

Biophysics 210: Biological Light Microscopy  
Kurt Thorn  
Syllabus

Discussion section meets Tuesdays from 1-2:30pm in MH2100  
Labs meet Thursday or Friday from 2-5pm (location varies)

**Week 7: Optical Sectioning: Deconvolution and Light Sheet**

**Goals:** Understand the principles of deconvolution and light sheet microscopy. Compare and contrast these approaches to optical sectioning to confocal and two-photon microscopy. Learn several different methods for constructing light sheet microscopes and understand the strengths and weaknesses of each.

**Discussion Section:** May 12<sup>th</sup>

**Labs:** May 14<sup>th</sup> and 15<sup>th</sup>

**Lectures** (watch before discussion section):

- [Deconvolution Microscopy](#)
- [Light Sheet Sectioning](#)
- [Dual-View Inverted Selective Plane Illumination \(diSPIM\)](#)

**Reading required for discussion section:**

- [Phillipp J. Keller and Misha B. Ahrens. Visualizing Whole-Brain Activity and Development at the Single-Cell Level Using Light-Sheet Microscopy. Neuron \(2015\) 85\(3\):462-483](#)
- [Yicong Wu, Peter Wawrzusin, Justin Senseney, Robert S Fischer, Ryan Christensen, Anthony Santella, Andrew G York, Peter W Winter, Clare M Waterman, Zhirong Bao, Daniel A Colón-Ramos, Matthew McAuliffe and Hari Shroff. Spatially isotropic four-dimensional imaging with dual-view plane illumination microscopy. Nature Biotechnology \(2013\) 31\(11\):1032-1038](#)

**Additional Reading** (optional):

- [Wallace, W., Schaefer, L. H. and Swedlow, J. R. A Workingperson's Guide to Deconvolution in Light Microscopy. BioTechniques 31: 1036-1097 \(2001\).](#)
- [Molecular Expressions: Deconvolution Microscopy](#)

- [Emmanuel G Reynaud, Jan Peychl, Jan Huiskens and Pavel Tomancak. Guide to light-sheet microscopy for adventurous biologists. Nature Methods \(2015\) 12:30-34](#)
- [Jan Huiskens, Jim Swoger, Filippo Del Bene, Joachim Wittbrodt, Ernst H.K. Stelzer. Optical sectioning deep inside live embryos by selective plane illumination microscopy. Science \(2004\) 305:1007-1009](#)
- [Jan Huiskens and Didier Y. R. Stainier. Even fluorescence excitation by multidirectional selective plane illumination microscopy \(mSPIM\). Optics Letters \(2007\) 32\(17\):2608-2610](#)
- [Keller, Philipp J., et al. "Reconstruction of zebrafish early embryonic development by scanned light sheet microscopy." Science 322.5904 \(2008\): 1065-1069.](#)

**Discussion Section Topic:** Instead of our usual problem set format, this week's discussion section will be devoted to a discussion of the various approaches to 3D imaging that we have learned about over the last two weeks, their pros and cons, and how they can be used together.

**Lab:** We will demonstrate light sheet imaging and deconvolution microscopy. (Nikon Imaging Center)