



29th May 2019 - 15:00 h

CFEL – building 99, seminar rooms I + II, ground floor

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On Removal of Multiple Scattering Effects from Diffraction Data

I'll discuss the history and theory of the multiple elastic scattering inversion problem - reconstructing charge density from multiply scattered data, for both electron and X-ray diffraction.

Multiple scattering artifacts can make soft-Xray, MicroED or TEM data unusable. However, solution of the difficult inversion problem also solves the phase problem, since multiple scattering renders diffracted intensities sensitive to structure factor phases. This would provide a new imaging technique based on coherent nanodiffraction using diffraction-limited synchrotrons and XFELs.

I'll also discuss the limitations on the use of the multislice algorithm for X-ray diffraction and Ptychography (1). Approaches to inversion based on the use of two wavelengths (2), on iterative projection algorithms (3), on dynamical Ptychography (4), on symmetry reduction (irreducible representation), on neural networks (5) and on the matrix logarithm (6) will be discussed. For a review, see (7).

I'll summarize progress on the ASU campus compact X-ray laser. We expect first light from the non-lasing version by the end of this year (8).

1. Li and Maiden Scientific Reports 8 2049 (2018)
2. Spence Acta A65 p28 (2009)
3. Spence et al Acta Cryst A55, 112 (1999)
4. Spence Acta A54 p7 (1998)
5. Wang, Koch et al PRL 117 p.015501 (2016)
6. Brown, Allen et al PRL 121, p. 266102 (2018)
7. Zuo and Spence. Advanced TEM Springer (2017)
8. Graves, W. et al "The ASU compact XFEL" Proc. FEL2017. TUB03 (2017)
and Phys Rev 17, 120701 (2014)

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