Nanometric Optical Imaging

Pacific Northwest NATIONAL LABORATORY

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Frontiers in Chemical Imaging
Seminar Series

Presented by…

Professor Aaron Lewis

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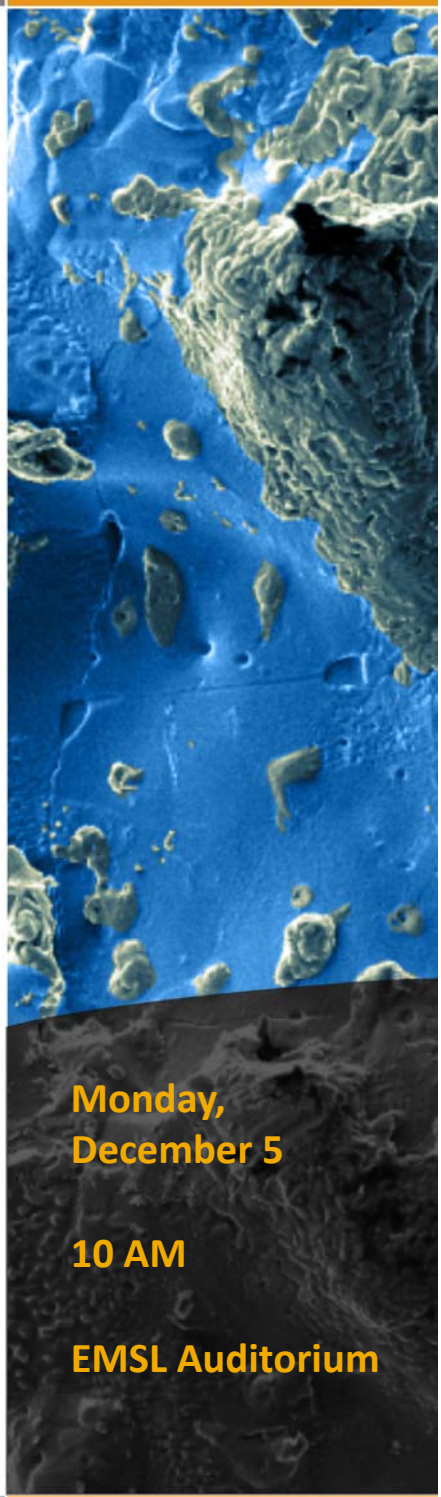

Monday, December 5

10 AM

EMSL Auditorium

Abstract

Work in nanophotonics began in the 1980s, before the word nanophotonics was even recognized. This work and the work of groups around the world has evolved into an exciting and rapidly growing field which has provided for nanometric optical imaging in the near-field. Even though a variety of techniques are being developed with nanometric optical imaging potential, near-field optics remains the most general method for optical characterization with resolutions at and below 100 nm. It is the only technique that can be applied to absorption, fluorescence, light collection and has demonstrated potential in non-linear imaging and Raman scattering. It is also the only optical method that provides for on-line pixel by pixel correlation with topography.

In this lecture, Lewis will highlight important nanometric imaging applications that extend from biology to plasmonics to photonic band gap materials and to such spectral techniques as Raman scattering and sensing in this blooming of approaches to concentrate and guide light nanometrically for imaging and other purposes. Further, the technology has led to breakthroughs in atomic force microscopy and sensing including such imaging modalities as multiprobe nanoscale thermal imaging, chemical delivery and other new horizons.

Finally, as part of this lecture, Lewis will show that the instrumentation developed allows for new directions in fully integrated methods of optical imaging with on-line atomic force information. It will be shown that such approaches of integrated microscopy have achieved for the first time a non-iterative solution to the phase problem in far-field optics and lead to addressing the inverse problem of optical imaging providing for new directions in super-resolution.

Bio

Professor Lewis developed near-field scanning optical microscopy, which has produced the highest resolution optical images ever achieved and allowed optical imaging to enter the nanoworld. His lab pioneered multiphoton second harmonic microscopy, which is the most sensitive method for optically monitoring membrane potential. In addition, his research led to a major alteration in accepted scientific dogma on the mechanism of excitation in vision and in the light driven proton pump, bacteriorhodopsin. He has also pioneered the field of time-resolved x-ray spectroscopy.