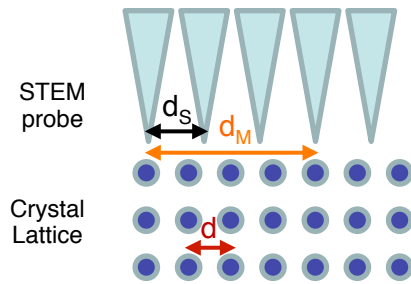


# sMoiré

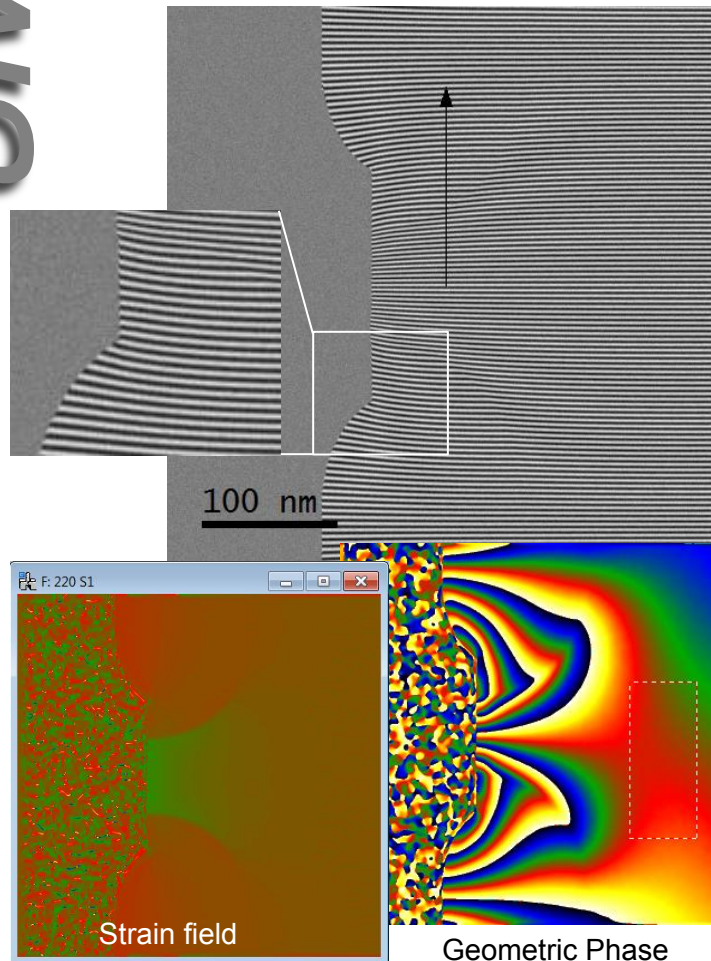
DigitalMicrograph Plug-in

# STEM Moiré Analysis

## Analysis of STEM digital moiré images for Strain Mapping



Artificial STEM moirés ( $d_M$ ) are created in a STEM by deliberately choosing a low magnification where the scan step ( $d_s$ ) is close to the crystalline periodicity ( $d$ ) [1, 2].



sMoiré provides strain map from single STEM Moiré image using geometric phases [3]

sMoiré generates fully two-dimensional strain maps from two STEM Moiré images using the procedure similar to Dark-Field Holography [4] (HoloDark for DM plug-in [5])

### Key Features

- ◆ Aligns multiple STEM Moiré images to increase S/N ratio
- ◆ Can repeat the single Moiré analysis for a routine work
- ◆ Handles a scan-step close to a multiple of lattice spacing
- ◆ Aligns two STEM Moiré images by correcting drift, rotation and magnification changes
- ◆ Calculate an accurate scan-step from a nominal calibration
- ◆ Corrects “fly-back” instability of STEM scan-lines

### References:

- [1] D. Su and Y. Zhu, *Ultramicroscopy* **110** (2010) 229-233. *Scanning moiré fringe imaging by scanning transmission electron microscopy.*
- [2] S. Kim, Y. Kondo, K. Lee, G. Byun, J. J. Kim, S. Lee and K. Lee, *Applied Physics Letters* **102**, 161604 (2013). *Scanning moiré fringe imaging for quantitative strain mapping in semiconductor devices.*
- [3] M. J. Hÿtch, E. Snoeck, R. Kilaas, *Ultramicroscopy* **74** (1998) 131–146. *Quantitative measurement of displacement and strain fields from HREM micrographs.*
- [4] M.J. Hÿtch, F. Houdellier, F. Hÿe, and E. Snoeck, *Nature* **453** (2008) 1086-1089. *Nanoscale holographic interferometry for strain measurements in electronic devices.*
- [5] HoloDark – holography for strain, HREM Research Inc.