



## PSI Colloquium

### Fast bioimaging with an X-ray laser

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**DATE :** Friday, April 20, 2012  
**COFFEE:** 11:00 am  
**SEMINAR:** 11:15 am  
**PLACE:** WHGA/001

***Abstract:***

I will review our\* recent experiments with the first hard X-ray laser at SLAC near Stanford, the LCLS. These have included snap-shot imaging from membrane protein nanocrystals and viruses, and the first pump-probe experiments on Photosystem 1 - ferredoxin using a liquid jet sample-delivery system of novel design. Our aim is to record movies of molecular machines at work, using femtosecond X-ray pulses so brief that they terminate before radiation damage commences. New phasing methods for protein nanocrystals and the extraction of structure factors by our Monte-Carlo method will be reviewed. Recent work using angular correlation functions to recover molecular images from the correlated fluctuations in snap-shot diffraction patterns from many randomly-oriented molecules in solution will also be outlined. The prospects for dynamic snap-shot chemical imaging using mixing jets will also be described, and a new method based on the Kapitza-Dirac effect which uses a laser as a Zernike phase plate for electron microscopy. Finally, we consider the prospects for using fast electron beam pulses instead of X-rays for molecular movies.

\* Chapman et al Nature 470, 73 (2011).  
Spence et al Rep. Prog. Phys. (2012).  
Fromme and Spence, Curr. Opin. Struct. Biol. 21, 509 (2011).