香港科技大學
THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

土木及環境工程學系
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

SEMINAR

# CRISPR TECHNOLOGY AND ITS APPLICATIONS TO PATHOGEN DETECTION


## Speaker

## Professor X. Chris Le

Distinguished University Professor
Fellow of the Royal Society of Canada, Academy of Science
University of Alberta, Canada



## Abstract

CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) and CRISPR-associated (Cas) protein systems have revolutionized genome engineering. CRISPR-Cas systems also advance analytical and environmental sciences. This presentation will discuss three examples of CRISPR techniques: (1) a genome-editing nanomachine constructed with a CRISPR system, (2) integration of CRISPR with isothermal amplification techniques for molecular detection of nucleic acids, and (3) detection of pathogens and wastewater-based surveillance. The genome-editing nanomachine uses the sequence-specific recognition, unwinding, and nicking ability of the Cas9 system. The analytical techniques take advantage of the trans-cleavage activity of Cas12 and Cas13, which generates amplified signal outputs for detection. Successful integrations of CRISPR with isothermal amplification techniques, such as loop mediated amplification (LAMP) and recombinase polymerase amplification (RPA), result in highly sensitive and specific detection of diverse molecular targets. Examples of detecting specific bacterial and viral sequences in nasopharyngeal swabs, saliva, skin swabs, and wastewater demonstrate clinical and environmental applications of the CRISPR-based analytical technology.


## Biography

Dr. Le is Distinguished University Professor and Director of the Analytical and Environmental Toxicology Division at the University of Alberta (Canada). He is an elected Fellow of the Royal Society of Canada, Academy of Science. Dr. Le received BSc in chemistry (1983) from Wuhan University, MSc (1986) from the Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, and PhD in environmental chemistry (1993) from the University of British Columbia (Canada). He carried out postdoctoral research (1994-1995) in bioanalytical chemistry at the University of Alberta. He was recruited to the Faculty of Medicine in 1995, promoted to full professor in 2003, and awarded Distinguished University Professor title in 2011. Dr. Le previously received an E.W.R. Steacie Memorial Fellowship from the Natural Sciences and Engineering Research Council of Canada (2000), Canada Research Chair in Bio-analytical Technology and Environmental Health from the government of Canada (2001-2017), the W.A.E. McBryde Medal (2002) and the Maxxam Award for Analytical Chemistry (2011) from the Canadian Society for Chemistry, the Environment Research and Development Award (2011) from the Chemical Institute of Canada, and Honorary Fellow of the Chinese Chemical Society (2022). He also received the Martha Cook Piper Research Prize (2000), the Award for Excellence in Mentoring (2009), Canada 150 Research Award (2018), and the University Cup (2018) from the University of Alberta. Dr. Le is an Associate Editor for Analytical Chemistry (American Chemical Society) and Co-Editor-in-Chief for Journal of Environmental Sciences (Chinese Academy of Sciences and Elsevier). He also served/serves as an editorial board member for 10 other international journals on the topics of chemistry and environment.Dr. Le has mentored more than 100 graduate students and postdoctoral fellows. Thirty-five of them currently hold independent academic positions in Canada, China, Türkiye, and the United States.

**10 October 2024**
**Thursday**

**3:00 pm - 4:00 pm**

**Civil Engineering Conference Room**
**Room 3574 (Lift 27/28)**
**HKUST**

## Enquiry:


Ms. Rebecca Yau
cerebeca@ust.hk