Electron Diffraction from a Beam of Laser-aligned Proteins: Progress Report

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The use of diffraction patterns from aligned molecular beams has been proposed as an approach to the structure determination of proteins that are difficult to crystallize [1]. Polarized laser light is used to align the molecules in the beam. By cooling a beam of hydrated proteins to low temperature, sufficient alignment for diffraction purposes might be possible. Therefore an arrangement has been suggested [2] consisting of continuous, orthogonal, intersecting electron (or X-ray), molecular and laser beams. Limited coherence of the electron beam ensures that no interference occurs between the wavefields scattered by different molecules within the electron beam. The diffraction pattern is a sum of the intensities of the identical patterns from the many hydrated molecules within the beam at any one time. The two-dimensional electron diffraction pattern accumulates continuously at the detector for a fixed laser and molecular orientation before being read out. Repeating this process for many orientations would allow tomographic reconstruction of the molecule. An electron diffraction camera with a water droplet source, a polarized laser beam and a LaB_6 electron gun is currently under development. Initially we use micron size water droplets and dope them with large particles like TMV, since they are easier to align. Preliminary results with this instrument will be presented.

[1] Spence J., Doak T., *Phys. Rev. Lett.*, 2004, **92**, 198102–198104. [2] Spence J.C.H., Schmidt K., et.al., *Acta Cryst.*, 2005, **A61**, 237–245.

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