

Confirmed Plenary Speakers

1. Prof. Weihong Tan (member of Chinese Academy of Sciences)
Shanghai Jiaotong University, Hunan University, China

Title: DNA functional biomaterials and molecular networks

Abstract:

Biography:

2. Prof. Yingfu Li, McMaster University, Canada



Title: Functional Nucleic Acids as Bacterial and Viral Sensors

Abstract: Rapid detection of infectious pathogens is vital for improving human health. Current detection methods oftentimes lack the means to detect infectious pathogens in a simple, rapid, and reliable manner at the time and point of need. Functional nucleic acids (FNAs) – specifically DNA aptamers and DNazymes – have the potential to overcome these limitations by acting as key components for point-of-care (POC) biosensors due to their distinctive advantages that include high binding affinities and specificities, excellent chemical stability, ease of synthesis and modification, and compatibility with a variety of signal-amplification and signal-transduction mechanisms. In this presentation, I will discuss the work completed in my laboratory, in collaboration with several other groups at McMaster, towards developing simple-to-use paper-based analytical devices and hand-held electrical devices with integrated FNAs to detect bacterial and viral pathogens, including SARS-CoV-2 that is responsible for the COVID-19 pandemic, directly in clinical samples, such as urine, blood, saliva and stool.

Biography: Yingfu Li is a Professor in the Department of Biochemistry and Biomedical Sciences at McMaster University. He earned a PhD in Biochemistry from Simon Fraser University in 1997 and his PhD work won him Governor General of Canada Academic Gold Medal and Natural Sciences and Engineering Research Council of Canada Doctoral Prize. He carried out his postdoctoral research at Yale University

between 1997-1999 with a fellowship from Medical Research Council of Canada. In November 1999, he joined McMaster University as an Assistant Professor in the Department of Biochemistry and Biomedical Sciences, was promoted to a Full Professor by 2010. He has published extensively on functional nucleic acids, including ~250 research papers, review articles, and book chapters. He has also served as an Associate Editor of Journal of Molecular Evolution and Co-Editor-in-Chief of Advanced Agrochem. He has received many recognitions, including Canada Research Chair, New Investigator Award from the Canadian Institute of Health Research, Premier Research Excellent Award from Ontario Government, McBryde Medal from Canadian Society of Chemistry.

3. Prof. Xiaoyuan (Shawn) Chen, National University of Singapore, Singapore



Title: Modulating immunosuppressive tumor microenvironment with nanomedicine

Abstract:

Biography: Prof. Xiaoyuan (Shawn) Chen received his PhD in Chemistry from the University of Idaho (1999). After being a faculty at the University of Southern California, Stanford University and then Senior Investigator/Lab Chief at the National Institutes of Health, he is now Nasrat Muzayyin Professor in Medicine and Technology, Yong Loo Lin School of Medicine and Faculty of Engineering, National University of Singapore. His current research interests are mainly theranostics (radiotheranostics, nanotheranostics, immunotheranostics, magnetotheranostics, phototheranostics, etc.) that can be clinically translatable. He has published over 900 papers and numerous books (Total citations > 108,000, H index 171 based on Google scholar). He was elected as AIMBE Fellow (2017) and SNMMI Fellow (2020), received SNMMI Michael J. Welch Award (2019), ACS Bioconjugate Chemistry Lecturer Award (2016), NIH Director's Award (2014), NIBIB Mentor Award (2012). He is also the Past President of Chinese-American Society of Nuclear Medicine and Molecular Imaging (CASNMMI), Past President of the Radiopharmaceutical Science Council (RPSC), Society of Nuclear Medicine and Molecular Imaging (SNMMI), and Past President of the Chinese American Society of Nanomedicine and Nanobiotechnology (CASNN).

4. Prof. Warren C.W. Chan, University of Toronto, Canada

Title: Nanoparticle delivery to solid tumours

Abstract: The delivery of medical agents to a specific diseased tissue or cell is critical for diagnosing and treating patients. Nanomaterials can transport drugs, contrast agents, immunotherapies, and gene editors to diseased sites. However, less than 1% are delivered to solid tumours, impacting their use and clinical translation for cancer

applications. In this presentation, I will discuss the challenge of delivering of medical agents and nanoparticles to solid tumours. The seminar will discuss the impact of nanoparticle design and biology on the in vivo transport process. It will finish with a discussion of strategies to overcome the delivery problem with nano-bio interaction studies, machine learning, and computational analysis.

Biography: Dr. Chan is currently a professor and head of the Institute of Biomedical Engineering at the University of Toronto. He is the Canadian Research Chair in Nanoengineering. He received his B.S. degree from the University of Illinois in 1996, Ph.D. degree from Indiana University in 2001, and post-doctoral training at the University of California (San Diego). His lab develops nanotechnology for diagnosing and treating cancer and infectious diseases. Some of his awards include NSERC E. W. R. Memorial Steacie Fellowship, Kabiller Young Investigator Award in Nanomedicine (Northwestern University), Rank Prize Fund award in Optoelectronics (England), and Dennis Gabor Award (Hungary). He is currently an Associate Editor of ACS Nano.

5. Prof. Kenneth J Shea, Univ. California Irvine, USA

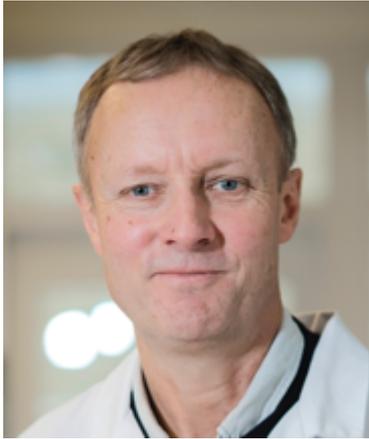
Title: Synthetic Antibodies from Statistical Hydrogel Copolymers and Their Relationship to Molecular Imprinting

Abstract:

Protein-protein binding involves non-covalent interactions between amino acid side chains at the protein interface. The organization of the functional groups and protein function is determined by the amino acid sequence of each protein. The code for the amino acid sequence can be traced back to its DNA. Proteins are high information content materials. Slight disruptions or mutations in the information code can result in diminished or loss of function. A corollary to this analysis is that synthetic copolymers with random or statistical distributions of functional groups can only engage in non-specific binding. There is however, no basis for this assumption. We ask, are high information content materials necessary to achieve affinity and selectivity for binding a protein target? My talk will discuss an alternative approach, the engineering of abiotic, synthetic hydrogel copolymers with affinity and selectivity for peptides and proteins. The synthetic organic hydrogels are comprised of statistical distributions of relatively few, simple organic functional groups. We describe recent progress in the development of hydrogel copolymer nanoparticles (NPs) for protein sequestration,¹ enzyme inhibition² and therapeutic applications³.

Biography:

6. Prof. Börje Sellergren, Malmö University, Sweden



Title: MIPs and rSAMs: Recent examples using “lock and key” and dynamic, multivalent receptor models

Abstract:

Biography: Börje Sellergren studied chemistry at Lund Institute of Technology in Lund, Sweden. In 1989 he obtained his PhD in Pure and Applied Biochemistry. After postdoctoral research (1989-93) at the University of California Irvine he worked as assistant professor at University of Mainz (1994-2002) and as associate professor at University of Dortmund (2002-2012), Germany. In 2012 he was appointed Chair in Biomedical Technology with focus on Molecular Imprinting at the Research Center for Biointerfaces, Department of Biomedical Sciences at University of Malmö, Sweden. His research is centered around artificial receptors and related supramolecular, polymer and materials chemistry as well as various applications in biomedicine.

7. Prof. Karsten Haupt, University of Technology Compiègne, France

Title: Molecularly imprinted polymers as synthetic antibodies: New trends, approaches and applications

Abstract:

Biography: Karsten Haupt is a Biochemist from the University of Leipzig, Germany. After obtaining a PhD in Bioengineering from UTC, France, he was a researcher at Lund University, Sweden and at INSERM, Paris, and an assistant professor at the University of Paris 12. Since 2003 he has been a full professor of Bioengineering at UTC, where he is now the Head of the CNRS Laboratory for Enzyme and Cell Engineering. Karsten Haupt is a Senior Member of Institut Universitaire de France, and the co-founder of the companies PolyIntell (now Affinisep, 2004) and SensWay (2021). His present research interests include affinity technology, chemical sensors, synthetic antibodies (molecularly imprinted polymers), biomimetic polymers and nanomaterials for biomedical applications.

8. Prof. Sergey Piletsky, University of Leicester, UK

Title: MIP nanoparticles for diagnostics and imaging applications

Abstract: Our team has made a major breakthrough in MIP technology developing solid-phase approach for preparation of soluble molecularly imprinted nanoparticles (nanoMIPs) - “plastic antibodies” with exquisite affinity and selectivity for their

templates. The success came from combining controlled radical polymerisation with an affinity separation step performed on surface-immobilised template. This approach represents the state-of-the-art in nanoMIP synthesis: not only are soluble particles with defined size (20-200 nm) and a narrow size distribution produced in one hour, they possess subnanomolar dissociation constants for their respective targets, they can be easily functionalised with fluorescent, electrochemical or magnetic labels, and the immobilised template can be re-used. High affinity nanoMIPs were made for small molecules, proteins, whole cells, bacteria and virus particles.

The main practical niches for application of synthesised nanoMIPs are diagnostics, imaging and drug delivery. Members of our team have used nanoMIPs successfully as a replacement for antibodies in ELISA-type assays, electrochemical and optical sensors. The exciting examples of our work with in vitro and in vivo imaging by targeting membrane proteins and sugar derivatives. Very encouraging facts that enables practical applications of MIPs in vivo are lack of polymer toxicity, ability of nanoMIPs to penetrate into cells and to pass blood barrier. The possibility to integrate sensing and drug delivery functions in our MIPs make them suitable for theranostics applications. Current paper discusses this work and opportunities that it brings for our collaboration.

Biography:

9. Xiaogang Qu, Changchun Institute of Applied Chemistry

Title: Recent Advances in Construction of Bio-inspired Nanozymes and Their Applications

Abstract: Nanozymes, as a new type of artificial enzymes, have received much attention in recent years. Many different kinds of nanomaterials have shown enzyme-like activities. However, their activity and selectivity are much lower when compared with natural enzymes. In this report, recent advances in bio-inspired construction of nanozymes and their applications are overviewed.

Biography: Xiaogang Qu is Professor of Chemistry at CIAC, FRSC (Elected 2015), Honorary Professor of the University of Queensland, Deputy Director of the Academic Committee of CIAC, Director of Laboratory of Chemical Biology, Associate Editors of *J. Mater. Chem. B* and *Mater. Adv.* He received his Ph.D. from CAS in 1995 and won the President's Award of CAS. He moved to the USA afterwards and worked with Professor J. B. Chaires at UMMC and Nobel Laureate Professor Ahmed H. Zewail at Caltech. Since late 2002, he has been a professor at CIAC, CAS. From 12/2006 to 05/2007, he visited the group of Nobel Laureate Professor Alan J. Heeger at UCSB. He has published over 290 papers in high influential journals, SCI citations by others >37,700, h-index 103; 2017-2021 "Highly Cited Researchers" from Clarivate Analytics.

10. Prof. Zhen Liu, Nanjing University, China

Title: Molecular imprinting of 50 years: Quo vadis?

Abstract:

Biography: Dr. Zhen Liu his Ph.D. from Dalian Institute of Chemical Physics, Chinese Academy of Sciences in 1998. He was appointed as a full professor at Nanjing University in 2005. He has been a Distinguished Professor of Nanjing University since

2014 after being awarded the National Science Fund for Distinguished Young Scholars in 2014. He was appointed as an adjunct professor at the Faculty of Engineering, University of Waterloo from 2011 to 2014. He is a Fellow of the Royal Society of Chemistry, a Senior Member of the Chinese Chemical Society and a Member of American Chemical Society. He is an associate editor of *Analytical Methods* and an advisory board member of multiple journals such as *Electrophoresis* and *Chinese Science Bulletin*. He has authored and co-authored more than 170 peer-reviewed papers, with a series of papers published in prestigious journals, such as, *Chemical Society Reviews*, *Accounts of Chemical Research*, *Angewandte Chemie International Edition*, *Nature Protocols*, *Advanced Science*, *ACS Nano* and *Chemical Science*. His current h-index is 53. He has authored and co-authored 2 books and 7 book chapters. He holds 15 authorized patents. In 2020, he was awarded the *Advances in Measurement Science Lectureship* by the American Chemical Society (ACS).