



SACRAMENTO STATE

Department of Physics & Astronomy Spring 2009

Physics Colloquium Series

“Imaging with X-ray Lasers”

Ever since Wilhelm Röntgen photographed his wife's hand in 1896, the imaging power of X-rays has been exploited to help see the unseen. The penetrating power of x-rays allows us to view the internal structure of many objects, while their short wavelength allows scientists to look at nanometre-scale objects. Achieving near-atomic spatial resolution, however, is still a huge challenge. The high penetration of x-rays makes the production of high-resolution lenses difficult, and high doses destroy live samples beyond recognition before atomic resolution can be achieved.

Recent technological breakthroughs promise to solve these problems for the first time. The development of free-electron lasers now offer the realistic prospect of imaging on the time-scale of atomic motion. So bright is the flash of x-ray light that a sample is vaporized, but not before an image or a hologram is recorded.

Even so, building lenses capable of atomic resolution is still well beyond reach. The development of lensless ("diffractive") x-ray imaging techniques appears to cut this Gordian knot by replacing the necessary lens with a computer algorithm to recombine the scattered photons, providing an image whose resolution is limited in principle only by the x-ray wavelength.

This combination of brighter sources, computer algorithms and improved detectors promises a giant leap in the structural characterization required for developing nanoscience and nanotechnology.

Dr. Stefano Marchesini
***Advanced Light Source,
Lawrence Berkeley National Lab***

**Thursday, April 16, 2009
4:00-5:20 PM - MND 1015**

Open & Free to all Students, Faculty & Public