecuch	美国密歇根州立大学	Approaching Exact Quantum Chemistry by Stochastic Wave Function Sampling and Deterministic Coupled-Cluster Computations
577	Nov.22	Lothenbach, Barbara Elisabeth	EMPA,挪威科技大学	Chemistry of Cements
578	Nov.29	江必旺	苏州纳微科技有限公司董事长	纳米微球材料的精准制备技术及其产业化的应用
579	Dec.6	程正迪	华南理工大学	Topological and Sequence Engineering of Giant Molecules: Structures and Functions
580	Dec.13	林文斌	芝加哥大学	Molecular Materials for Sustainability and Human Health
581	Dec.27	支春义	香港城市大学	Flexible Energy Storage and Zinc Based Batteries

Texaphyrins as Drug Candidates

Abstract

This lecture will present a personal story of a 3x cancer survivor and how with the assistance of great coworkers and collaborators an effort has been made to fight back against this disease by studying the chemistry and anti-cancer biology of expanded porphyrins. Expanded porphyrin is a term we introduced into the literature in 1988 to describe larger homologues of natural blood pigments, such as the dyes (called heme) that make blood red. Many expanded porphyrins are now known. They have seen application in areas as diverse as anion recognition (capturing species with negative charges) and extraction (removal of pollutants from waste streams), photodynamic therapy (where light is used to burn out a cancer), and aromaticity (a fundamental property of organic chemistry).

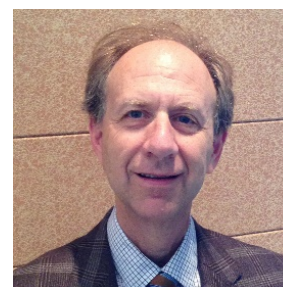
Prof. Jonathan L. Sessler

Department of Chemistry, The University of Texas, Austin, USA

1977 BS., University of California, Berkeley,

1982 Ph. D., Stanford University in 1982 (supervisor: Professor James P. Collman)

1984-now Doherty-Welch Chair Professor University of Texas at Austin



Honors and Awards

2019 Member of the European Academy of Sciences. ACS Cope Scholar Award, the RSC Centenary Prize, the Southwest Regional ACS Award, the Molecular Sensors-Molecular Logic Gates Award, the CASE award, and the Hans Fischer Award.

Selected Publications

1. Sessler, J. L.; Murai, T.; Lynch, V.; Cyr, M. J. *Am. Chem. Soc.* 1988, 110, 5586-5588.
2. Ishida, M.; Kim, S.-J.; Preihs, C.; Ohkubo, K.; Lim, J. M.; Lee, B. S.; Park, J. S.; Lynch, V. M.; Roznyatovskiy, V. V.; Sarma, T.; Panda, P. K.; Lee, C. H.; Fukuzumi, S.; Kim, D.; Sessler, J. L. *Nature Chem.* 2013, 5, 15-20.
3. Cha, W.-Y.; Kim, T.; Ghosh, A.; Zhang, Z.; Ke, X.-S.; Ali, R.; Lynch, V. M.; Jung, J.; Kim, W.; Lee, S.; Fukuzumi, S.; Park, J. S.; Sessler, J. L.; Chandrashekar, T. K.; Kim, D. *Nature Chem.* 2017, 9, 1243-1248.



Molecular design of tough hydrogels with sacrificial bonds mechanism



Prof. Jianping Gong (龚剑萍)

Advanced life science, soft matter GI-CoRe, Institute for chemical reaction design and discovery, Hokkaido University, Japan

- 1983 BA, Zhejiang University, China
- 1991 MA, Ibaraki University, Japan
- 1983 Ph. D., Tokyo Institute of Technology, Japan
- 1993- Hokkaido University
- 2016- Director of Global Station for Soft Matter, GI-Core
- 2018- PI for WPI-ICReDD

Abstract

Invention of the tough double network hydrogels (DN gels), consisting of interpenetrated rigid/brittle network and soft/stretchable network, shows that the effective energy dissipation by the breaking of the covalent bond of the brittle network prevents catastrophic crack propagation upon deformation, and thus, gives the extraordinarily high toughness of the material. Such sacrificial bond effect has been successfully applied to develop tough double network hydrogels of diverse chemistry and also to double and triple network elastomer materials. Thus, sacrificial bond concept is proved to be a general approach for developing tough soft materials.

Selected Publications

1. Gong J. P. *Soft Matter* **2010**, 6, 2583-2590.
2. Sun T. L.; Gong J. P. *Nat. Mater.* **2013**, 12, 932-937.
3. Matsuda T.; Gong J. P. *Science* **2019**, 363, 504-508.

Honors and Awards

2017 Hokkaido University President's Award for Excellence in Research and Education, 2014 The DSM Materials Sciences Award; 2011 The Chemical Society of Japan Award for Creative Work; 2006 The Award of the Society of Polymer Science, Japan.



Supramolecular Functional Liquid Crystals for the Next Generation of Materials

Abstract

New functional liquid crystals are presented. We have developed nanostructured liquid crystals that serve as materials for transport of ion and charges, water treatment membranes, and stimuli-responsive materials. Control of supramolecular and self-assembled structures as well as design of chemical structures of molecules is key for their functional design. Bio-inspired inorganic/organic liquid crystal materials are also described as environmental friendly functional materials.

Prof. Takashi Kato

School of Engineering, Department of Chemistry and Biotechnology
The University of Tokyo, Japan

1983 B.S. The University of Tokyo

1988 Ph.D. The University of Tokyo

1988-1989 Postdoc Cornell University (Prof. Jean M. J. Frechet)



Selected Publications

1. Kato T.; Uchida J. et al. "Functional Liquid Crystals towards the Next Generation of Materials" *Angew. Chem. Int. Ed.*, 2018 57, 4355.
2. Nakayama M.; Kato T. et al. "Stimuli-Responsive Hydroxyapatite Liquid Crystal: Dynamic Control of Macroscopic Ordering and Magneto-Optical Functions" *Nat. Commun.*, 2018, 9, 568.
3. Sakamoto T.; Kato T. et al. "Development of Nanostructured Water Treatment Membranes Based on Thermotropic Liquid Crystals: Molecular Design of Sub-Nanoporous Materials" *Adv. Sci.*, 2018 5, 1700405.
4. Kato T.; Yoshio M.; Ichikawa T, et al. "Transport of Ions and Electrons in Nanostructured Liquid Crystals" *Nature Reviews Mater.*, 2017, 2, 17001.
5. Uchida J.; Kato T. et al. "Self-Assembly of Giant Spherical Liquid-Crystalline Complexes and Formation of Nanostructured Polymer Gels Exhibiting Self-Healing Properties" *Angew. Chem. Int. Ed.*, 2017 56, 14085.

Honors and Awards

- 2017 The Chemical Society of Japan Award
- 2014 Fellow of the Royal Society of Chemistry (FRSC)
- 2012 The Japanese Liquid Crystal Society (JLCS) Awards
- 2010 The Award of the Society of the Polymer Science, Japan
- 2009 Molecular Science Forum Lecture Professorship, Institute of Chemistry, Chinese Academy of Science
- 2005 The 1st JSPS Prize (JSPS: Japan Society for Promotion of Science)
- 2003 The 17th IBM Japan Science Award



Biomimetic Metal-Oxygen Intermediates in Dioxygen Activation Chemistry

Abstract

Dioxygen is essential in life processes, and enzymes activate dioxygen to carry out a variety of biological reactions. One primary goal in biomimetic research is to elucidate structures of reactive intermediates and mechanistic details of dioxygen activation and oxygenation reactions occurring at the active sites of enzymes, by utilizing synthetic metal-oxygen complexes. A growing class of metal-oxygen complexes, such as metal–superoxo, –peroxo, –hydroperoxo, and –oxo species, have been isolated, characterized spectroscopically, and investigated in various oxygenation reactions. During the past decade, we have been studying the chemical and physical properties of various reactive intermediates in oxygenation reactions, such as high-valent iron(IV)- and manganese(V)-oxo complexes of heme and non-heme ligands in oxo-transfer and C-H activation reactions, non-heme metal-peroxo complexes in nucleophilic reactions, and non-heme metal-superoxo complexes in electrophilic reactions. The effects of supporting and axial ligands on structural and spectroscopic properties and reactivities of metal-oxygen adducts have been extensively investigated as well. In this presentation, I will present our recent results on the synthesis and structural and spectroscopic characterization of mononuclear nonheme metal-dioxygen intermediates as well as their reactivities in electrophilic and nucleophilic oxidation reactions.



Prof. Wonwoo Nam

Department of Chemistry and Nano Science, Center for Biomimetic Systems, Ewha Womans University, Seoul, Korea

1981-1985	B.S. California State University, Los Angeles
1986-1990	Ph.D. University of California, Los Angeles
1990 – 1991	Postdoctoral Fellow, UCLA
1991 – 1994	Assistant Professor, Hongik University
1994 – 2000	Associate Professor, Ewha Womans University
2000 – Present	Professor, Ewha Womans University
2005 – Present	Distinguished Professor, Ewha Womans University

Honors and Awards

- Best Research Paper by Korean Federation of Science and Technology Societies, 2004
- The 1st Ewha Academic Award, 2005
- Monthly Best Scientist Award by Ministry of Science and Technology of Korea, 2005
- Korean Chemical Society Award, 2006
- The 5th DuPont Science and Technology Award, 2006
- The 3rd Kyeong-Am Academic Award, 2007
- Named as a Role Model Scientist, Korea Science Foundation, 2008
- Excellent Research Award at Ewha Womans University, 2008
- Taikyu Rhee Academic Award, 2012
- Outstanding Achievement Award, Society of Asian Biological Inorganic Chemistry, 2014
- Commendation for Excellent Research in Basic Science, Ministry of Science, ICT and Future Planning, 2015
- Korea Science Award (A highly honored award given by the President of Korea), 2015

From Simple Discrete Metal Complexes to Ensembles, Conjugates and Nano-Assemblies for Sensing, Molecular Imaging and Bioassays

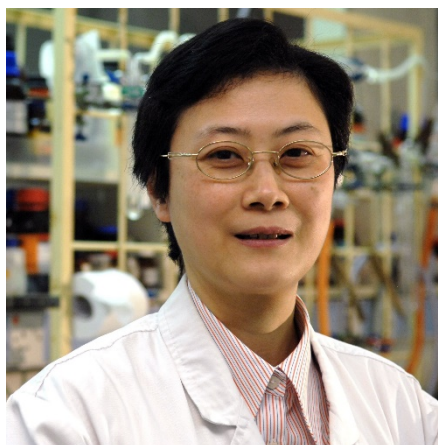
Abstract

In this presentation, various new classes of chromophoric and luminescent metal complexes will be described. A number of these metal complexes have been shown to display rich optical and luminescence behavior. Correlations of the chromophoric and luminescence behavior with the electronic and structural effects of the metal complexes have been made to elucidate their spectroscopic origins. These simple discrete metal complexes are found to undergo supramolecular assembly to give a variety of nanostructures and morphologies. Subtle changes in the microenvironment and nanostructured morphologies have led to drastic changes in both the electronic absorption and emission properties of these supramolecular assemblies. Explorations into the underlying factors that determine their spectroscopic properties and morphologies as well as their assembly mechanisms have provided new insights into the understanding of the interplay of the various intermolecular forces and interactions for the directed assembly of novel classes of metal-containing soft materials and hybrids. Through a fine control of the interplay amongst various coordination motifs, electrostatic assembly and non-covalent metallophilic, hydrophobic-hydrophobic and π - π interactions, together with the modulation of various photo-induced electron and energy transfer processes, new strategies towards the rational design of luminescent metal-ligand chromophoric ensembles, conjugates and nano-assemblies that would lead to changes in the absorption and emission characteristics for potential applications and functions in luminescence sensing, molecular imaging and bioassays, have also been made.

Prof. Vivian W.W. Yam(任咏华)

Institute of Molecular Functional Materials (UGC Areas of Excellence Scheme) and Department of Chemistry, The University of Hong Kong, Hong Kong

任咏华，出生于中国香港，无机化学家，中国科学院院士、第三世界科学院院士、美国国家科学院外籍院士、欧洲人文和自然科学院外籍院士、香港科学院创院院士，香港大学化学系讲座教授。1985年任咏华从香港大学化学系毕业；1988年获该校博士学位后进入香港城市大学任教；1990年转入香港大学任教，先后担任讲师、高级讲师、教授、讲座教授；2001年38岁时增选为中国科学院院士，是当时最年轻的院士；2005年获得中国国家自然科学奖二等奖；2006年当选第三世界科学院院士；2011年获得世界杰出女科学家成就奖；2012年当选为美国国家科学院外籍院士；2015年当选为欧洲人文和自然科学院外籍院士，是该院化学界唯一一名外籍院士。任咏华教授主要从事超分子自组装和有机凝胶，光致变色材料，金属有机、纳米簇和纳米材料，分子材料学，光电材料，发光材料和发光化学传感器和生物标签等方面的研究。



Honors and Awards

- 2001 Member (Academician), Chinese Academy of Sciences
- 2012 International Member (Foreign Associate), US National Academy of Sciences
- 2015 Foreign Member, Academia Europaea (The Academy of Europe)
- 2006 Fellow, The World Academy of Sciences - for the advancement of science in developing countries (TWAS)
- 2015 Founding Member, The Hong Kong Academy of Sciences
- 2018 Selected as one of the Ten Science Stars of East Asia by Nature
- 2018 Huang Yao-Zeng Organometallic Chemistry Award of the Chinese Chemical Society
- 2017 Korean Advanced Institute of Science & Technology (KAIST) Chemistry Distinguished Lectureship Award
- 2016 Japan Society of Coordination Chemistry (JSCC) International Award
- 2016 Asian and Oceanian Photochemistry Association (APA) Masuhara Lectureship Award

Pseudo Natural Products

Abstract

Natural products have provided inspiration for chemical biology and medicinal chemistry research. However, their often complex structure, and, therefore, demanding synthesis as well as their frequent unavailability, hamper their application.

This raises the fundamental question whether the particular structural and biological properties of natural products can be translated to structurally less demanding compounds, readily accessible by chemical synthesis and yet still endowed with pronounced bioactivity.

The lecture will describe a logic for the simplification of natural product structure by means of “Biology Oriented Synthesis” (BIOS) and its evolution into the “Pseudo Natural Product” (PNP) concept. Application of natural product inspired compound collections designed and synthesized following these principles in cell-based phenotypic assays and subsequent identification of the cellular target proteins demonstrate that the BIOS and PNPs may enable innovation in both chemical biology and medicinal chemistry research.

Prof. Herbert Waldmann

Max-Planck-Institute of Molecular Physiology, Germany

- 1976-1985 Ph. D., University of Mainz, Germany
- 1985-1986 Postdoctoral Fellow, Harvard University
- 1986-1991 Habilitation at the University of Mainz
- 1991-1993 Professor of Organic Chemistry at the University of Bonn, Germany
- 1993-1999 Full Professor of Organic Chemistry at the University of Karlsruhe, Germany
- 1999- Director at the Max Planck Institute of Molecular Physiology, Department of Chemical Biology, Dortmund, Germany
- 1999- Full Professor of Organic Chemistry at the TU Dortmund University, Germany
- 2005- Head of the Chemical Genomics Centre of the Max Planck Society, Dortmund, Germany



Selected Publications

1. Karageorgis G.; Reckzeh, E. S.; Ceballos, J.; Schwalfenberg, M.; Sievers, S.; Ostermann, C.; Pahl, A.; Ziegler, S.; Waldmann, H. *Nat. Chem.* 2018, 10, 1103–1111.
2. Over, B.; Wetzel, S.; Grütter, C.; Nakai, Y.; Renner, S.; Rauh, D.; Waldmann, H. *Nat. Chem.* 2013, 5, 21–28.
3. Antonchick, A. P.; Gerding-Reimers, C.; Catarinella, M.; Schürmann, M.; Preut, H.; Ziegler, S.; Rauh, D.; Waldmann, H. *Nat. Chem.* 2010, 2, 735–740.
4. Zimmermann, G.; Papke, B.; Ismail, S.; Vartak, N.; Chandra, A.; Hoffmann, M.; Hahn, S. A.; Triola, G.; Wittinghofer, A.; Bastiaens, P. I.; Waldmann, H. *Nature* 2013, 497, 638–642.

Honors and Awards

Paul Karrer Medal, Universität Zürich; Emil Fischer Medal of the GDCh (Gesellschaft Deutscher Chemiker); Hans-Herloff Inhoffen-Medaille 2010; Glaxo SmithKline-Award for Outstanding Achievement in the field of Chemical Biology; Fellow of the Royal Society of Chemistry; Max-Bergmann Medal; Otto-Bayer-Award.

Learning from Nature How to Build Beautiful Structures from Protein Molecules

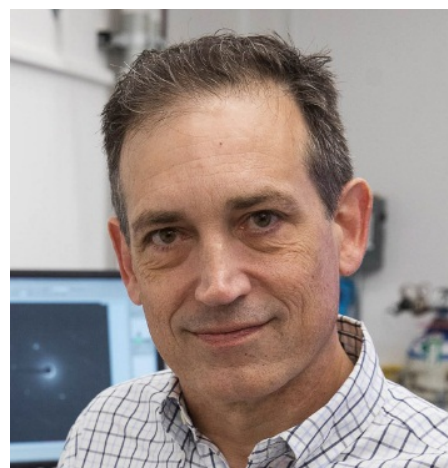
Abstract

Taking lessons from the symmetry in natural protein assemblies, successful strategies have been demonstrated for designing novel geometric architectures like protein cages in the shapes of cubes and other Platonic solids, as well as extended materials with long-range order. This talk will cover the underlying principles that eventually led to success, along with a discussion of some of the obstacles encountered, and remaining challenges that must be met before routine application of the technologies is possible.

Prof. Todd O. Yeates

Department of Chemistry and Biochemistry, University of California, Los Angeles, USA

1983 B.S. University of California, Los Angeles
 1988 Ph. D. University of California, Los Angeles
 1989 Postdoc The Scripps Research Institute
 1990-present University of California, Los Angeles

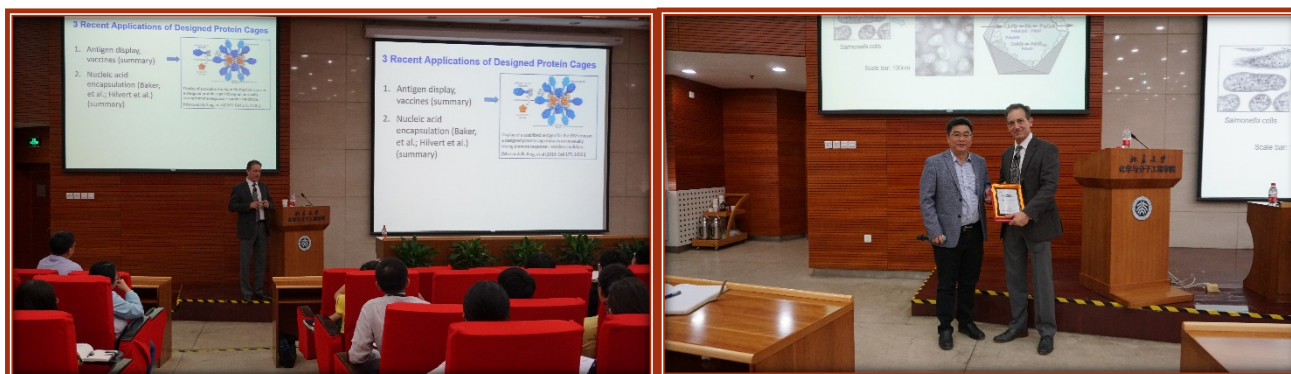


Selected Publications

1. Lai Y. T.; Cascio D.; Yeates T. O. *Science* 2012, 336, 1129.
2. King N. P.; Sheffler W.; Sawaya M. R.; Vollmar B. S.; Sumida J. P.; André I.; Gonen T.; Yeates T. O.; Baker D. *Science* 2012, 336, 1171.
3. Bale J. B., Gonen S.; Liu Y.; Sheffler W.; Ellis D.; Thomas C.; Cascio D.; Yeates T. O.; Gonen T.; King N. P.; Baker D. *Science* 2016. 353, 389.

Honors and Awards

ASBMB Delano Award for Computational Biosciences; UCLA Hansen-Dow Award for Excellence in Teaching; UCLA McCoy Award for Excellence in Research; Pittsburgh Diffraction Society Sidhu Award; NSF Presidential Young Investigator Award; American Crystallographic Association; American Association for the Advancement of Science Fellow; and so on.



Playing with the Molecules of Life

Abstract

Our research program combines the tools and principles of chemistry with the molecules and processes of living cells to synthesize new molecules and molecular assemblies with novel physical, chemical and biological functions. By studying the structure and function of the resulting molecules, new insights can be gained into the mechanisms of complex biological and chemical systems. Examples of this synergistic chemical/biological approach to synthesis will be discussed including (1) the addition of amino acids with novel biological, chemical and physical properties to the genetic codes of prokaryotic and eukaryotic organisms, (2) recapitulating the evolution of mitochondria in a synthetic eukaryotic system, (3) characterizing organisms with chimeric RNA-DNA genomes, and (4) the identification of small molecules that control stem cell fate in vivo.

Prof. Peter G. Schultz

President, The Scripps Research Institute, USA



Peter G. Schultz graduated from Caltech in 1979 with a B.S. degree in Chemistry (summa cum laude) and continued there for his doctoral degree with Peter Dervan (in 1984). After a postdoctoral year at the Massachusetts Institute of Technology, he moved to the University of California, Berkeley, where he was a Professor of Chemistry, a Principal Investigator at the Lawrence Berkeley National Laboratory and an Investigator in the Howard Hughes Medical Institute. He moved to The Scripps Research Institute in 1999 where he is currently the President and The Scripps Family Chair Professor. Schultz has been a pioneer in the fields of chemical and synthetic biology- specifically in using chemical and biological approaches together to create new molecules and systems of molecules with novel functions.

His contributions to science include: (1) the discovery of catalytic antibodies, and their use to study fundamental mechanisms of biological catalysis and the immune response; (2) the development of methods to expand the genetic code of living organisms to include noncanonical amino acids with novel chemical and biological properties, and their application to fundamental problems in cell biology, medicine and molecular evolution; and (3) the development and application of molecular diversity technologies to problems in chemistry, materials science and medicine, including the first application of combinatorial methods to materials science and the identification of regenerative drugs. Schultz also established the Genomics Institute of the Novartis Research Foundation I 1999 (GNF; La Jolla, CA) and served as its Director until 2010 with some 600 FTE.

Honors and Awards

He has received numerous awards including the Alan T. Waterman Award, NSF (1988), the ACS Award in Pure Chemistry (1990), the Wolf Prize in Chemistry (1994), the Paul Ehrlich and Ludwig Darmstaedter Award (2002), the ACS Arthur C. Cope Award (2006), the Solvay Prize (2013), and the Wieland Prize (2016). Professor Schultz is a member of the National Academy of Sciences, USA (1993) and the Institute of Medicine of the National Academy of Sciences (1998) and he is active on many editorial and scientific advisory boards. He is a founder of Affymax Research Institute, Symyx Technologies, Syrrx, Kalypsys, Phenomix, Ilypsa, Ambrx, Wildcat Discovery Technologies, and Ardelyx, which have pioneered the application of molecular diversity technologies to challenges in energy, materials and human health.

Translating Molecular Bioengineering from the Lab to the Patient

Abstract

This talk will highlight recent work from my laboratory that illustrates the clinical translation of molecular bioengineering technologies for point-of-care clinical diagnostics, drug delivery, and regenerative medicine. In the first example, I will describe a point-of-care diagnostic—the D4 assay—that we have developed, in which all reagents are printed and stored on a “non-fouling”—protein and cell resistant—polymer brush. The D4 assay has a speed and sensitivity that is as good or better than commercially available point-of-care tests and is far simpler, cheaper more rugged, and does not require a cold-chain. In the area of drug delivery, I will describe a recombinant fusion of peptide and protein drugs to a thermally sensitive polypeptide that forms an insoluble depot upon subcutaneous injection and provides sustained and tunable release of the drug from the injection site. In the area of tissue engineering/regenerative medicine, I will discuss how we have used ELPs as a template to encode higher order, hierarchical self-assembly into macroscopic biomaterials by modulating the degree of order in these intrinsically disordered polymers, leading to materials that are soluble at room temperature but upon injection subcutaneously—or elsewhere in the body—self-assemble into a physically crosslinked material with interconnected pores. These materials spontaneously vascularize, exhibit minimal inflammation, and show excellent tissue integration, and these properties suggest that they may be useful for regenerative medicine.

Prof. Ashutosh Chilkoti

Department of Biomedical Engineering, Duke University, USA

Ashutosh Chilkoti is the Alan L. Kaganov Professor and the Chair of the Department of Biomedical Engineering at Duke University. His areas of research include genetically encoded materials and biointerface science. He has published ~300 papers, has been cited ~30,000 times, has a Google Scholar H-index of 93 and has 30 patents awarded and 50 in process. Prof. Chilkoti was awarded the Clemson Award for Contributions to the Literature by the Society for Biomaterials in 2011, the Robert A. Pritzker Distinguished Lecture award by the Biomedical Engineering Society in 2013, was elected to the National Academy of Inventors in 2014, received the Distinguished Alumni award from the Indian Institute of Technology, Delhi in 2015, and the Diamond award from the College of Engineering at the University of Washington in 2017. He is the founder of five start-up companies: PhaseBio Pharmaceuticals, a publicly traded company on NASDAQ (ticker: PHAS) that is taking drug delivery technology that he developed into clinical trials, Sentilus, a clinical diagnostics company that was acquired by Immucor in 2014, BioStealth, a spinoff of Sentilus, GatewayBio, that is commercializing a next-generation PEGylation technology for biologics, Isolere Bio that is developing a non-chromatographic technology for purification of monoclonal antibodies, and inSoma Bio that is developing a recombinant protein matrix for tissue reconstruction.



Selected Publications

1. J. Wang, Saha, S. , Schaal, J. L. , Yousefpour, P. , Li, X. , and Chilkoti, A. , “Heuristics for the Optimal Presentation of Bioactive Peptides on Polypeptide Micelles”, *Nano Letters*, vol. 19, no. 11, pp. 7977 - 7987, 2019.
2. J. R. Simon, Egtesadi, S. Ali, Dzuricky, M. , You, L. , and Chilkoti, A. , “Engineered Ribonucleoprotein Granules Inhibit Translation in Protocells”, *Molecular Cell*, 2019.
3. A. K. Varanko and Chilkoti, A. , “Molecular and Materials Engineering for Delivery of Peptide Drugs to Treat Type 2 Diabetes”, *Advanced Healthcare Materials*, no. 1801509, p. 1801509, 2019.
4. P. Yousefpour, Ahn, L. , Tewksbury, J. , Saha, S. , Costa, S. A. , Bellucci, J. J. , Li, X. , and Chilkoti, A. , “Conjugate of Doxorubicin to Albumin - Binding Peptide Outperforms Aldoxorubicin”, *Small*, vol. 15, no. 12, p. 1804452, 2019.

Catalytic active sites are dynamical and metastable

Abstract

The determination of the structure of heterogeneous catalytic systems is a key aspect for a detailed understanding of the nature of active sites and for the rational design of efficient catalysts. However, the situation for the catalytic active sites is complicated and the determination of their structure is not straightforward. Indeed, catalysts are not static but dynamic, fluxional, metastable and they strongly evolve under reaction conditions, creating new active sites, not present for the as prepared catalysts. The best active sites are not found on the most stable structure of the catalysts, but require first its isomerization to a highly active metastable structure. The lecture will present several examples, based on quantum chemical calculations.

The first part will focus on the modelling of small Pt cluster (Pt₇ to Pt₁₃) under hydrogen pressure and on their reactivity for alkane dehydrogenation. The approach combines Density Functional Theory, high-dimensional Neural Networks and evolutionary techniques. It also includes grand canonical global optimization to study variable amount of adsorbed hydrogen and novel constrained global optimization methods to determine the structure of the active site that makes the reaction easiest. The approach will be extended to Cu₄O_x clusters on amorphous alumina, showing that the irregular nature of the support is another parameter to generate diverse sets of supported clusters, and hence diverse catalytic reactivity. The second part will deal with single-atom catalysts, that are widely investigated heterogeneous catalysts. We will consider Rh single atoms on TiO₂ as a generic example, investigating the optimal structure of the single atoms under H₂ reduction, CO adsorption and its reactivity for reverse water gas shift (RWGS) reaction. The combination of theoretical and experimental studies clearly demonstrates that Rh single atoms change their structure and adapt their catalytic site under reaction conditions.



Prof. Philippe Sautet

Department of Chemical and Biomolecular engineering, Department of Chemistry and Biochemistry, University of California Los Angeles, USA

Philippe Sautet has studied at “Ecole Polytechnique” in Paris and defended his doctorate in Theoretical Chemistry at Orsay University (Paris XI) in 1989. He then entered CNRS at the Institute of Research on Catalysis in Lyon, where he developed and lead a group devoted to the applications of theoretical chemistry to heterogeneous catalysis. He spent a sabbatical at Berkeley University. After being the director of the laboratory of Chemistry at the ENS of Lyon for 8 years, he was director of the “Institut de Chimie de Lyon”, a cluster of chemistry laboratories in Lyon, from 2007 to 2015. Philippe Sautet is now Professor at the Chemical and Biomolecular Engineering department and at the Chemistry and Biochemistry department of UCLA. He has published over 300 scientific papers. The

impact of his research is illustrated by more than 100 invited lectures at conferences and by a H factor of 61. He received several awards including the silver medal of CNRS in 2007, the Paul Pascal Prize of the French Academy of Science in 2008 and the Pierre Süe Grand Prize of the French Chemical Society in 2012. He was elected at the French Academy of Science in 2010. In addition France distinguished him as “Chevalier de l'Ordre National du Mérite” for his action in research and research organization and as “Chevalier de l'ordre des palmes académiques” for his teaching and action towards students. He is nominated in several councils or committees and is associate editor of ACS Catalysis, an international journal published by the American Chemical Society.



Plasmonic chemistry: opportunities challenges and unresolved questions

Abstract

Metallic plasmonic nanostructures have emerged as an important class of optically active materials. The initial interest in these materials was based on their nano-antenna properties where these materials concentrate electromagnetic UV-vis fields in small volumes at the surface of the nanostructure. A critical problem with using these metallic materials as nano-antennas is that they lose a significant fraction of electromagnetic energy due to the formation of energetic electron-hole (e-h) pairs in the nanostructures.

There has been a growing realization that the formation of energetic charge carriers in the nanoparticles opens avenues for a number of application including photocatalytic chemical conversion, or any application that benefit from conversion of light energy into electric potential or heat. At the core of these applications is the need to control the rate of formation of energetic e-h pairs, the location of their formation, and their flow in the nanostructure. In particular, there has been an elevated degree of interest in using hybrid nanostructures containing plasmonic nanoparticles, where the plasmonic component controls the interaction of light with the material, while the non-plasmonic component uses the resultant energetic carriers to perform a function. Examples of these materials include metal-metal, metal-semiconductor or metal-molecule hybrids. Naturally, the use of these multicomponent materials introduces a number of fundamental questions related to the impact of the interface between the plasmonic and non-plasmonic component as well as the presence of the non-plasmonic material on the optical properties of the system, the flow of energy and excited charge carriers in the system.

I will discuss our recent work in the emerging field of hybrid plasmonic materials, focusing on the underlying physical principles that govern the flow of energy and excited charge carriers in these systems, as well as on common misconceptions and fundamental questions that deserve more attention and warrant additional studies.

Prof. Suljo Linic

Department of Chemical Engineering, University of Michigan, USA

Prof. Linic obtained his PhD degree, specializing in surface and colloidal chemistry and heterogeneous catalysis, at the University of Delaware in 2003. He was a Max Planck postdoctoral fellow with Prof. Dr. Matthias Scheffler at the Fritz Haber Institute of Max Planck Society in Berlin (Germany), working on first principles studies of surface chemistry. He started his independent faculty career in 2004 the University of Michigan in Ann Arbor where he is currently the Class of 1983 Faculty Scholar Professor of chemical engineering. Prof. Linic's research has been recognized through multiple awards including the 2017 Emmett Award by The North American Catalysis Society, the 2014 ACS (American Chemical Society) Catalysis Lectureship for the Advancement of Catalytic Science, awarded annually by the ACS Catalysis journal and Catalysis Science and Technology Division of ACS, the 2011 Nanoscale Science and Engineering Forum Young Investigator Award, awarded by American Institute of Chemical Engineers, the 2009 ACS Unilever Award awarded by the Colloids and Surface Science Division of ACS, the 2009 Camille Dreyfus Teacher-Scholar Award awarded by the Dreyfus Foundation, the 2008 DuPont Young Professor Award, and a 2006 NSF Career Award. Prof. Linic has presented more than 200 invited and keynote lectures and published more than 80 peer reviewed articles in leading journals in the fields of catalysis and general science. He serves as the associate editor of ACS catalysis journal.



Exploiting Photogenerated Radical Pairs as Spin Qubits for Quantum Information Science

Abstract

Chemistry is fundamental to the development of complex matter that can address critical societal problems ranging from energy production to healthcare and information sciences. This same strategy is now being applied to the rapidly expanding field of Quantum Information Science (QIS), which seeks to harness the fundamental quantum nature of matter and photons to advance computation, communication, and sensing. Chemical synthesis affords the opportunity to build novel QIS systems from the bottom up, which allows control over the nature of the quantum bit (qubit) itself, thus enabling the careful tuning of individual quantum states. We will discuss how photogenerated radical pairs can function as spin qubit pairs capable of carrying out quantum operations such as electron spin state teleportation and controlled-NOT (CNOT) logic.

Quantum teleportation is a procedure that transfers a quantum state over an arbitrary distance from one location to another through the agency of quantum entanglement. Measuring a quantum state in an attempt to copy it destroys the information it contains, leaving teleportation as the only option for transmitting the state with high fidelity. Demonstrations of this phenomenon in molecular systems amenable to tailoring by chemical synthesis, with its inherent advantages in constructing complex functional structures, have been notably absent. We have now demonstrated electron spin state teleportation with 90% fidelity in a covalent electron donor-acceptor-stable radical system (A). This result affords the possibility that chemical synthesis can create complex nanostructures for QIS applications.

Implementation of the two-qubit CNOT gate is necessary to develop a complete set of universal gates for quantum computing. Here we demonstrate that a photogenerated entangled spin qubit pair within a covalent donor-chromophore-acceptor molecule (B) can be used to successfully execute a CNOT gate with 97% fidelity. Our results show that photogenerated molecular spin qubit pairs can be used to execute this essential quantum gate at moderate temperatures, which makes it possible to develop structures to execute more complex quantum logic operations using electron spins initially prepared in pure spin states.



Prof. Michael R. Wasielewski

Department of Chemistry and Institute for Sustainability and Energy at Northwestern, Northwestern University, USA

Michael R. Wasielewski is currently the Clare Hamilton Hall Professor of Chemistry at Northwestern University, Executive Director of the Institute for Sustainability and Energy at Northwestern, and Director of the Center for Light Energy Activated Redox Processes, a US-DOE Energy Frontier Research Center. He received his Ph.D. from the University of Chicago and was a postdoctoral fellow at Columbia University. His research has resulted in over 650 publications and focuses on light-driven processes in molecules and materials, artificial photosynthesis, molecular electronics, quantum information science, ultrafast optical spectroscopy, and time-resolved electron paramagnetic resonance spectroscopy. His recent honors and awards include election to the American Academy of Arts and Sciences; the Josef Michl American Chemical Society Award in Photochemistry; the Silver Medal in Chemistry, International EPR Society; the Royal Society of Chemistry Physical Organic Chemistry

Award; the Chemical Pioneer Award of the American Institute of Chemists; the Royal Society of Chemistry Environment Prize; the Humboldt Research Award; the Arthur C. Cope Scholar Award of the American Chemical Society; the Porter Medal for Photochemistry; and the James Flack Norris Award in Physical Organic Chemistry of the American Chemical Society.

Sugars & proteins: towards a synthetic biology

Abstract

Our work studies the interplay of biomolecules – proteins, sugars and their modifications. Synthetic Biology's development at the start of this century may be compared with Synthetic Organic Chemistry's expansion at the start of the last; after decades of isolation, identification, analysis and functional confirmation the future logical and free-ranging redesign of biomacromolecules offers tantalizing opportunities. This lecture will cover emerging areas in our group in chemical manipulation of biomolecules with an emphasis on new bond-forming and -breaking processes compatible with biology:

- (i) New methods: Despite 90-years-worth of non-specific, chemical modification of proteins, precise methods in protein chemistry remain rare. The development of efficient, complete, chemo- and regio-selective methods, applied in benign aqueous systems to redesign and reprogramme the structure and function of biomolecule both in vitro and in vivo will be presented.
- (ii) 'Synthetic Biologics' and their applications: biomimicry; functional recapitulation; effector [drug/agrochemical/gene/radio-dose] delivery; selective protein degradation; inhibitors of pathogen interactions; non-invasive presymptomatic disease diagnosis; probes and modulators of in vivo function.

Prof. Benjamin G. Davis

Department of Chemistry, University of Oxford, UK

Ben Davis got his B.A. (1993) and D.Phil. (1996) from the University of Oxford. During this time he learnt the beauty of carbohydrate chemistry under the supervision of Professor George Fleet. He then spent 2 years as a postdoctoral fellow in the laboratory of Professor Bryan Jones at the University of Toronto, exploring protein chemistry and biocatalysis.

In 1998 he returned to the U.K. to take up a lectureship at the University of Durham. In the autumn of 2001 he moved to the Dyson Perrins Laboratory, University of Oxford and received a fellowship at Pembroke College, Oxford. He was promoted to Full Professor in 2005.

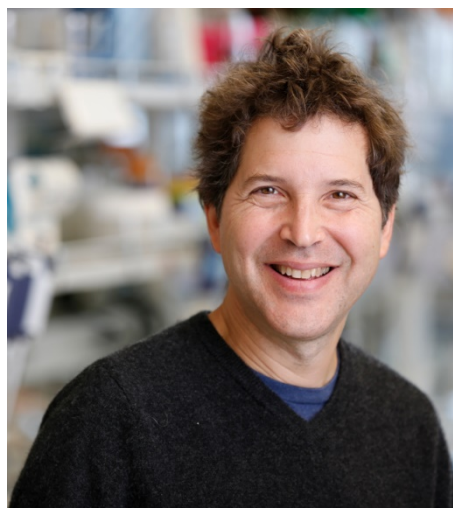
His group's research centres on the chemical understanding and exploitation of biomolecular function (Synthetic Biology, Chemical Biology and Chemical Medicine), with an emphasis on carbohydrates and proteins. In particular, the group's interests encompass synthesis and methodology; target biomolecule synthesis; inhibitor/probe/substrate design; biocatalysis; enzyme & biomolecule mechanism; biosynthetic pathway determination; protein engineering; drug delivery; molecular biology; structural biology; cell biology; glycobiology; molecular imaging and in vivo biology



De novo design of protein therapeutic candidates, nanomaterials, and logic

Prof. David Baker

Department of Chemistry, Massachusetts Institute of Technology, USA



David Baker is the director of the Institute for Protein Design, a Howard Hughes Medical Institute Investigator, the Henrietta and Aubrey Davis Endowed Professor in Biochemistry, and an adjunct professor of genome sciences, bioengineering, chemical engineering, computer science, and physics at the University of Washington. His research group is focused on the design of macromolecular structures and functions.

He received his Ph.D. in biochemistry with Randy Schekman at the University of California, Berkeley, and did postdoctoral work in biophysics with David Agard at UCSF.

Dr. Baker has received awards from the National Science Foundation, the Beckman Foundation, and the Packard Foundation. He is the recipient of the Breakthrough Prize in Life Sciences, Irving Sigal and Hans Neurath awards from the Protein Society, the Overton Prize from the ISCB, the Feynman Prize from the Foresight Institute, the AAAS Newcomb

Cleveland Prize, the Sackler prize in biophysics, and the Centenary Award from the Biochemical society. Sixty-five of his mentees have gone on to independent faculty positions, he has published over 500 research papers, been granted over 100 patents, and co-founded 11 companies.

Dr. Baker is a member of the National Academy of Sciences and the American Academy of Arts and Sciences. He is also a project leader with The Audacious Project.

Honors and Awards

2018 Protein Society Hans Neurath Award

2017 Henrietta and Aubrey Davis Endowed Professorship in Biochemistry

2014 David Perlman Memorial Award

2012 Biochemical Society Centenary Award

2011 University of Washington Inventor of the Year Award

2009 American Academy of Sciences

2008 Sackler Prize in Biophysics

2007 Editorial Board, PNAS

2006 National Academy of Sciences

2004 Foresight Institute Feynman Prize

2004 AAAS Newcomb-Cleveland prize

2003 Director, Biomolecular structure and design graduate program (BMSD)

2002 International Society for

Computational Biology Overton Prize

2000 Protein Society Young Investigator Award

2000 HHMI Assistant Investigator

2000 Editorial Advisory Board, Protein Science



Approaching Exact Quantum Chemistry by Stochastic Wave Function Sampling and Deterministic Coupled-Cluster Computations

Abstract

In this talk, we will examine a radically new way of obtaining accurate energetics equivalent to high-level CC calculations, such as CCSDT or CCSDTQ, even when multireference correlation effects become significant, at the small fraction of the computational cost, while preserving the black-box character of single-reference computations. The key idea is a merger of the deterministic formalism, abbreviated as CC(P;Q), with the stochastic CI and CC Quantum Monte Carlo (QMC) approaches. We will also demonstrate that one can take the merger of the stochastic and deterministic ideas to the ultimate level and use it to extract the exact, full CI (FCI), energetics out of the early stages of FCIQMC propagations with the help of the relatively inexpensive polynomial steps similar to CCSD calculations, eliminating exponential complexity of conventional FCI Hamiltonian diagonalizations altogether. Extensions to excited electronic states by a combination of stochastic CIQMC and deterministic EOMCC computations and converging FCI energetics in strongly correlated systems, such as those involved in modeling metal-insulator transitions, where the traditional CCSD, CCSDT, CCSDTQ, etc. hierarchy breaks down, will be discussed as well.

Prof. Piotr Piecuch

Department of Chemistry and Department of Physics & Astronomy,
Michigan State University, USA

Ph.D., 1988, University of Wroclaw, Poland (with Distinction)

M.S., 1983, University of Wroclaw, Poland (with Distinction)

Assistant Professor (tenure track), Department of Chemistry, Michigan State University, 1998-2002

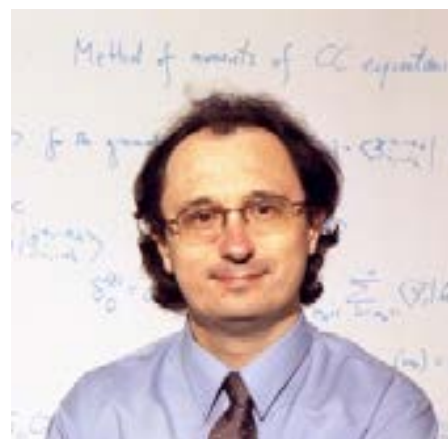
Associate Professor (with tenure), Department of Chemistry, Michigan State University, 2002-2004

Adjunct Associate Professor, Department of Physics and Astronomy, Michigan State University, 2003-2004

Professor (with tenure), Department of Chemistry, Michigan State University, 2004-present

Adjunct Professor, Department of Physics and Astronomy, Michigan State University, 2004-2010, 2014-present

University Distinguished Professor, Department of Chemistry, Michigan State University, 2007-present



Honors and Awards

Elected Member of the International Academy of Quantum Molecular Science, 2018

The Lawrence J. Schaad Lectureship in Theoretical Chemistry, Vanderbilt University, 2017

Fellow of the Royal Society of Chemistry, 2016

Clark Way Harrison Distinguished Visiting Professor, Washington University in St. Louis, 2016

Distinguished Fellow of the Kosciuszko Foundation Collegium of Eminent Scientists, 2015

Outstanding Reviewer for Chemical Physics Letters (Elsevier), 2014

Invited Professor and Scientist (Visiting Professor) at the Institute for Molecular Science, Okazaki, Japan, 2012/2013



Chemistry of cements

Abstract

The processes during the hydration of Portland cement are well known. The main hydrates formed include C-S-H, portlandite, ettringite, hydrotalcite and AFm-phases such as monocarbonate or monosulfate. Thermodynamic modelling coupled with kinetic equations, which describe the dissolution of the clinker, can be used to predict the composition of hydrated cements as a function of time. In the absence of limestone, ettringite becomes unstable and monosulfate is present after longer hydration times, while in modern Portland cement, where up to 5% of limestone is generally added, ettringite and monocarbonate are formed. The presence of small amounts of limestone (up to approx. 5%) increases the total volume of hydrated solids and thus lowers the total porosity.

Also the temperature has an important influence on the composition of the hydrates. Temperatures of 50 °C and more lead in the long-term to a destabilisation of ettringite and monocarbonate and to the formation of monosulfate. The resulting higher porosity is one of the reasons for the lower compressive strength at higher temperatures.

The presence of silica rich supplementary cementitious materials (SCM) such as silica fume, fly ash or slag changes further the composition of the hydrates. Modelling of such blended systems indicates that not only the amount of portlandite decreases but that the lower pH can lead to the destabilization of ettringite and monocarbonate and to the formation of strätlingite.

Prof. Lothenbach, Barbara Elisabeth

Head Thermodynamic Modelling Group, Laboratory Concrete/Construction Chemistry, Switzerland
 Professor II, Concrete Group, Department of Structural Engineering, NTNU, Trondheim, Norway



1986-1987 Study of Biology at ETH Zürich: Pre-Diploma in Biology
 1987-1992 Study of Environmental Science at ETH Zürich;
 1993-1996 PhD at the Laboratory of Soil Science, ETH Zürich, Switzerland
 1996 - 2002 Project leader and consultant scientist for nuclear wastes at BMG Engineering Ltd, Schlieren, Switzerland:
 transport and retention of heavy metals and radionuclides in bentonite and cementitious liners, database development, waste management, representation of Switzerland
 2000-2002 in UN's PRTR working group.
 2002 to date Laboratory Concrete and Construction Chemistry, Empa Dübendorf, Switzerland;
 Distinguished Senior Scientist / Head Thermodynamic Modelling Group
 2017 to date Professor II, International Chair at the Concrete Group, Department of Structural Engineering, NTNU Trondheim, Norway.

Honors and awards

2016 promoted "Distinguished Senior Researcher" by Empa in recognition of outstanding research, the title has been awarded only four times so far

2016 Materials and Structures outstanding papers award for: The pore solution of blended cements: a review by A. Vollpracht, B. Lothenbach, R. Snellings, J. Haufe



纳米微球材料的精准制备技术及其产业化的应用

Abstract

高性能微球材料是生物制药、液晶显示、体外诊断、食品安全检测等领域的关键支撑材料。长期以来这些材料由国外少数公司垄断，因此微球材料被科技日报列为中国 35 项卡脖子技术之一。这个报告将与大家分享江博士团队如何通过跨领域创新突破微球精准制备技术壁垒，如何解决微球产业化的技术难题，最后成功地应用于生物制药、液晶显示、体外诊断等众多领域。报告还分享了江博士团队十多年创新创业的经历。

Dr. Biwang Jiang (江必旺)

苏州纳微科技股份有限公司创始人

江必旺博士，国家“千人计划”特聘专家，毕业于北京大学化学系，获纽约州立 Binghamton 博士、在加州 Berkeley 从事博士后研究，随后加入美国 Rohm and Haas 公司工作。回国后创建了北京大学深圳研究生院微纳米材料研究中心并担任该中心主任。于 2007 年，江博士创建了苏州纳微科技有限公司，专门从事高精度、高性能和高附加值纳微米球材料的研发和产业化。



江博士及其团队不仅攻克了多项微球精准制备技术的难题，而且成功实施多项高端微球材料产业化，并应用于生物制药、平板显示、医疗诊断、食品安全检测等领域。

Honors and Awards

江博士荣获中国侨界贡献奖、科技部创新创业人才、江苏五一劳动奖章、苏州市十佳魅力科技人物等多项荣誉。申请 60 多项国内外发明专利，发表学术论文 30 篇。



Topological and sequence Engineering of Giant Molecules: Structures and Functions

Abstract

Inverse design and inverse thinking are critical steps in the new materials developments (materials genome approach). When we design materials with specific functional properties, we often start with independent building blocks which possess well-defined molecular functions and precise chemical structures. Using the “Molecular Lego” approach, we can then, in some cases with multiple steps, assemble such elemental building blocks together in preferred secondary structures (or packing schemes) to construct materials possessing topologically mandated hierarchical structures with desired functions. In this talk, a unique approach along this inverse design and inverse thinking path will be presented. Various “giant molecules” based on “nano-atoms” are designed and synthesized. “Nano-atoms” refer to shape-persistent molecular nanoparticles (MNPs) such as fullerenes, polyhedral oligomeric silsesquioxanes, polyoxometalates, and folded globular proteins, and others. These “nano-atoms” possess precisely-defined chemical structures, surface functionalities and molecular shapes, which serve as elemental units for the precision synthesis of “giant molecules” via methods such as click chemistry and other efficient chemical transformations. These “giant molecules” include, but are not limited to, giant surfactants, giant shape amphiphiles, and giant polyhedra. These “giant molecules” can assemble into diverse highly ordered building blocks (spherical and non-spherical) to further construct the thermodynamically stable and metastable hierarchical structures in the bulk, thin-film, and solution. Unconventional nanostructures can be obtained in various environments to exhibit specifically desired properties. This approach has provided a versatile platform for engineering nanostructures that are not only scientifically intriguing, but also technologically relevant.



Prof. Stephen Z. D. Cheng (程正迪)

Advanced Institute for Soft Matter Science and Technology, School of Molecular Science and Engineering, South China University of Technology, China

程正迪教授，美国工程院院士，现任华南理工大学分子科学与工程学院院长，华南理工大学软物质科学与技术高等研究院院长。2018年七月前，任Akron大学Frank C. Sullivan杰出科研教授，Robert C. Musson教授和Trustees教授。1985年于Rensselaer Polytechnic Institute获博士学位。2007年至2014年任美国Akron大学高分子科学与工程学院院长。程教授的研究广泛涉及高分子凝聚态和液晶体系的各个领域。他长期研究平衡及非平衡软物质相转变中的热力学与动力学以及不同空间、能量和时间尺度下的结构和分子运动的相互关系，致力于将高分子和液晶体系的基本物理特征与材料的特殊性能联系起来。同时对显示器光学薄膜、光学通讯等高科技的开发及商业化起了决定性的作用。近十年来，他更进一步开辟了基于纳米原子的巨型分子的研究领域，系统发展了多层次选择性组装以实现杂化功能材料的新思路，为高分子科研提供了新的方向。迄今在国际学术刊物上发表SCI收录论文550余篇，总引用率19000余次，H因子为76。在国际和国内学术会议上做邀请报告800多次。他申请美国和世界发明专利14项。他著有学术专著《Phase Transitions in Polymers: The Role of Metastable States》。他获得了多项奖励及荣誉称号，包括Presidential Young Investigator Award (White House & NSF, 1991), John H. Dillon Medal (APS, 1995), Mettler-Toledo Award (NATAS, 1999), TA-Instrument Award (ICTAC, 2004), PMSE Cooperative Research Award (ACS, 2005), Polymer Physics Prize (APS, 2013), 影响世界华人大奖(2014)等。他现在是美国化学会荣誉会士，美国国家发明者院会士，美国物理学会会士，美国科学发展协会(AAAS)会士，美国化学会高分子材料科学与工程分会会士。2008年被选为美国工程院院士。他也是国际刊物《Polymer》的总主编。

同时，他对显示器光学薄膜、光学通讯等高科技的开发及商业化起了决定性的作用。近十年来，他更进一步开辟了基于纳米原子的巨型分子的研究领域，系统发展了多层次选择性组装以实现杂化功能材料的新思路，为高分子科研提供了新的方向。迄今在国际学术刊物上发表SCI收录论文550余篇，总引用率19000余次，H因子为76。在国际和国内学术会议上做邀请报告800多次。他申请美国和世界发明专利14项。他著有学术专著《Phase Transitions in Polymers: The Role of Metastable States》。他获得了多项奖励及荣誉称号，包括Presidential Young Investigator Award (White House & NSF, 1991), John H. Dillon Medal (APS, 1995), Mettler-Toledo Award (NATAS, 1999), TA-Instrument Award (ICTAC, 2004), PMSE Cooperative Research Award (ACS, 2005), Polymer Physics Prize (APS, 2013), 影响世界华人大奖(2014)等。他现在是美国化学会荣誉会士，美国国家发明者院会士，美国物理学会会士，美国科学发展协会(AAAS)会士，美国化学会高分子材料科学与工程分会会士。2008年被选为美国工程院院士。他也是国际刊物《Polymer》的总主编。

Molecular Materials for Sustainability and Human Health

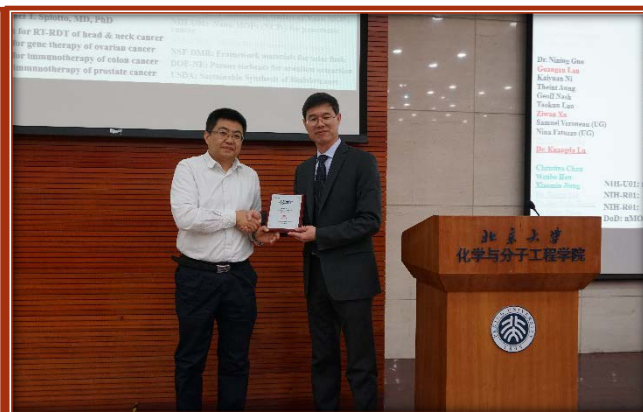
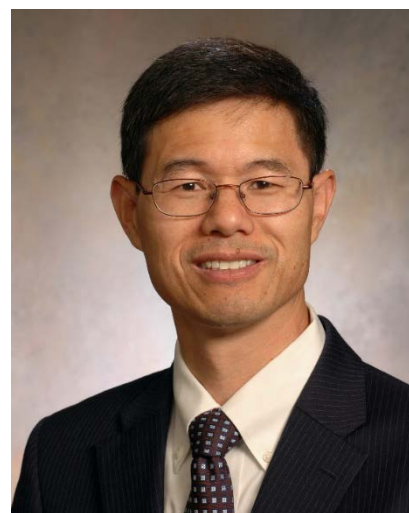
Abstract

Metal-organic frameworks (MOFs), also known as coordination polymers and coordination networks, are an interesting class of crystalline molecular materials with potential applications. The modular nature of and mild conditions for MOF synthesis permit the rational structural design of numerous MOFs and the incorporation of various functionalities via constituent building blocks. In this talk, I will discuss our recent works on designing MOFs/coordination polymers for sustainability and human health. MOFs have enabled the rational synthesis of well-defined solid catalysts by not only facilitating the immobilization of known homogeneous catalysts but also allowing the discovery of new molecular catalysts that do not have homogeneous counterparts. Hierarchical organization of multiple active sites further enables cooperative catalysis with unprecedentedly high efficiency. MOFs/coordination polymers have also allowed the incorporation of multiple therapeutics or treatment modalities for chemotherapy, radiotherapy, gene, and immunotherapy of resistant cancers. Clinical translation of representative MOF/coordination polymer systems will be discussed.

Prof. Wenbin Lin (林文斌)

Department of Chemistry, University of Chicago, USA

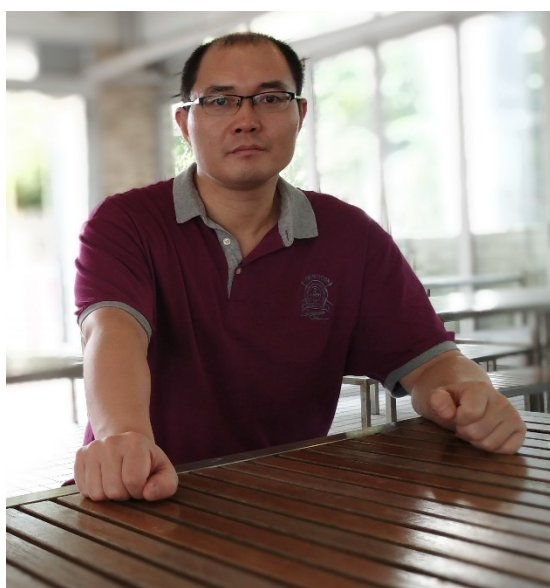
Dr. Wenbin Lin is the James Franck Professor of Chemistry, Radiation and Cellular Oncology, and the Ludwig Center for Metastasis Research, and Comprehensive Cancer Center at the University of Chicago. Lin obtained his BS from the University of Science and Technology in Hefei, China and his PhD from the University of Illinois at Urbana-Champaign. He was an NSF postdoctoral fellow with Professor Tobin J. Marks at Northwestern University. Lin focuses on designing molecular materials for sustainability and human health, and has published close to 350 peer-reviewed articles. He has been among the most cited chemists several years in a row and was selected as one of the top 10 chemists in the 1999-2009 decade based on per article citations. Dr. Lin is founder of two clinical stage biopharmaceutical companies and has received numerous professional honors for his contributions to functional molecular materials.



Flexible Energy Storage and Zinc Based Batteries

Abstract

Our research focuses on development of flexible energy storage/conversion devices, including supercapacitors, aqueous electrolyte batteries and metal air batteries. We will introduce an extremely safe and wearable solid-state zinc ion battery (ZIB) comprising a novel gelatin and PAM based hierarchical polymer electrolyte (HPE) and an α -MnO₂ cathode. Benefiting from the well-designed electrolyte and electrodes, the flexible solid-state ZIB delivers a high areal energy density and power density, high specific capacity and excellent cycling stability. More importantly, the solid-state ZIB offers high wearability and extreme safety performance over conventional flexible LIBs, and performs very well under various severe conditions, such as being greatly cut, bent, hammered, punctured, sewed, washed in water or even put on fire. In addition, our recent progresses on development of ZIBs, including the zinc ion storage mechanism in cathode and stability study of zinc anode will be also introduced.



Prof. Chunyi Zhi (支春义)

Department of Materials Science & Engineering, City University of Hong Kong, Hong Kong

Dr. Chunyi Zhi obtained his PhD degree in physics from institute of physics, Chinese Academy of Sciences. After that, he worked as a postdoctoral researcher in National Institute for Materials Science (NIMS) in Japan, followed by a permanent position in NIMS as a senior researcher. He is currently an associate professor in Department of Materials Science & Engineering, City University of Hong Kong. Zhi's research focuses on flexible/wearable energy storage devices and zinc-based batteries etc. He has published more than 280 peer-reviewed papers and been granted more than 80 patents. Zhi is highly cited researcher in materials science (2019) and fellow of the Hong Kong Young Academy of Sciences. He is

also founder of Amazinc Energy Ltd. and has received numerous professional awards for his contributions to flexible energy storage.

