

## Spectroscopy of Metallic Nanoparticles, Fullerenes, and Carbon Nanotubes

### Computational Nanophysics

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**Description:** The encapsulation of an atom or an atomic nanocluster, or even a smaller fullerene in a fullerene cage offers a unique laboratory in which to examine the behavior of the guest system in confinement and to probe subtleties of quantum effects in the nanometer region. These endofullerenes hold the promise of exciting applications in quantum computations, superconductivity, biomedical fields, drug delivery research, magnetic resonance imaging, and organic photovoltaic devices. Hence, understanding the influence of the confining cage on the spectroscopy of the confined species and *vice versa*, are matters of great interest. Theoretical and computational studies of the response of these compounds, as well as single and multi-walled carbon nanotubes, to the external photon and fast bare ion fields are being investigated in this program.

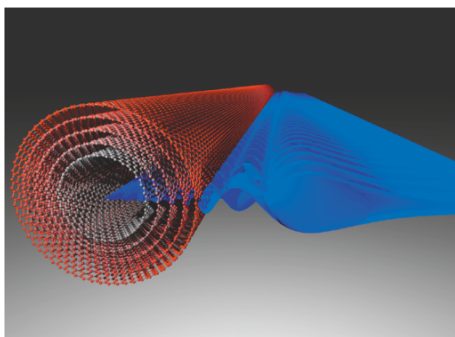
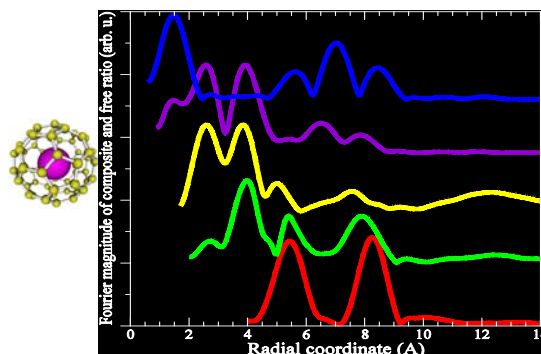


Image potential electronic states in multiwalled carbon nanotubes. "Time-Resolved Photoimaging of Image-Potential States in Carbon Nanotubes"; Zamkov, Woody, Shan, Chakraborty et al., *Physical Review Letters*, Volume 93, page 156803, (2004)



Fourier photoionization spectra of a system comprised of a xenon atom confined in  $C_{60}$ ; "Probing photoelectron multiple interferences via Fourier spectroscopy in energetic photoionization of  $Xe@C_{60}$ "; Potter, McCune, De, Madjet, and Chakraborty, *Physical Review A*, Volume 82, page 033201, (2010)

### ➤ Student Researchers (since 2008)

- Matt McCune (7 journal publications, 8 conference presentations; Currently in Graduate School PhD Program, University of Missouri, Columbia)
- Dale Hopper (2 journal publications, 4 conference presentations; Currently K12 Teacher)
- Andrea Potter (1 journal publication, 1 conference presentation)
- Sean Feehan (Current student)
- Aakash Patel (1 journal publication; Current student)