PHYSICS
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# CSU PHYSICS COLLOQUIUM

## The Contrast Problem in Biological Electron Microscopy

**Christopher Ackerson**

**Colorado State University**

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120 Engineering (Hammond Auditorium)

## Abstract

Images are made by contrast. In other words, we only see (or acquire information) on things that are distinguishable from their background. In all forms of biological imaging, many things are visible, yet many other things remain camouflaged or indistinguishable from the background. For instance, in an X-ray, it's easy to see bones, but not so easy to see muscles, fat or skin. This is also true in microscopic images, where it's often easy to see the edges of cells, but much harder to see the details inside cells. Green Fluorescent Protein and related fluorescent proteins complement small molecule stains and dyes to essentially solve the contrast problem in optical imaging. For imaging based on X-rays or electrons, however, there are no clonable contrast agents. This talk presents an overview of approaches and progress toward approaches that allow identification of otherwise difficult to distinguish structures in biological electron microscopy. The application of pre-formed nanoparticle/protein conjugates, the use of metallothionein, the use of ferritin-like proteins, and the development of alternative approaches will be presented.

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# Short Biography

Professor Christopher Ackerson's scientific training centered on the use of metal nanoparticles for imparting contrast in biological electron microscopy. After earning a Bachelor's degree with Honors at the University of Texas at Austin, Prof Ackerson earned a PhD in Biophysics in the laboratory of 2006 Nobel Laureate Roger Kornberg at Stanford University. As a PhD student, Prof Ackerson developed synthesis of exactly defined giant gold clusters as well as their rigid, specific and discrete bioconjugation to proteins. As a postdoc, Prof Ackerson returned to his birth-state of Colorado, where Prof Ackerson worked in the Boulder Lab for 3D EM of cells to develop clonable metal nanoparticle contrast labels (i.e., a GFP analog, but visible in the transmission electron microscope.) Professor Ackerson started as an assistant professor at Colorado State University in 2009, and was tenured and promoted to associate professor in 2015. His lab at CSU specializes in the interface of inorganic materials with biological materials, including the continuing development of clonable nanoparticles.