13th nanobiofluids seminar

2025 April 11th, 10:30-11:30

Seminar Room (Room 104), 1st Floor, Bldg. No.2

https://www.infront.kyoto-u.ac.jp/en/access/

Zoom registration
https://kyoto-u-edu.zoom.us/meeting/register/pm3OsXxaQr-5viVFzkf1TA

Unconventional Nano-Biophotonic Tools For Imaging and Sensing Applications

Aniruddha Ray, Ph.D.
Associate Professor
Department of Physics and Astronomy,
University of Toledo, Ohio

Abstract

Our research focuses on developing innovative imaging and biosensing platforms that integrate nanotechnology and photonics for a wide range of biomedical applications, from oncology to infectious disease detection. Here I will delve into two distinct types of platforms.

First, I will introduce lens-free on-chip microscopy, a powerful alternative to traditional optical microscopy, that addresses key limitations associated with objective lenses, such as limited field of view. Using computational techniques based on holography and fluorescence, these on-chip microscopy systems enable wide-area imaging and high-throughput analysis, while offering a cost-effective (~$100) and portable solution. I will discuss the design of on-chip microscopy and its utility towards a wide range of applications, particularly for screening anti-cancer drugs and detection of pathogens.

In the second part, I will shift focus to the development of ultrabright nanoparticles tailored for high-resolution deep-tissue structural and functional imaging. These nanoparticles consist of an inorganic perovskite nanocrystal core enclosed by multiple polymer shells, which can encapsulate fluorescent sensors and drug molecules. These multi-core-shell nanoparticles are being utilized in tasks like labeling cells and mapping various chemical analytes in cells and tissues for early diagnostics and therapy monitoring.

Biography

Dr. Aniruddha Ray is an Associate Professor in the Department of Physics and Astronomy at the University of Toledo, Ohio. He earned his B.Sc. and M.Sc. in Physics from IIT Kharagpur, India, completed his Ph.D. in Biophysics from University of Michigan, USA, and post-doc from University of California Los Angeles (UCLA), USA. Dr. Ray has also worked in several other institutions including the Max Planck Institute for the Science of Light in Germany, University of Arizona and National Institute of Standards and Technology (NIST) in the US and National Tsing Hua University in Taiwan. Dr. Ray has over 100 peer-reviewed publications, conference proceedings, invited talks, and patents. His research has received funding from different organizations including the National Institute of Health (NIH), National Science Foundation (NIH), NIST, Research Corporation for Science Advancement (RCSA) and Cotton Inc, amongst others. Dr. Ray had served on the editorial boards of multiple journals like Scientific Reports, Sensors, Diagnostics and has been recognized with awards including the NIH Ruth L. Kirschstein Fellowship, NIST PREP Scholarship and Scialog fellow, amongst others.

Host: Hirofumi Shintaku, shintaku@infront.kyoto-u.ac.jp