



# Photonics Forum

February 28, 2018

11:45 a.m. -  
1:15 p.m.

9th Floor

Room 901

Photonics Center

8 Saint Mary's Street

Lunch will be served!



## Professor Ji-Xin Cheng, Boston University

### Killing Super Bug “MRSA” with Photons

Confronted with the severe situation that the pace of resistance acquisition from mutation in pathogens is faster than clinical introduction of new antibiotics, health organizations are calling for alternative approaches to combat methicillin-resistant *Staphylococcus aureus* (MRSA) infections. In this talk, Dr. Cheng will report a drug-free approach to eliminate MRSA through photobleaching of staphyloxanthin, a membrane-bound antioxidant of *S. aureus*. The photobleaching process, uncovered through a transient absorption imaging study and quantitated by absorption spectroscopy and mass spectrometry, decomposes staphyloxanthin, and sensitizes MRSA to reactive oxygen species attack. Consequently, staphyloxanthin bleaching by low-level blue light eradicates MRSA synergistically with external or internal reactive oxygen species. The effectiveness of this synergistic therapy is validated in MRSA culture, MRSA-infected macrophage cells, *S. aureus* biofilms, and a mouse wound infection model. Furthermore, photobleaching of staphyloxanthin is found to potentiate reactive oxygen species-producing antibiotics to eradicate MRSA. Collectively, these findings highlight broad applications of staphyloxanthin photobleaching for treatment of MRSA infections.

Ji-Xin Cheng was born in Jixi, Anhui Province, P. R. China in 1971. He attended The University of Science and Technology of China (USTC) from 1989 to 1994. From 1994 to 1998, he carried out his Ph.D. studies on bond-selective chemistry under the supervision of Qingshi Zhu at USTC. After postdoctoral training on ultrafast spectroscopy in Yijing Yan's group at Hon Kong University of Science and Technology, he joined Sunney Xie's group at Harvard University as a post doc, where he and others developed CARS microscopy that allows high-speed vibrational imaging of cells and tissues. Cheng joined Purdue University in 2003 as Assistant Professor in the Weldon School of Biomedical Engineering and the Department of Chemistry, and was promoted to Associate Professor in 2009 and Professor in 2013. He joined Boston University as the Moustakas Chair Professor in Photonics and Optoelectronics in the summer of 2017.



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