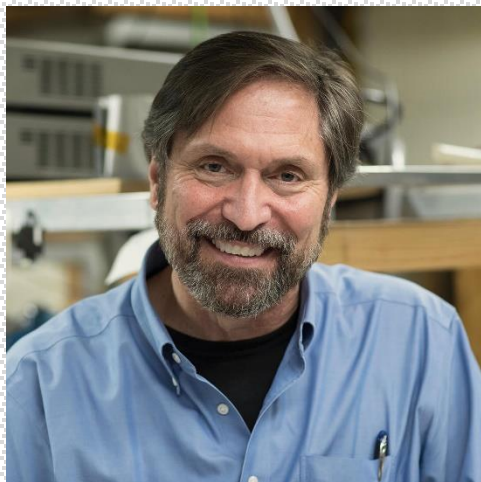


Physics Colloquium

Monday, March 5, 2018 / 428 Pupin Hall / 4:15 PM
(reception immediately following)

"Ultra-sensitive MRI using gamma rays: a surprising spinoff that began with neutron studies"

Gordon Cates, University of Virginia



For over two decades, polarized He-3 has proven to be a powerful tool for investigating the structure of the neutron. The advent of liter-scale polarized He-3 targets, in turn, led quickly to magnetic resonance imaging of the gas space of human lungs with unprecedented resolution. Clinical research using "noble-gas imaging" quickly came to include the use of polarized Xe-129, and both gases have seen extensive use in research related to pulmonary disease and drug discovery. Because xenon dissolves readily into blood, there has also been interest in imaging other organ systems. Outside the lungs, however, results have been limited by small signals. In addition to providing some historical context, I will describe a

new imaging modality that builds on noble-gas imaging, but that has enormously increased sensitivity. Spatial information is encoded using magnetic-field gradients, but imaging data are acquired entirely through the detection of gamma rays (without the use of a gamma camera). The quantity of atoms needed for producing images is reduced by more than a factor of a million, creating the potential for a new type of nuclear tracer. Indeed, so few atoms are required that novel polarization techniques can be considered as a path for expanding the range of applications.