Structured illumination microscopy imaging of mitochondria in living cells

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1. Introduction
The mitochondrion is an essential organelle to produce energy in cells. It is challenging for fluorescence microscopy due to the highly folded inner membrane with topologically complicated structures. Structured illumination microscopy (SIM) with our proposed reconstruction method is the most suitable fluorescence microscopy to visualize mitochondrial inner membrane dynamics in living cells owing to a less photodamage and a higher resolution.

2. Results
The Hessian-SIM can retain the details and suppress the artifacts in the reconstruction. Fig.1 shows the mitochondrial inner membrane in living COS-7 cells labeled with MitoTracker Green FM under wide field (a) and 2D-SIM (b). It provides a detailed view on the inner membrane architecture in mitochondria.

3. Conclusion
We proposed a modified parameter estimation method and Hessian-SIM microscopy, which can visualize vivid dynamics of mitochondrial cristae structures during fusion, fission and inter-cristae remodeling in living cells.

References:

Figure 1: (a) the mitochondrial inner membrane in living COS-7 cells labeled with MitoTracker Green FM under wide field mode. (b) the corresponding Hessian reconstruction 2D-SIM result. Scale bar: 1µm.