Visualizing Cells and Viruses at Molecular Resolution with 3D Electron Microscopy

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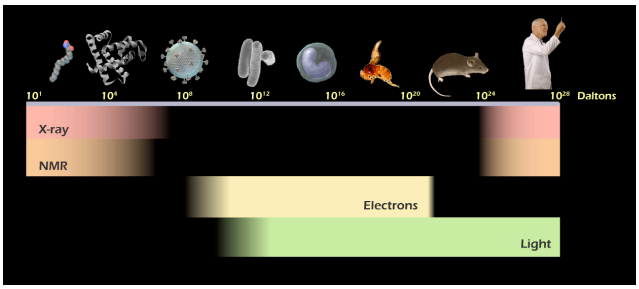
Emerging methods in 3D biological electron microscopy provide powerful tools and great promise to bridge a critical gap in imaging in the biomedical size spectrum. This comprises a size range of considerable interest that includes cellular protein machines, giant protein and nucleic acid assemblies, small subcellular organelles and bacteria. These objects are generally too large and/or too heterogeneous to be investigated by high resolution X-ray and NMR methods; yet the level of detail afforded by conventional light and electron microscopy is often not adequate to describe their structures at resolutions high enough to be useful in understanding the chemical basis of biological function. T he long-term mission of our research program is to obtain an integrated molecular understanding of cellular architecture by combining novel technologies for 3D biological imaging with advanced methods for image segmentation and computational analysis. I will review our recent progress in imaging and modeling dynamic biological systems, with particular emphasis on applications to signal transduction, HIV/AIDS and cancer.



from:
Subramaniam, S. (2005) Bridging the imaging gap: Visualizing subcellular architecture with electron tomography *Curr. Opin. Microbiology* 8, 316-322.

Lab website: http://electron.nci.nih.gov

Some recent reference material that may be useful:

1. Milne J.L.S. and Subramaniam S. (2009) Visualizing Cells and Viruses at Molecular Resolution *Nature Rev. Micro. (in press)*.
2. Bartesaghi, A. and Subramaniam, S. (2009) Membrane protein structure determination using cryo-electron tomography and 3D image averaging *Curr. Opin. Struct. Biol.* (in press).
3. Liu, J., Bartesaghi. A., Borgnia, M. J., Sapiro. G. and Subramaniam, S. (2008) Molecular architecture of native gp120 trimers *Nature* 455, 109-113.
4. Khursigara, C., Wu, X., Zhang, P., Lefman, J. and Subramaniam, S. (2008) Role of HAMP domains in chemotaxis signaling by bacterial chemoreceptors *Proc. Natl. Acad. Sci. USA* 105, 16555-16560.