

4CF14-2014-000013

Abstract for an Invited Paper  
for the 4CF14 Meeting of  
the American Physical Society

### **X-ray lasers for structural biology**

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Snapshot X-ray pictures from the world's first hard X-ray laser near Stanford (the LCLS) has provided time-resolved atomic-resolution images of the molecular machine in plants which splits water to create the oxygen we breathe, while digesting CO<sub>2</sub>, important for global warming. I'll describe the single-file synchronized submicron droplet beam we use to run molecules across the pulsed laser, and how we image protein molecules important in disease (GPCRs, membrane proteins, 2D crystals, an enzyme drug target for sleeping sickness). We use femtosecond pulses to outrun radiation damage, and unscramble orientational disorder from randomly oriented molecules in solution without modeling, using angular correlation functions. I'll also describe how this coherent radiation provides new solutions to the phase problem for nanocrystals. An overview will also be provided of the NSF's new Science and Technology Center for the application of X-ray lasers to structural biology, a seven-campus consortium which started in 2013.