



Physics Colloquium



Tuesday, November 5, 2019, 3:30PM in SC 10

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New Frontiers in Spectral X-Ray Imaging and Image Science

The field of X-ray imaging is undergoing a new revolution, fueled by advanced detector technologies and computational methods. X-ray phase-contrast imaging and phase-retrieval methods have significant advantages, but also pose considerable experimental burden. I will show that using the physics of light transport along with cutting-edge spectral detectors, this difficult phase-retrieval problem can be tackled. The key to advances has been developments such as photon-counting X-ray detectors (PCDs) suitable for high-flux imaging (such as the Medipix detectors developed at CERN originally for particle tracking). I will also discuss novel material decomposition methods in spectral computed tomography (CT) that use PCDs. Other medical and biological applications of spectral CT and phase imaging are in targeted drug delivery, disease characterization, biomaterials imaging and quantitative imaging. Finally, I will briefly touch upon the importance of understanding the physics of image formation for both image science and psychophysics. These insights are of interest in areas such as machine learning and computational observers and can assist in system and algorithmic designs. I will use results from our work on digital breast tomosynthesis (DBT) to illustrate these ideas.

Refreshments at 3:00PM in SC 103