

Low-dose cryo electron ptychography

Pelz, P.¹, Buecker, R.¹, Ramm, G.², Kassier, G.¹ and Miller, R.D.¹

¹ Max Planck Institute for the Structure and Dynamics of Matter, Germany, ² Monash University, Australia

Electron ptychography has seen a recent surge of interest for phase sensitive imaging at atomic or near-atomic resolution. However, applications are so far mainly limited to radiation-hard samples, because the required doses are too high for imaging organic samples at high resolution. We have shown via numerical simulations [1] that the dose required for successful reconstruction can be reduced by two orders of magnitude compared to previous experiments. As an important application we use this method for imaging single biological macromolecules at cryogenic temperatures and show first results of 2D single-particle reconstructions from the human ribosome. We compare the image quality with images taken with a Volta phase plate. With its independence from the microscope transfer function, direct recovery of phase contrast, and better scaling of signal-to-noise ratio, low-dose cryo electron ptychography may become a promising alternative to Zernike phase-contrast microscopy.

References:

[1] Pelz, P. M., Qiu, W. X., Buecker, R., Kassier, G. & Miller, R. J. D. Low-dose cryo electron ptychography via non-convex Bayesian optimization. *Scientific Reports* **7**, 9883 (2017).

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