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New X-Ray Optics and Sources for Single-particle Crystallography¹

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With the continued development of extremely bright x-ray sources, the minimum size of objects suitable for detailed study with x-ray scattering now approaches that of single molecules and other nanoparticles. To date, x-ray scattering is a tool which explores the statistical structural properties of an ensemble of particles. While this has been an extremely powerful approach to understanding the structural properties of materials and structure/property relationships, important details are often difficult to extract because of averaging. In particular, when looking at collections of nanoparticles, the only information available is small angle x-ray scattering which yields the general shape of the particles. Combining the current statistical information with detailed scattering from individual particles would greatly reduce the difficulty of extracting the important structural information. This talk will discuss the status of x-ray sources and optics, and explore the feasibility and challenges of applying them to real-world crystallographic studies of single nanoparticles.

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