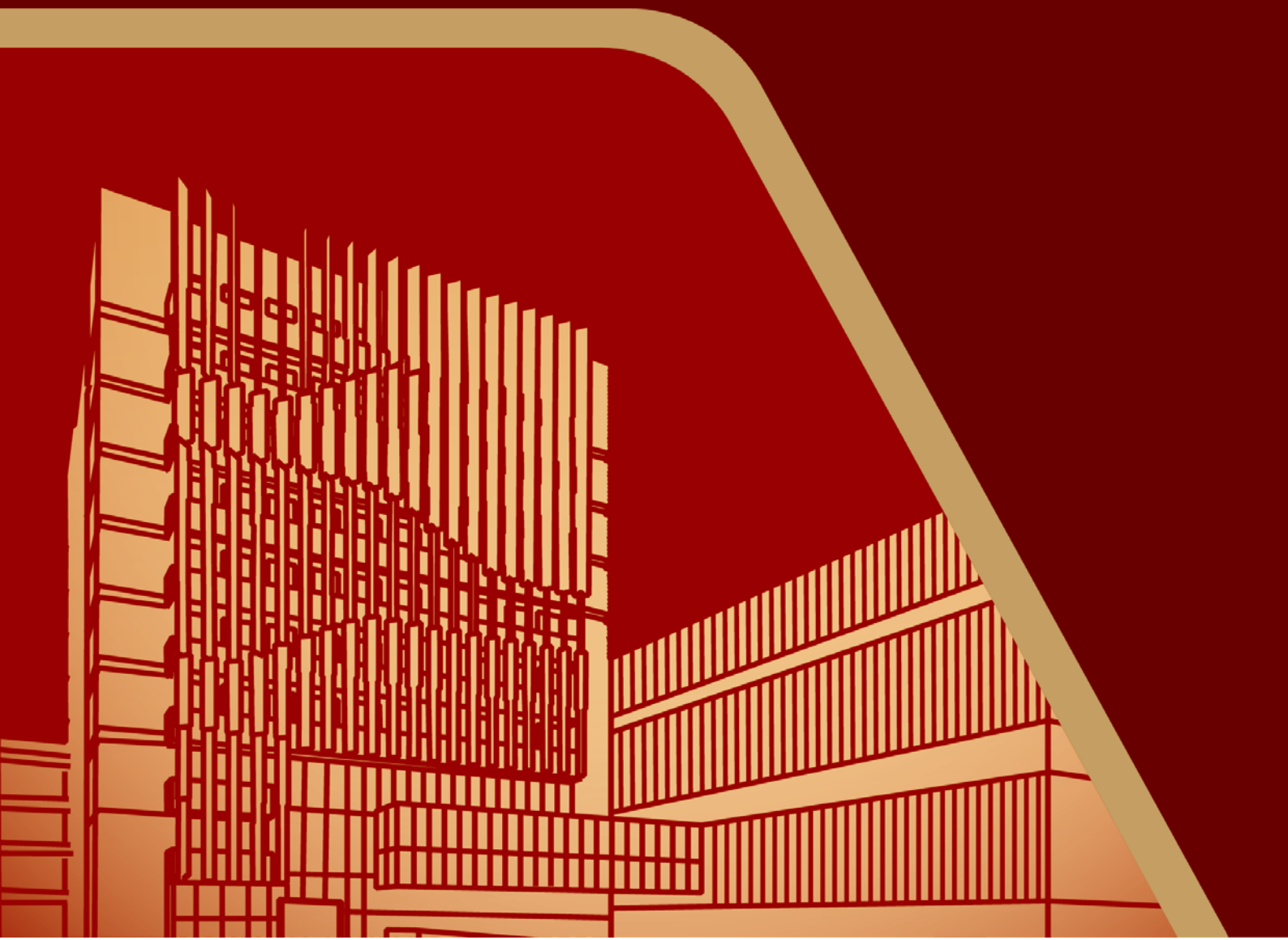
北京大学化学与分子工程学院

XING DA Lectureship

兴大报告年报

2021 XING DA 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.

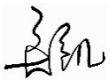
The Xingda Lecture Series is held on every Friday throughout the academic year. Up to the time this booklet was edited, about 500 scientists had been invited to give talks at the Xingda Lecture Series which nearly cover all the research areas in chemistry and related disciplines. Needless to say, this 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

2021 Xingda Lecture schedule

Issue	Time	Speaker	Institution	Title
593	Apr.2	Brian K. Shoichet	University of California San Francisco	Ultra-Large Library Docking for New Chemotypes with New Biology
594	Apr.16	陈学思	中国科学院长春应用化学研究所	生物可降解高分子材料及其应用
595	Apr.23	贺福初	军事科学院军事医学研究院	蛋白质组学的使命与挑战
596	May.28	Leticia González	University of Vienna	Molecules and Light: Challenges for Theory
597	Jun.11	汤子康	澳门大学	当材料物理遇上生物医学——交叉学科合作研究的汗水与收获
598	Jun.25	徐春明	中国石油大学	化学-化工-材料：从基础到应用
599	Sep.17	Charlotte K. Williams	University of Oxford	Catalytic Activation of Carbon Dioxide to Make Plastics
600	Oct.8	谭蔚泓	湖南大学	健康中国时代的分子科学
601	Oct.15	Bernhard Küster	Technical University of Munich	Adding a Proteomic Component to Therapeutic Decision Making by Molecular Tumor Boards
602	Oct.29	Ichio Shimada	RIKEN	Function Related Dynamics of Membrane Proteins by NMR
603	Nov.5	Annie B. Kersting	Lawrence Livermore National Laboratory	Environmental Behavior of Plutonium: Challenges for Clean-up and Safe Long-term Storage
604	Nov.5	Jason W. Chin	University of Cambridge	Reprogramming the Genetic Code
605	Nov.12	Tanja Weil	Max Planck Institute for Polymer Research	Materials Talking to Cells
606	Nov.19	Yasuyuki Tezuka	Tokyo Institute of Technology	Topological Polymer Chemistry: Endless Attractions with Macromolecular Designing
607	Dec.3	Dongping Zhong (仲冬平)	The Ohio State University	超快光生物功能动力学
608	Dec.10	Jianwei (John) Miao (缪建伟)	University of California Los Angeles	Determining the 3D Atomic Structure of Non-Crystalline Materials
609	Dec.24	Hank F Kung (孔繁渊)	University of Pennsylvania	Development of Radiopharmaceutical: From Bench to FDA Approved Clinical Application
610	Jau.7	Joseph A. Loo	University of California-Los Angeles	Mass Spectrometry of Proteins and Protein Complexes as a Tool for Structural Biology
611	Jau.14	Kai Johnsson	Max Planck Institute for Medical Research	Fluorescent and Bioluminescent Probes for Imaging and Diagnostics

No.593 Ultra-Large Library Docking for New Chemotypes with New Biology

Abstract

Docking screens compound libraries for molecules that complement the structures of protein targets, seeking novel chemotypes. Often, these new chemotypes can confer new biology. Recently, our libraries have expanded from 3 million “off-the-shelf” to over 1 billion “make-on-demand” molecules. We first explored the pragmatism of such ultra-large, virtual libraries in prospective campaigns against b-lactamase and the dopamine D4 receptor, where new docking hits were tested functionally and, where possible, by crystallography. By testing over 500 new-to-the-planet molecules, we could correlate docking score and likelihood of binding, for the first time. Subsequently, we expanded these studies to discovering biologically active lead molecules for the melatonin receptor, the 5HT2a receptor, and the sigma2 receptor, where again we have been able to test hundreds of molecules and test the relationship between docking score and hit rate. Opportunities and challenges from this 100-fold increase in community-accessible chemical space will be considered.

Prof. Brian K. Shoichet

Dept. of Pharmaceutical Chemistry, University of California San Francisco, USA

1985	B. Sc., MIT,
1991	Ph. D., UCSF (supervisor: Tack Kuntz),
1992-1995	Postdoc, University of Oregon,
1996-2002	Associate-Professor of Molecular Pharmacology at Northwestern University Med. School,
2002-	Full-Professor of Pharmaceutical Chemistry of the UCSF

Selected Publications

1. Tummino T et al. *BioRxiv*(**2021**).
2. Pottel J et al. *Science*, 369, 403-413 **(2020)**.
3. Gordon Det al. *Nature*, 583, 459–468 (**2020**).
4. Stein RM et al. *Nature*, 579, 609-614(**2020**).
5. Lyu J et al. *Nature*, 566, 224-229 (**2019**).

Honors and Awards

2017 DeLano Award for Computational Biosciences; 2011 Topliss Lectureship, University of Michigan; 2009 Abbott Lectureship, Yale University; 2008 Swiss Universities 3e Cycle en Chimie (Lausanne, Bern, Friborg, Geneva); 2006-2007 Novartis Chemistry Lecturer (Cambridge, Basel, Vienna, Horsham, Tsukuba, Emeryville); 2004 Astra Lectureship, University of Ottawa.

No.594 生物可降解高分子材料及其应用

Abstract

聚乳酸（PLA）可以减少对石油依赖的程度，消除普通石油基不可降解薄膜带来的白色污染，从更本上解决“白色污染”问题。乳酸单体是由淀粉等多糖原料经发酵得到。聚乳酸原料丙交酯单体是通过乳酸脱水低聚、裂解获得的，单体的旋光性及其排列直接影响了聚合物链立体结构，进而影响材料性能。将光学纯的聚左旋乳酸（PLLA）和聚右旋乳酸（PDLA）等比例混合所形成的立体复合物熔点高达 254℃，对提高 PLA 的实际应用性能具有重要意义。课题组 2000 年开始与浙江海正集团合作，目前聚乳酸生产能力达到 4.5 万吨/年，成为继美国之后第二家掌握 PLA 全套生产技术的国家，整体生产技术水平达到国际领先。PLA 还可以广泛用于骨固定器件、组织工程支架和药物载体等领域。组建的长春圣博玛生物材料有限公司依托课题组技术开发的可吸收接骨螺钉和接骨板获 2 项中华人民共和国医疗器械注册证（器械 III 类）。聚氨基酸是一类生物相容性好、体内可吸收的生物医用材料。通过手性聚合获得了高分子量和高旋光性聚 l-氨基酸；提出了通过聚氨基酸主侧链一级结构调控 α-螺旋和 β-折叠等二级结构的策略；通过引入特异活性基团及环境响应性基元，赋予了材料智能识别、靶向、刺激响应等功能。利用改性聚氨基酸作为药物载体，制备了抗肿瘤药物/基因纳米制剂，动物实验结果良好。近期，在抗肿瘤免疫治疗上结合纳米药物开展了前沿基础研究，取得了良好的初步结果。一种基因载体实现了商品化销售；一种制剂已完成了临床前动物实验评价，正在申报临床实验许可。

Prof. XueSi Chen(陈学思)

中国科学院院士，长春应化所学委会常务副主任，中国生物材料学会生物医用高分子材料分会主任委员。2004 年获国家杰出青年科学基金、2013 年入选科技部科技创新创业人才和万人计划。2016 年入选国际生物材料与工程联合会会士。担任 *ACS Biomaterials Science and Engineering* 期刊副主编。

Selected Publications

1. Jiang J, Shen N, Ci T, Tang Z, Gu Z, Li G, Chen X. *Advanced Materials*, 31(44), 1904278(**2019**).
2. Liu F, Lin L, Zhang Y, Wang Y, Sheng S, Xu C, Tian H, et al. *Advanced Materials*, 31(40), 1902885(**2019**).
3. Chen J, Ding J, Wang Y, Cheng J, Ji S, Zhuang X, Chen X. *Advanced Materials*, 29(32): 1701170(**2017**).
4. Fang H, Guo Z, Lin L, Chen J, Sun P, Wu J, Xu C, et al. *Journal of the American Chemical Society*, 140(38), 11992-12000(**2018**).
5. Xu C, Wang Y, Yu H, Tian H, Chen X. *ACS Nano*, 12(8), 8255-8265(**2018**).

Honors and Awards

2004 Distinguished Young Scholar by the National Science Fund
2019 Academician of the Chinese Academy of Sciences

No.595 蛋白质组学的使命与挑战

Abstract

伴随着人类基因组计划（HGP）的完成，蛋白质组学在后 HGP 时代曾被“给予厚望”。2001 年 2 月，人类蛋白质组组织即宣告成立，次年，人类蛋白质组计划宣布启动。我国是最早加入蛋白质组计划的成员国之一，率先提出“两谱、两图、三库和两出口”的总体研究策略，并应用于首个人类组织、器官的蛋白质组计划——“人类肝脏蛋白质组计划（HLPP）”。在完成人类蛋白质组图谱——肝脏分卷的绘制后，我国科学家迅即启动中国人蛋白质组计划（CNHPP），选取人体十大组织、器官绘制其生理、病理条件下的蛋白质组全景图谱。CNHPP 实施以来，实现了蛋白质组研究和应用的系统突破，率先提出国际疾病蛋白质组计划研究策略，引领了国际蛋白质组学与精准医学研究的汇聚。系统构建了十种主要人体器官代表性疾病的蛋白质组图谱、疾病组织的深度覆盖蛋白质表达谱，实现潜在分子标志物和候选靶标的深入发掘，取得了一批与临床应用紧密结合的成果。CNHPP 率先公布胃癌、肝癌、肺癌的蛋白质组分子分型并发现新的治疗靶标，为下一步中国引领国际开启精准医学新时代——蛋白质组学驱动的精准医学，奠定了理论和实践基础。如今，蛋白质组学已成为一个高度专业化的独立学科，仍未成熟，在时空分辨率、灵敏度、通量等方面仍存在诸多挑战。亟需交叉集成数理、信息、化学、工程与材料等多学科力量，攻关关键性技术，探索变革性技术，为蛋白质组学驱动的生命解码与精准医学提供基础性和前沿性的理论、技术储备，提升对重大、疑难疾病的“精准定位”和“精确打击”能力，助力进一步提升人类健康水平。

贺福初 研究员

细胞生物学、遗传学家。中国科学院院士、发展中国家科学院院士。国家蛋白质科学中心（北京）理事长，蛋白质组学国家重点实验室主任，军事科学院军事医学研究院研究员。

Selected Publications

1. Jiang, Y., et al., Proteomics identifies new therapeutic targets of early-stage hepatocellular carcinoma. *Nature*, 567(7747), 257-261(**2019**).

2. Xu, J.Y., et al., Integrative Proteomic Characterization of Human Lung Adenocarcinoma. *Cell*, 182(1), 245-261.e17(**2020**).

3. Zhang, H., et al., Genome-wide association study identifies 1p36.22 as a new susceptibility locus for hepatocellular carcinoma in chronic hepatitis B virus carriers. *Nat Genet*, 42, 755-758(**2010**).

Honors and Awards

曾获国家科技进步奖一等奖 1 项、二等奖 3 项、国家自然科学奖二等奖 2 项、人类蛋白质组组织“杰出贡献奖”和“杰出成就奖”、“谈家桢生命科学成就奖”、“求是奖”、“何梁何利奖”等。

No.596 Molecules and light: Challenges for theory

Abstract

How do molecules interact with light? While light is the driving force behind a number of chemical reactions vital in chemistry, biology and even medicine understanding how molecular properties change upon light irradiation is not an easy task. Quantum theory possesses the fundamental equations to model electronically excite states and its time-evolution and yet it is plagued of challenges. In this talk I will review recent progress and strategies developed in my group to disentangle light-induced processes related to systems of different complexity, from gas phase to solution or embedded in biological environments.

Prof. Leticia González

Department of Chemistry, University of Vienna, Austria

1994	B.S., Autonomous University of Madrid
1995	M.Sc., King's College London
1998	PhD, Autonomous University of Madrid
1999-2007	Assistant Professor, Free University of Berlin
2007-2011	W2 Professor, University of Jena
2011-	Professor of Theoretical Chemistry, University of Vienna
2017-	Chairman of the German Theoretical Chemical Society

Selected Publications

1. S. Mai, P. Marquetand, L. González: Nonadiabatic dynamics: The SHARC approach. *Wiley Interdiscip. Rev. Comput. Mol. Sci.* 8, e1370(**2018**).
2. S. Mai, L. González: Unconventional two-step spin relaxation dynamics of $[Re(CO)_3(im)(phen)]^+$ in aqueous solution. *Chem. Sci.* 10, 10405-10411 (**2019**).
3. L. M. Ibele, P. A. Sanchez-Murcia, S. Mai, J. J. Nogueira, L. González: Excimer Intermediates en Route to Long-Lived Charge-Transfer States in Single-Stranded Adenine DNA as Revealed by Nonadiabatic Dynamics. *J. Phys. Chem. Lett.* 11, 7483-7488(**2020**).

Honors and Awards

Member of the Austrian Academy of Sciences, Fellow of the European Academy of Sciences, Spanish Royal Society of Chemistry Excellent Research Award, Honoris Causa Université de Lorraine, Göttingen Academy of Sciences and Humanities Gauß Professorship, ChemPubSoc Europe Fellow, Member of the International Academy of Quantum Molecular Sciences, Robert Bunsen Award, Dirac Medal of "World Association of Theoretical and Computational Chemists", Spanish Royal Society of Chemistry SIGMA-ALDRICH Award, Alexander von Humboldt Fellowship.

No.597 当材料物理遇上生物医学——交叉学科合作研究的汗水与收获

Abstract

有些研究领域需要长年累月的知识积累，比如中医领域。年份越长经验越丰富，研究成果越是信手拈来。我们经常会情不自禁地对白发苍苍的老中医肃然起敬，对老中医的信任度与其年龄成正比。而另一些领域，比如计算机科学，似乎注定就是年轻人的天下，知识的变更与淘汰节奏太快，上了年纪的研究人员根本无法跟上学科知识讯息万变的步伐。本演讲将介绍另一种介于述两者之间的情况：既不用仗着自己年长经验丰富的优势，也不用担心讯息万变之间自己惨被淘汰，那就是不同交叉学科之间的合作与碰撞。两个完全不同的学科领域，通常思维方式以及研究方法都会有很大的差异。两个不同学科之间科学家碰撞到一起，海阔天空天马行空地头脑风暴，从好奇到激辩、碰撞到合作、往往会收到惊奇的效果。

Prof. Zikang Tang(汤子康)

Institute of Applied Physics and Materials Engineering，University of Macau

1992 Ph.D., Condensed Matter Physics, Tohoku University, Japan

1990 M.Phil., Condensed Matter Physics, Tohoku University, Japan

1986 M.S., Solid State Photo-electronics, Changchun Institute of Optics, Fine Mechanics and Physics, Chinese Academy of Science, China.

1983 B.S., Physics, Zhejiang University, China.

Selected Publications

1. M. M. Chen, D. Y. Yong, C. X. Wu, Z. Shen, A. Q. Chen, Y. Zhu, B. C. Pan, Z. K. Tang. *J. Alloys Compounds*, 658, 636-641 (**2016**).

2. D. Y. Yong, H. Y. He, Z. K. Tang, S. H. Wei, B. C. Pan. *Phys. Rev. B*, 92, 235207 (**2015**).

3. Z. Q. Lin, X. C. Gui, Z. P. Zeng, B. H. Liang, W. J. Chen, M. Liu, Y. Zhu, A. Y. Cao, Z. K. Tang. *Adv. Funct. Mater*. 25, 7173-7179 (**2015**).

Honors and Awards

2021 The 13th Guanghua Engineering Technology Award

2019 Medal for the 70th Anniversary of the People's Republic of China

2012 Top 50 of the Most Cited Papers in the past 50 Years of *Applied Physics Letters*, issue of the 50th Year Celebration

No.598 化学-化工-材料：从基础到应用

Abstract

报告简单介绍化学学科、化学工程学科、材料学科的定义、内涵本质，并简要分析“碳中和”背景下化学化工学科面临的机遇和挑战。然后介绍两个从化学基础出发到工程、材料应用的案例：中国石油大学（北京）研发的复合离子液体催化碳四烷基化绿色新工艺和大规模高性能针状焦生产技术。中国石油大学（北京）创新性地合成出兼具高活性和选择性的复合离子液体催化剂；开发成功复合离子液体碳四烷基化新工艺，发明了催化剂活性监测方法和再生技术；开发成功新型管道式反应器、旋液分离器等专用设备，建成世界首套“10 万吨/年复合离子液体碳四烷基化工业装置”。目前有 5 套大规模工业装置在运行。在对重油分子表征认识基础上，发明了“重油梯级分离”高效清洁转化新工艺。将该创新工艺用于重油催化油浆的超临界梯级分离，开发了以富芳烃原料制备性能优异的针状焦的全套工艺技术，于 2017 年建成了 20 万吨/年处理能力的工业装置并实现稳定运行，解决了我国针状焦原料短缺及产品长期依赖进口的“卡脖子”问题，为锂离子电池行业的快速发展及时提供了优质负极材料。

Prof. ChunMing Xu(徐春明)

中国石油大学（北京）化学工程与环境学院

徐春明于 1981 年考入华东石油学院，先后获得学士、硕士研究生、博士学位；1991 年博士毕业后留校，在石油大学重质油加工国家重点实验室工作；1993 年在加拿大 Syncrude 研究中心工作；1995 年加入中国共产党；1995 年至 1998 年担任石油大学重质油加工国家重点实验室副主任；1998 年至 2003 年担任石油大学重质油加工国家重点实验室主任；1999 年至 2002 年担任石油大学化学科学与工程学院副院长；2002 年至 2005 年担任中国石油大学（北京）化学科学与工程学院院长；2003 年至 2008 年担任石油大学重质油国家重点实验室主任；2005 年至 2017 年担任中国石油大学（北京）副校长；2005 年获得国家杰出青年科学基金资助；2017 年在中国石油大学（北京）化学工程与环境学院工作；2019 年当选为中国科学院院士；2022 年担任山东石油化工学院院长。

Honors and Awards

近 30 年来一直致力于重油高效转化和清洁油品生产的研究，研究成果获国家技术发明二等奖 1 项，国家科技进步二等奖 2 项，中国石油和化学工业联合会技术发明特等奖 1 项，省部级一等奖 8 项。发表高水平论文 300 余篇，专著 4 部。授权国际发明专利 36 件、中国发明专利 102 件，其中实施转化 48 件。

No.599 Catalytic Activation of Carbon Dioxide to Make Plastics

Abstract

The lecture discussed recent research in the Williams group using controlled polymerization reactions to improve the sustainability of polymers. The first part focused on how to exploit concepts of synergy in making high activity catalysts for carbon dioxide/epoxide ring-opening copolymerizations. The second part introduced a form of switchable polymerization catalysis, whereby a catalyst is selfswitched by the presence/absence of monomers between different mechanism. This switchable catalysis allows for the preparation of block polymers from mixtures of monomers. The catalysis will be used to make specific sequences in the block polymers to deliver improved performances as ductile plastics or pressure sensitive adhesives. The lecture included some reflections on the pressing contemporary challenges in these fields and some career advice for graduate students.

Prof. Charlotte K. Williams

Department of Chemistry, University of Oxford, UK

2016- Professor of Inorganic Chemistry, EPSRC Established Career Research Fellow and Head of Research Chemistry, Oxford University

2003-2016 Head of Inorganic Chemistry teaching and Head of Materials Chemistry, Imperial College London

2002-2003 postdoctoral researcher, Cambridge University

2001-2002 postdoctoral researcher, the University of Minnesota

2001, PhD, Imperial College London, supervised by Vernon Gibson FRS and Nick Long

1998, BSc, Imperial College London

Selected Publications

1. Williams, C. K. & Gregory, G. L. *Nature*, 590(7846), 391–392(**2021**).
2. Kerr, Ryan W. F., Ewing, Paul M. D. A., Raman, Sumesh K., Smith, Andrew D., Williams, Charlotte K. & Arnold, Polly L. *Acs Catalysis*, 11, 1563-1569(**2021**).
3. Deacy, Arron C., Kilpatrick, Alexander F. R., Regoutz, Anna, Williams, Charlotte K. *Nature Chemistry*, 12(4), 372-380(**2020**).
4. Hepburn, C.; Adlen, E., Beddington, J., Carter, E. A., Fuss, S., Mac Dowell, N., Minx, J. C., Smith, P., & Williams, C. K. *Nature*, 575(7781), 87-97(**2019**).
5. Deacy AC, Moreby E, Phanopoulos A, Williams CK. *J. Am. Chem. Soc.*, 142(45), 19150-19160 (**2020**).

Honors and Awards

2021, Fellow of the Royal Society; 2021, the Royal Society of Chemistry Tilden Medal; 2020, OBE from Queen Elizabeth II for Services to Chemistry; 2019, Macro Group UK Medal; 2018, DeChema Otto Roelen Catalysis Medal; 2017, Sir John Meurig Thomas Medal for Catalysis; 2016, the Royal Society of Chemistry Corday Morgan Medal;

No.600 Molecular Science in the Era of Healthy China

Abstract

The occurrence of the COVID-19 epidemic demonstrates the importance and difficulty of implanting "Healthy China Strategy". Modern medicine has entered the era of molecular medicine, and precise diagnosis and targeted treatment are the clear goals of contemporary medicine, but there are great challenges. Molecular medicine requires identification protocols at the molecular level, but such molecular tools have been scarce in clinical applications and research. Therefore, one of the most important groups of people driving molecular medicine must be molecular scientists. Here, Prof. Tan presented their latest research progress in this field and discussed the development of molecular science in the era of healthy China as well as the broad application prospects and great potential in the fields of diagnosis, therapy, pharmaceuticals, and prevention. The development of molecular medicine will promote a more beautiful, happier, healthier, and happier human life.

Prof. Weihong Tan(谭蔚泓)

Director of the Institute of Basic Medicine and Cancer, CAS
Distinguished Professor of Chemistry and Biology, Hunan University
Director of Institute of Molecular Medicine, Shanghai Jiao Tong University

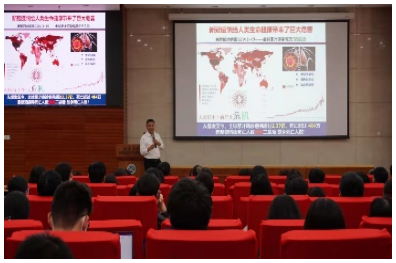
2019 –	Director, Institute of Basic Medicine and Cancer, CAS
2017 – 2020	Vice President, Hunan University
2010 –	Director, State Key Laboratory of Chemo/Biosensing and Chemometrics
1987 – 1992	PhD, The University of Michigan
1982 – 1985	MS, Institute of Coal Chemistry Chinese Academy of Science

Selected Publications

1. Zhang, P., Gao, D., An, K., Shen, Q., Wang, C., Zhang, Y., Pan, X., Chen, X., Lyv, Y., Cui, C., Liang, T., Duan, X., Liu, J., Yang, T., Hu, X., Zhu, J. J., Xu, F., & Tan, W. *Nature Chemistry*, 12(4), 381–390(**2020**).
2. Peng, R., Xu, L., Wang, H., Lyu, Y., Wang, D., Bi, C., Cui, C., Fan, C., Liu, Q., Zhang, X., & Tan, W. *Nature communications*, 11(1), 978(**2020**).
3. Xie, S., Du, Y., Zhang, Y., Wang, Z., Zhang, D., He, L., Qiu, L., Jiang, J., & Tan, W. *Nature communications*, 11(1), 1347(**2020**).

Honors and Awards

2019, Member of the European Academy of Science; 2019, The Pittsburgh Analytical Chemistry Award; 2018, Award in Spectrochemical Analysis from the American Chemical Society; 2016, Academician of the World Academy of Sciences in Developing Countries; 2015, Academician of the Chinese Academy of Sciences;



No.601 Adding a Proteomic Component to Therapeutic Decision Making by Molecular Tumor Boards

Abstract

Most (cancer) drugs act directly on proteins, are proteins themselves or engage cellular pathways controlled by proteins. Hence, adding a proteomic component to the molecular profiling of tumor patients may provide additional information to genomic and transcriptomic data to aid therapeutic decision making by molecular tumor boards (MTBs). To test if this is indeed the case, Küster group have extended the multi-omics registry trial MASTER (Molecularly Aided Stratification for Tumor Eradication) to the profiling of cancer patient (phospho-)proteomes. This talk gave examples from these experiments to illustrate what can be gleaned from such data and how they use this to inform patient proteome data and translate this information into treatment recommendations.

Prof. Bernhard Küster

School of Life Sciences, Technical University of Munich

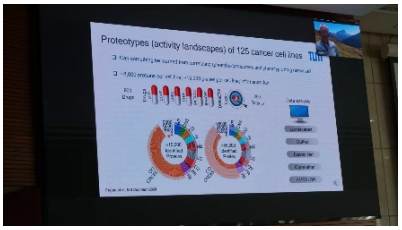
1994 Diploma in Chemistry, University of Cologne, Germany
1997 D. Phil. in Biochemistry, University of Oxford, UK
1997 – 1999 Postdoc, European Molecular Biology Laboratory (EMBL), Heidelberg, Germany and Department for Molecular Biology, University of Southern Denmark, Odense, Denmark
2000 – 2000 Associate Research Professor, Department for Molecular Biology, University of Southern Denmark, Odense, Denmark
2000 – 2007 VP Analytical Sciences and Informatics, Cellzome, Heidelberg, Germany
2007 – Professor, School of Life Sciences, Technical University of Munich, Germany

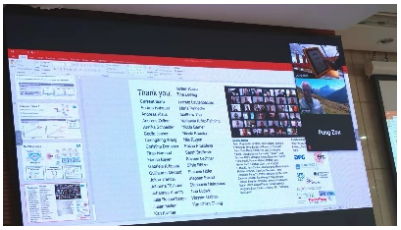
Selected Publications

1. J. Mergner, B. Kuster, et al. *Nature*, 579, 409(**2020**).
2. Jarzab, J., Kuster, B, et al. *Nature Methods*, 17, 495-503(**2020**)
3. Klaeger S, Kuster B, et al. *Science*, 358, eaan4368(**2017**)
4. Zolg DP, Kuster B, et al. *Nature Methods*, 14, 259-262(**2017**).
5. Wilhelm M, Kuster B, et al. *Nature*, 509, 582-587(**2014**)

Honors and Awards

2014, Heinz Maier-Leibnitz Award, Technical University of Munich; 2014, Discovery in Proteomic Sciences Award, Human Proteome Organization; 1998, Mattauch-Herzog Award, German Mass Spectrometry Society.





No.602 Function Related Dynamics of Membrane Proteins by NMR

Abstract

Many drugs that target G-protein-coupled receptors (GPCRs) induce or inhibit their signal transduction with different strengths, which affect their therapeutic properties. However, the mechanism underlying the differences in the signaling levels is still not clear, although several structures of GPCRs complexed with ligands determined by X-ray crystallography are available. Here, Shimada group utilized NMR to monitor the signals from the methionine residue at position 82 in neutral antagonist- and partial agonist-bound states of β_2-adrenergic receptor (β_2AR), which are correlated with the conformational changes of the transmembrane regions upon activation. They show that this residue exists in a conformational equilibrium between the inverse agonist-bound states and the full agonist-bound state, and the population of the latter reflects the signal transduction level in each ligand-bound state. These functional equilibriums provide insights into the multi-level signaling of β_2AR and other GPCRs, including the basal activity, and the mechanism of signal transduction mediated by GPCRs.

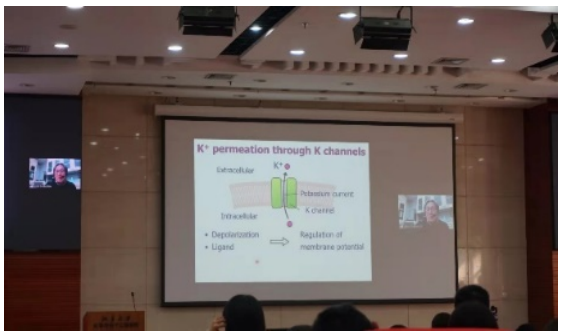
Prof. Ichio Shimada

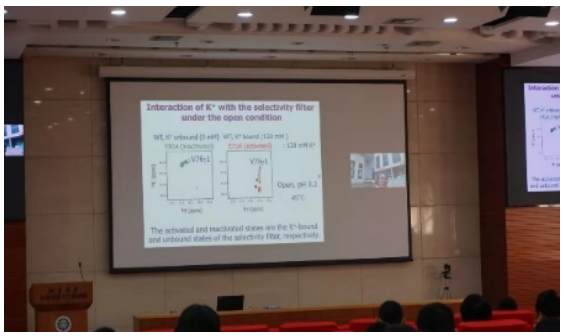
RIKEN Center for Biosystems Dynamics Research(BDR), Japan

Ichio Shimada is a Team Leader of the Laboratory for Dynamic Structure of Biomolecules in RIKEN BDR. His research interests are the development of NMR methodologies for studying larger protein complexes and functional analyses of proteins, including membrane proteins. He also served as the Professor and Dean of the Graduate School of Pharmaceutical Sciences at the University of Tokyo, as well as Director and Scientific Advisor of the Biomedicinal Information Research Center at the National Institute of Advanced Industrial Science and Technology (AIST). He is currently a council member of The International Council on Magnetic Resonance in Biological Systems (ICMRBS) and the International Society of Magnetic Resonance (ISMAR) and he was elected an ISMAR fellow in 2017, for his contributions to the field of magnetic resonance.

Selected Publications

1. Takeuchi K, Misaki I, Tokunaga Y, et al. *Angew. Chem. Int. Ed.*, 60(12), 6567-6572 (**2021**)
2. Iwahashi Y, Toyama Y, Imai S, et al. *Nature Communications*, 11, 5168 (**2020**)
3. Mizukoshi Y, Takeuchi K, Tokunaga Y, et al. *Science Advances*, 6(40), eabd0480 (**2020**)
4. Zhao Q, Fujimiya R, Kubo S, et al. *Cell Reports* 32(8), 108074 (**2020**)
5. Mizumura T, Kondo K, Kurita M, et al. *Science Advances*, 6(12), eaay8544 (**2020**)





No.603 Environmental Behavior of Plutonium: Challenges for clean-up and safe long-term storage

Abstract

Humans have produced approximately 2,700 metric tons of Pu worldwide with ~1% (or 27,000 kg) that has been released into the environment where subsequently low-level transport in the surface and subsurface has occurred on the scale of kilometers. Because of its long half-life (239Pu $t_{1/2}$ ~24,000 yrs) and high toxicity, Pu will persist in the environment for a long time and represents a significant environmental and public health risk. Understanding Pu behavior in the environment is critical for managing clean-up and planning for the safe, long-term isolation of nuclear waste from the biosphere. Although the lack of a robust model has hampered efforts to predict long-term enviromental behavior of Pu; advances in our understanding have recently resulted in an emerging conceptual model. Understanding the interplay (the bio-geo-chemistry) between Pu and the repository environment is necessary to predict the conditions for which Pu will either migrate or remain immobile. A mechanistic understanding of the surface structure and reactivity of coupled Pu–mineral, Pu–organic ligand, and Pu–microbe, interfacial processes is needed to advance our understanding. To elucidate the mechanisms controlling Pu transport, we have investigated Pu sorption and desorption rates from mineral, organic and microbe surfaces over a range of concentrations found in the environment. Field and laboratory experiments show that the both inorganic and organic matter play an important role in stabilizing Pu in solution and on mineral surfaces. I will present an overview of our present understanding of the behaviour of Pu in an effort to develop a conceptual model of Pu subsurface behavior.

Prof. Annie B. Kersting

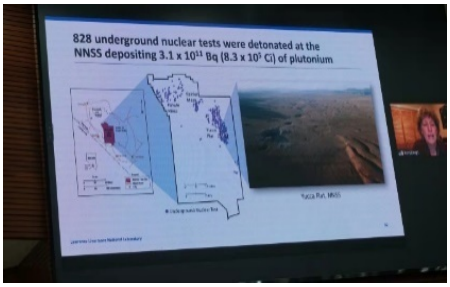
Lawrence Livermore National Laboratory(LLNL), USA
2018- Technical Co-Manager, DOE Office of Science, Biological and Environmental Research Special Focus Area, LLNL.
2017- Program Manager, Nonproliferation Research and Development Program, LLNL
2016- Director, University Relations and Science Education, LLNL
1991, Ph.D., Geology and Geophysics, University of Michigan, Ann Arbor

Selected Publications

1. Deblonde, G.J.P., Kersting, A.B., & Zavarin, M. *Commun. Chem.*, 3, 167(**2020**).
2. Shusterman, J.A., Mason, H.E., Bowers, J., Bruchet, A., Uribe, E.C., Kersting, A.B. and Nitsche, H. *Applied Materials & Interfaces*, 7 (37), 20591-20599(**2015**).
3. Tinnacher, R.M., Begg, J.D., Mason, H., Ranville, J., Powell, B.A., Wong, J.C., Kersting, A.B., and Zavarin, M. *Environ. Sci. Technol.*, 49(5), 2776-2785(**2015**),
4. Begg, J.D., Zavarin, M., Tumey, S.J., and Kersting, A.B. *J. Environ. Radioact.*, 141, 106-114(**2015**).
5. Boggs, M.A., Dai, Z., Zavarin, M., and Kersting, A.B. *J. Environ. Radioact.*, 141, 90-96(**2015**).

Honors and Awards

2020, Director's Institutional Operational Excellence Gold Award, for Excellent Innovation to Create a "Virtual" Summer Student Program (during COVID), LLNL; 2020, Director's Office Recognition Gold Award, for development of a new derivative-classifier-REV automated secure system for the review and release process, LLNL; 2018, Excellence in Execution of Student Summer Program, LLNL; 2016, Secretarial Honor Award (Ernest Moniz), DOE, Excellence in Service; 2016, Excellence in Science and Leadership, Physical and Life Sciences Directorate, LLNL; 2016, Frances P. Garvan–John M. Olin Medal, American Chemical Society, for excellence in chemistry, leadership and service. San Diego, CA. 2000, Excellence in Publication, LLNL.



No.604 Reprogramming the Genetic Code

Abstract

In terrestrial life, DNA is copied to messenger RNA, and the 64 triplet codons in messenger RNAs are decoded – in the process of translation – to synthesize proteins. Cellular protein translation provides the ultimate paradigm for the synthesis of long polymers of defined sequence and composition, but is commonly limited to polymerizing the 20 canonical amino acids. Prof. Chin described their progress towards the encoded synthesis of non-canonical biopolymers. These advances may form a basis for new classes of genetically encoded polymeric materials and medicines. To realize the goals they are re-imagining some of the most conserved features of the cell; They have created new ribosomes, new aminoacyl-tRNA synthetase/tRNA pairs, and organisms with entirely synthetic genomes in which they have re-written the genetic code.

Prof. Jason W. Chin

MRC Laboratory of Molecular Biology, Cambridge University

2018- Joint Head, Division of Protein & Nucleic Acid Chemistry MRC Laboratory of Molecular Biology, Cambridge, UK

2018- Associate Faculty, Synthetic Genomics Wellcome Sanger Insitute, Cambridge, UK

2010- Head, Centre for Chemical & Synthetic Biology (CCSB@LMB) MRC Laboratory of Molecular Biology, Cambridge, UK

2012- Professor of Chemistry & Chemical Biology Department of Chemistry, University of Cambridge, UK

2007- Programme Leader (tenured) MRC Laboratory of Molecular Biology, Cambridge, UK

2007- Fellow in Natural Sciences & Director of Studies in Biochemistry Trinity College, Cambridge University, UK

2003-2007 Programme Leader (tenure-track) MRC Laboratory of Molecular Biology, Cambridge, UK

2001-2003 Damon Runyon Postdoctoral Fellow, with Professor Peter G. Schultz. The Scripps Research Institute, La Jolla, CA, USA

1996-2001 PhD, with Professor Alanna Schepartz. Yale University, New Haven, CT, USA

Selected Publications

1. Robertson, W. E.; Funke, L. F. H.; Torre, D. de la; et al. *Science*, 372, 1057-1062(**2021**).
2. M. R Hodskinson, A. Bolner, K. Sato, A. N. Kamimae-Lanning, K. Rooijers, et al. *Nature*, 579, 603-608(**2020**)
3. Schmied, W. H.; Tnimov, Z.; Uttamapinant, C.; Rae, P.; Gallo, C. D.; Fried, S. D. *Nature*, 564, 444-448(**2018**).
4. Neumann, H.; Wang, K.; Davis, L.; Garcia-Alai, M.; Chin, J. W. *Nature*, 464, 441-444(**2010**).

Honors and Awards

2020, Meyerhof Lecture, Max Planck Institute Heidelberg; 2019, Sackler International Prize in the Physical Sciences; 2016 , Elected to Fellowship of the Academy of Medical Sciences (FMedSci); 2013, Elected to European Inventor Hall of Fame (European Patent Office); 2013, Andrew E. Derome Memorial Lectures (Oxford University); 2011 Louis-Jeantet Foundation Young Investigator Career Award; 2010 Elected EMBO (European Molecular Biology Organization) Member; 2010 The EMBO Gold Medal (European Molecular Biology Organization)

No.605 Materials Talking to Cells

Abstract

Wouldn't it be existing if we could design soft materials that could actively integrate into cells or tissue and stimulate cellular responses? Can we envision materials instructing cells to grow, proliferate or induce apoptosis? How would such materials look like and would we be capable of learning the language of cells and translate them into communicating materials? In this presentation, Prof. Tanja Weil firstly discussed how to create structurally precise polymeric nanostructures by applying the DNA origami technique. Then, She presented the identification of bioactive peptide nanostructures stimulating neuronal cell growth without growth factors or concentrating virions at the cellular membrane, which is attractive for applications in regenerative medicine and gene therapy. The controlled formation of peptide nanostructures within the cytoplasm by chemical cascade reactions provides new avenues as metabolic inhibitors for cancer therapy. Ultimately, this field requires a materials revolution to design soft materials resembling certain features of living matter so that they could communicate and stimulate desired cellular processes such as those required for regeneration or cancer therapy, among others.

Prof. Tanja Weil

Max Planck Institute for Polymer Research，Germany

2021- Associate Editor, Journal of the American Chemical Society, ACS

2020- Board Member of the Mildred Scheel Foundation of the German Cancer Aid

2019- Co-Director Max Planck-Bristol Centre for Minimal Biology

2019- Scientific Advisory Board of the research field "Information" at the Karlsruhe Institute of Technology

2017- Member of the Senate of the German Research Foundation

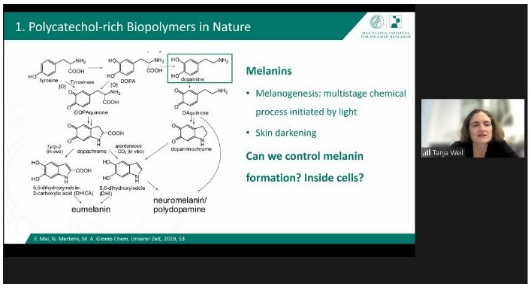
2016- Member of the Senate of the Leibniz Association and member of the evaluation panel

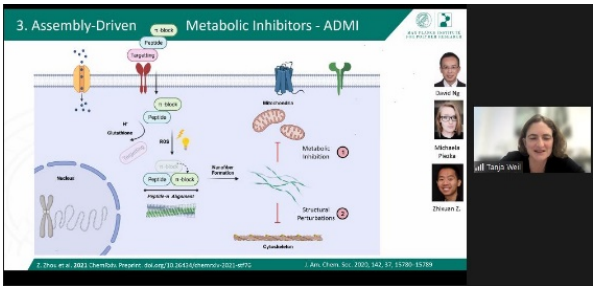
Selected Publications

1. Winterwerber, P.; Whitfield, C.; Ng, D. Y. W.; Weil, T. *Angew. Chem. Int. Ed.*, e202111226 (**2022**)
2. Xu, L.; Kuan, S. L.; Weil, T. *Angew. Chem. Int. Ed.*, 60 (25), 13757 - 13777 (**2021**)
3. C. J. Whitfield, M. Zhang, P. Winterwerber, Y. Wu, D. Y. W. Ng and T. Weil, *Chem. Revie.*, 121, 11030-11084(**2021**).
4. M. M. Zegota, M. A. Müller, B. Lantzberg, G. Kizilsavas, J. A. S. Coelho, P. Moscariello, M. Martínez-Negro, S. Morsbach, P. M. P. Gois, M. Wagner, D. Y. W. Ng, S. L. Kuan and T. Weil, *J. Am. Chem. Soc.*, 143, 17047-17058(**2021**).
5. Gačanin, J., Hedrich, J., Sieste, S., Glaßer, G., Lieberwirth, I., Schilling, C., Fischer, S., Barth, H., Knöll, B., Synatschke, C. V., Weil, T., *Adv. Mater.*, 31, 1805044(**2019**)

Honors and Awards

2020, Netherlands Scholar Award for Supramolecular Chemistry; 2017, Honorary Professor Johannes Gutenberg University Mainz; 2016, Honorary Professor Ulm University; 2014, Science Award of the City of Ulm; 2012, Synergy Grant of the European Research Council (ERC); 2002, Otto Hahn Medal of the Max Planck Society, Germany.





No.606 Topological Polymer Chemistry: Endless attractions with macromolecular designing

Abstract

The fascinating developments in topological polymer chemistry has proceeded to uncover unprecedented topology effects based upon topological geometry conjectures, intriguingly counterintuitive to Euclidian geometry common senses. Tezuka group have demonstrated an electrostatic self-assembly and covalent fixation (ESA-CF) procedure as a powerful synthetic technique for diverse topological polymers. A series of complex multicyclic topologies have been successfully constructed, including a topologically significant fused-tetracyclic $K_{3,3}$ graph polymer topology. Furthermore, the programmed polymer folding has now evolved into an emerging frontier in topological polymer chemistry.

Prof. Yasuyuki Tezuka

Department of Organic and Polymeric Materials, Tokyo Institute of Technology

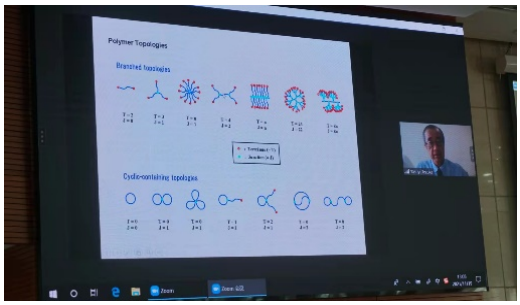
2003-2019 Full Professor, Tokyo Institute of Technology
1994-2003 Department of Organic and Polymeric Materials, Tokyo Institute of Technology
1991-1994 Associate Professor, Nagaoka University of Technology
1982-1991 Assistant Professor, Nagaoka University of Technology
1982 PhD, Ghent University, Belgium
1978 MS in synthetic chemistry, University of Tokyo
1976 BS in synthetic chemistry, University of Tokyo

Selected Publications

1. Topological Polymer Chemistry: concepts and practices, Y. Tezuka, T. Deguchi, eds., Springer Japan,Tokyo(**2021**).
2. Topological Polymer Chemistry: Progress of cyclic polymers in synthesis, properties and functions, Y. Tezuka ed., World Scientific, Singapore(**2013**).
3. Y. Tezuka, *Acc. Chem. Res*., 50, 2661 (**2017**).
4. Y, Tezuka, Isr. J. *Chem. (Rosarium Philosophorum – Macromlecules)*, 60, 67 (**2020**).
5. Y. Tezuka, *React. Funct. Polym.*, 148, 104489 (**2020**).
6. K. Kyoda, T. Yamamoto, Y. Tezuka, *J. Am.Chem. Soc.*, 141, 7526 (**2019**).

Honors and Awards

2018, SPSJ Award for Outstanding Achievement in Polymer Science and Technology; 2010,The Award of the Society of Polymer Science, Japan; 2004, Tokyo Tech Award of Best Teacher;



No.607 超快光生物功能动力学

Abstract

Research in the Zhong group is directed towards understanding the nature of elementary processes in biological systems. They relate dynamics and structures to functions at the most fundamental level with state-of-the-art femtosecond lasers and molecular biology techniques. The laboratory ultimately will have the capability of time resolution from femtosecond to millisecond (second); biological systems can be prepared and studied at the single molecule level. They are currently focusing on studies of molecular recognition and ultrafast protein/enzyme dynamics of several important biological systems.

Prof. Dongping Zhong(仲冬平)

The Ohio State University, USA

2010 - Robert Smith Professor of Physics, Professor of Chemistry and Biochemistry, The Ohio State University
2007-2010 Robert Smith Associate Professor of Physics, Associate Professor of Chemistry and Biochemistry, The Ohio State University
2002-2007 Assistant Professor, Departments of Physics, Chemistry (adjunct), and Biochemistry (adjunct), Member of Biophysics, Biochemistry, and Chemical Physics Programs, The Ohio State University
1999-2001 Postdoctoral Fellow, NSF Laboratory for Molecular Sciences, California Institute of Technology
1999 Ph.D. California Institute of Technology, Pasadena, California (Advisor: Nobel Laureate, Linus Pauling Professor Ahmed H. Zewail)
1985 B.S. laser physics from Huazhong University of Science and Technology (China)

Selected Publications

1. J. Cao, X. Wang and D. Zhong, *Science*, 374, 34 (**2021**).
2. P. Houston, N. Macro, M. Kang, L. Chen, J. Yang, L. Wang, Z. Wu and D. Zhong, *J. Am. Chem. Soc.*, 142, 3997 (**2020**).
3. J. Yang, Y. Wang, L. Wang, and D. Zhong, *J. Am. Chem. Soc.*, 139, 4399 (**2017**).
4. M. Zhang, L. Wang, S. Shu, A. Sancar, and D. Zhong, *Science*, 354, 209 (**2016**).
5. S. Faraji, D. Zhong, and A. Dreuw, *Angew. Chem. Int. Ed.*, 55, 5175 (**2016**).

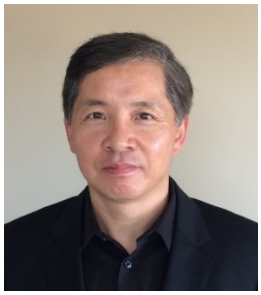
Honors and Awards

2013, Guggenheim Fellowship, The John Simon Guggenheim Memorial Foundation. 2009, Outstanding Young Researcher Award, Overseas Chinese Physics Association; 2011, Fellow, The American Association for the Advancement of Science; 2009, Fellow, American Physical Society; 2008, Dr. Elizabeth L. Gross Award for Faculty Excellence, The Ohio State University; 2008, Camille Dreyfus Teacher-Scholar Award, The Camille and Henry Dreyfus Foundation; 2008, CAREER Award, The National Science Foundation; 2008, Sloan Research Fellowship, The Alfred P. Sloan Foundation; 2007, Robert Smith Professorship, The Ohio State University; 2005, Packard Fellowship, The David and Lucile Packard Foundation; 1999, Milton and Francis Clauser Doctoral Prize, California Institute of Technology; 1999, The Herbert Newby McCoy Award, California Institute of Technology;

No.608 Determining the 3D Atomic Structure of Non-Crystalline Materials

Abstract

Over the past century, crystallography has been fundamental to the development of many fields of science. However, many samples in physics, materials science, chemistry, and nanoscience are non-crystalline and their 3D structures are not accessible by crystallography. A powerful method that can overcome this major hurdle is atomic electron tomography (AET). AET combines high-resolution tomographic tilt series with advanced computational algorithms to resolve the 3D atomic structure of materials without assuming crystallinity. Prof. Miao reported their recent results on the determination of the 3D coordinates of individual atoms and crystal defects in 2D materials with picometer precision. The experimentally measured 3D atomic coordinates are used as direct input to first principles calculations to reveal more accurate electronic structures than derived from conventional density functional theory calculations. Professor Miao then presented the determination of the 3D atomic positions of an amorphous material. Using a multi-component metallic glass, professor Miao's group quantitatively characterize the short- and medium-range order of the 3D atomic arrangement. They identify four types of crystal-like medium-range order-face-centred cubic, hexagonal close-packed, body-centred cubic and simple cubic-coexisting in the amorphous material, showing translational but not orientational order.



Prof. Jianwei (John) Miao

University of California Los Angeles, USA

2009 - full professor, UCLA

2004-2009 assistant professor, UCLA

1999-2004 staff scientist, SLAC National Accelerator Laboratory, Stanford University

1999 PhD. in Physics, an M.S. in computer science, and an Advanced Graduate Certificate in Biomedical Engineering, State University of New York, Stony Brook

Selected Publications

1. J. Miao, P. Ercius and S. J. L. Billinge. *Science*, 353, aaf2157 (**2016**).
2. J. Zhou, Y. Yang, Y. Yang, D. S. Kim, A. Yuan, X. Tian, C. Ophus, F. Sun, A. K. Schmid, M. Nathanson, H. Heinz, Q. An, H. Zeng, P. Ercius and J. Miao. *Nature*, 570, 500-503 (**2019**).
3. X. Tian, D. S. Kim, S. Yang, C. J. Ciccarino, Y. Gong, Yo. Yang, Ya. Yang, B. Duschatko, Y. Yuan, P. M. Ajayan, J. C. Idrobo, P. Narang and J. Miao. *Nature Mater*., 19, 867-873 (**2020**).
4. Y. Yang, J. Zhou, F. Zhu, Y. Yuan, D. Chang, D. S. Kim, M. Pham, A. Rana, X. Tian, Y. Yao, S. Osher, A. K. Schmid, L. Hu, P. Ercius and J. Miao. *Nature*, 592, 60–64 (**2021**).

Honors and Awards

1999, the Werner Meyer-Ilse Memorial Award; 2006-2008, Alfred P. Sloan Research Fellowship; 2006-2007, the Outstanding Teacher of the Year Award in the Department of Physics & Astronomy at UCLA; 2010, Kavli Frontiers Fellowship; 2013, Theodore von Kármán Fellowship from the RWTH Aachen University in Germany; 2013, the Microscopy Today Innovation Award; 2015-2017, a University of Strasbourg Institute for Advanced Study Fellowship; 2016, Fellow of the American Physical Society; 2018, NSF Creativity Award; 2021, the Innovation in Materials Characterization Award from the Materials Research Society .

No.609 Development of Radiopharmaceutical: From Bench to FDA Approved Clinical Application

Abstract

There is always a philosophical difference between academic centered university and commercial company in how to handle intellectual properties. In order to make their discoveries clinically useful, researchers need to understand the needs of medical practice and its relationship with financial aspect of the health care "industry". This practical mindset is not always compatible with academic priorities. An on-going discussion between the clinic and the academic laboratory is imperative for successful translational research. Researchers need to consider cost and convenience as well as distribution and use. An imaging agent may provide beautiful images for publication and yet it may not be practical for diagnosis or too expensive for daily use. The logistics of patent filing and licensing the technology to commercial companies is sometimes very difficult to manage and execute in an academic setting. In order to move a potential drug through the clinical trials required by the FDA approval process, millions of dollars of additional funding are needed. The processes of raising money from venture capitalists, licensing the agent and forming a startup company are not compatible with the traditional academic mission. The conflict of interest, or the appearance of it, causes many "pure and high minded" researchers to pause, contemplate and rethink their job description and the "dignity" of academic life. Examples of translational research in an academic institution by considering the development of two brain imaging agents were presented by using two case studies: 1. TRODAT-1, which can be used to diagnose and monitor Parkinson's disease and 2. AV-45 (Amyvid), an imaging agent for mapping amyloid plaques in the brain in patients at risk of having Alzheimer's disease. Trials and tribulations of developing radiopharmaceuticals from bench to clinics were presented and discussed.

Prof. Hank F Kung(孔繁渊)

孔繁渊教授是美国宾夕法尼亚大学医学院放射学系退休教授，放射性药物领域国际著名学者和专家，为世界核医学的发展做出巨大贡献。孔繁渊教授在放射性药物研究及临床转化领域取得举世瞩目的成就：发明老年痴呆 PET 诊断药物—^{18}F-AV45(Amyvid)，于 2012 年 4 月 6 日被 FDA 批准，成为全球首位上市的 ^{18}F 正电子专利药物，标志着 PET 分子显像医学发展新纪元。实验室研制的另一个 AD 诊断显像药物 ^{18}F-AV1(Neuraceq)也于 2014 年 3 月获得 FDA 批准上市。获得国际发明专利 40 余项，其中多项已在临床中发挥重要作用(D2\D3 受体显像剂 IBZM、DAT 显像剂 ^{99m}Tc-TRODAT-1、SERT 显像剂和 5HT1A 探针、VMAT2 显像剂 ^{18}F-AV133 等)。上世纪 90 年代孔教授发明的 ^{99m}Tc-TRODAT-1(多巴胺转运体靶向探针)成为核医学领域 Tc-99m 放射性药物中唯一能够定性、定量显像研究神经退行性病变过程的里程碑，至今广泛应用于临床。

Selected Publications

1. H. F. Kung, S. R. Choi, W. Qu, W. Zhang and D. Skovronsky, *Journal of Medicinal Chemistry*, 53, 933-941(**2010**).
2. S. R. Choi, G. Golding, Z. Zhuang, W. Zhang, N. Lim, F. Hefti, T. E. Benedum, M. R. Kilbourn, D. Skovronsky and H. F. Kung, *J Nucl Med.*, 50, 1887-1894(**2009**).
3. W. Zhang, S. Oya, M.-P. Kung, C. Hou, D. L. Maier and H. F. Kung, *Nuclear medicine and biology*, 32, 799-809(**2005**).

Honors and Awards

2004, Aebersold Award(美国核医学届最高科学奖, 1973 年创立以来首位华裔科学家获奖); 2012, Distinguished Investigator(美国放射学会); 2013, Kulh-Lassen Award(美国核医学与分子影像学会 SNMMI)。

No. 610 Mass Spectrometry of Proteins and Protein Complexes as a Tool for Structural Biology

Abstract

Ever since the development of electrospray ionization (ESI) and matrix-assisted laser desorption/ionization (MALDI) over 30-years ago, mass spectrometry (MS) has progressed as a defining analytical method for the detection and characterization of proteins. Native MS of proteins and protein assemblies reveals size and binding stoichiometry. ESI's gift for transforming solution-phase macromolecules into gas-phase ionized counterparts without disrupting weak non-covalent interactions is key for applying MS to study protein complexes. But elucidating the higher order structures of proteins to understand their function is more challenging. Combining native MS with top-down MS, i.e., the direct fragmentation of the gas-phase protein, yields an effective tool for deriving structural information for soluble and membrane protein complexes, and much of this information can be correlated to the solution-phase structure. Native top-down MS (nTDMS) generates information on the surface topology, ligand binding sites, and post-translational modifications (PTMs) and proteoforms of protein complexes. nTDMS endeavors to fragment covalent bonds in an intact biomolecule or complex in a conformation-sensitive manner, such that information about higher-order structure can be inferred from the fragmentation pattern. The investigation of the molecular action of compounds that prevent amyloid fibril formation in neurodegenerative diseases such as Alzheimer's and Parkinson's disease can be elucidated by nTDMS. Mass spectrometry is complementary to other biophysical methods used in structural biology; the integration of all of these methods form a powerful platform to address important questions in biology and medicine.

Prof. Joseph A. Loo

University of California-Los Angeles, USA

2001- Professor, Department of Chemistry & Biochemistry and the Department of Biological Chemistry, David Geffen School of Medicine at the University of California, Los Angeles.

1998 PhD in analytical chemistry, Cornell University, USA

Selected Publications

1. Smith LM, Thomas PM, Shortreed MR, Schaffer LV, Fellers RT, LeDuc RD, Tucholski T, Ge Y, Agar JN, Anderson LC, Chamot-Rooke J, Gault J, Loo JA, Paša-Tolic L, Robinson CV, Schlüter H, Tsybin YO, Vilaseca M, Vizcaíno JA, Danis PO, and Kelleher NL. *Nature Methods*, 16, 939–940(**2019**).
2. Li H, Nguyen HH, Ogorzalek Loo RR, Campuzano IDG, and Loo JA. *Nature Chem.*, 10, 139-148(**2018**).
3. Choi TS, Lee J, Han JY, Jung BC, Wongkongkathep P, Loo JA, Lee MJ, and Kim HI. *Angew. Chem. Int. Ed.*, 57, 3099-3103(**2018**).

Honors and Awards

Clarkson U. American Chemical Society Analytical Chemistry Division Award; Clarkson U. Chemical Rubber Company Achievement Award; Clarkson U. George L. Jones, Jr. Memorial Award; Clarkson U. Merck Chemistry Award; Cornell Chemistry Teaching Assistant Award; Clarkson U. Stephen Brunauer Senior Thesis Award; Bridges to the Professorate NIGMS Program Compact for Faculty Diversity Faculty Mentor of the Year Award;

No. 611 Fluorescent and Bioluminescent Probes for Imaging and Diagnostics

Abstract

The topic of professor Johnsson's presentation was how a combination of protein engineering and synthetic chemistry can be exploited to generate fluorescent and bioluminescent probes for live-cell imaging. Specifically, professor Johnsson reviewed their attempts to introduce new fluorescent dyes and sensor proteins that permit to visualize biochemical activities in living cells with high spatial and temporal resolution. He also discussed how these sensor proteins can be utilized for point-of-care therapeutic drug monitoring.

Prof. Kai Johnsson

Max Planck Institute for Medical Research, Germany

2017 - Director, Max Planck Institute for Medical Research, Heidelberg, Germany
1999 - Assistant Professor (1999-2005), Associate Professor (2005-2009), Full Professor (2009-2017), Affiliated Professor (2018-); Institute of Chemical Sciences and Engineering, EPFL Lausanne, Switzerland
1996 - 1999 Independent researcher; Ruhr-University Bochum, Germany
1993 - 1996 Postdoctoral fellow; Department of Chemistry, UC Berkeley, USA
1992 PhD in Chemistry, Department of Chemistry, ETH Zürich, Switzerland

Selected Publications

1. Yu, Q.; Xue, L.; Hiblot, J.; Griss, R.; Fabritz, S.; Roux, C.; Binz, P. A.; Haas, D.; Okun, J. G.; Johnsson, K.. *Science*, 361, 1122-1126(**2018**).
2. Lukinavicius, G.; Reymond, L.; D'Este, E.; Masharina, A.; Gottfert, F.; Ta, H.; Guther, A.; Fournier, M.; Rizzo, S.; Waldmann, H.; Blaukopf, C.; Sommer, C.; Gerlich, D. W.; Arndt, H. D.; Hell, S. W.; Johnsson, K. *Nature Methods*, 11, 731 (**2014**).
3. Haruki, H.; Pedersen, M. G.; Gorska, K. I.; Pojer, F.; Johnsson, K. *Science*, 340, 987(**2013**).
4. Lukinavicius, G.; Umezawa, K.; Olivier, N.; Honigmann, A.; Yang, G.; Plass, T.; Mueller, V.; Reymond, L.; Correa, I. R., Jr.; Luo, Z. G.; Schultz, C.; Lemke, E. A.; Heppenstall, P.; Eggeling, C.; Manley, S.; Johnsson, K. *Nature Chemistry*, 5, 132(**2013**).

Honors and Awards

2019, Elected Member of the Heidelberg Akademie der Wissenschaften; 2016, Karl-Heinz-Beckurts-Preis; 2015, AbbVie Lecture, UC Berkeley; 2012-2013, Novartis Lectureship Award; 2012, Leica Scientific Forum Lectureship Japan (Osaka, Kyoto, Tokyo); 2011, Amgen Lecture, UC Berkeley; 2013, Elected Member of EMBO; 2003, Prix APLE for the invention of the year 2003 of EPFL Lausanne;