

The NSOM Technique And It's Significance

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Prior to Near-Field Scanning Optical Microscopy (NSOM) there were two major light microscopy techniques; optical and confocal.

In an optical microscope a sample is illuminated with a flood of light. The lighted area is then imaged and magnified by collecting the light that is either reflected from or transmitted through the sample by a series of glass lenses. A color magnified image of the sample may be seen directly or displayed on a TV screen. Even if the lenses could be made perfectly, the resolution and magnification of an optical microscope are limited by diffraction effects to approximately one half of the wavelength of the light that is used. Optical microscopes are used routinely to image the general shape of samples as small as human chromosomes or compact disk bits.

In a confocal microscope, the sample is illuminated with a focused spot of laser light instead of a flood. This spot is scanned over the sample and the light is collected in a way which allows an image to be displayed on a computer screen. The magnification system is the same as the optical microscope, however, the small laser spot used in a confocal microscope allows about a 40% improvement in image resolution, and the ability to produce a 3-D image. A compact disk bit could be seen and profiled.

In a near-field scanning optical microscope the sample is illuminated with laser light, but the light is confined in a fiber optic guide. The fiber is prepared by tapering one end to allow only an extremely small exit for the light. The final shape looks like a microscopic eye dropper. This fiber guide is no bigger than a human hair and is tapered so that the end is a few atoms wide. Using techniques common for a scanning probe microscope, this fiber end is held very close to a sample surface and scanned. The magnified image of the sample is then displayed on a computer screen. This small, nanoscale, light source allows more than an order of magnitude better resolution than the best optical or confocal microscope. A near-field scanning optical microscope can be used to see extensive details in a chromosome, image much smaller structures such as viruses, and even make measurements from single molecules. ■

RELATIVE SIZE OF OBJECTS	Object	Size
	Small Pin Head	800 μm
	Human Egg	100 μm
	Human Chromosome	2.5 μm
	Compact Disk Bit	1 μm
	Virus	05 μm
	Large Molecule	007 μm



(For more detailed scientific information see "Super-Resolution Imaging Spectroscopy", T.D. Harris, R.D. Grober, J.K. Trautman and E. Betzig. *Applied Spectroscopy*, Volume 48, Number 1, 1994.)

ELECTRON MICROSCOPIST

The National Center for Electron Microscopy (NCEM) currently has an opening for an Electron Microscopist/Materials Scientist to develop and lead a research program on the electron optical characterization and experimental control of material microstructures.

The selected candidate will focus on the development and creative use of high resolution transmission electron microscopy as a quantitative technique and a major research tool including installation, testing and utilization of a new high resolution instrument. Other duties include providing project leadership in the development of new imaging methods and their applications to critical problems; presenting experimental results; developing proposals and preparing reports to funding agencies; initiating user collaborations both within the Center and Lawrence Berkeley Laboratory and with the external scientific community; and supervising technical staff.

We require an outstanding record of original research in materials sciences and electron microscopy; a strong background in transmission electron microscopy; knowledge of theoretical and practical principles of electron optical instrumentation and their application to significant problems in fundamental or applied materials research; demonstrated experience in experimental and theoretical high resolution imaging and analysis; proven experience in initiating and sustaining successful scientific collaborations; ability to be a team leader and team member; and good verbal/written communication skills. Ph.D. in physical sciences desired.

This is a 1-year term appointment with possibility of renewal and/or conversion to career. Submit your resume, publication record and names of three references to: **Lawrence Berkeley Laboratory, Staffing Office, Box #JMIT2266, One Cyclotron Road, Bldg. 938A, Berkeley, CA 94720.** LBL is an EEO/AA employer committed to the development of a diverse workforce.



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