

**STANFORD UNIVERSITY**  
**DEPARTMENT OF STATISTICS**  
**DEPARTMENTAL SEMINAR**

4:15 p.m., Tuesday, April 17, 2007  
Sequoia Hall Room 200  
(Cookies at 3:45 in 1st Floor Lounge)

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**Random Tomography and Structural Biology**

Single particle electron microscopy is a powerful method that biophysicists employ to learn about the structure of biological macromolecules. In contrast to the more traditional crystallographic methods, this method images unconstrained particles, thus posing a variety of statistical problems. We formulate and study such a problem, one that is essentially of a random tomographic nature, where a structural model for a biological particle is to be constructed given random projections of its Coulomb potential density, observed through the electron microscope. Although unidentifiable (ill-posed), this problem can be seen to be amenable to a statistical solution, once parametric assumptions are imposed. It can also be seen to present challenges both from a data analysis point of view (e.g. uncertainty estimation and presentation) as well as computationally. The proposed methodology will be illustrated on simulated data, and practical issues will be discussed.