RO notes on .h5 and .mx files in this folder and its subfolders: '/Users/rudolfo/Software/GitHub/BirTomo/data/2025\_07/SpiculeA Experim&Simulation/Simulation Data'

The .h5 and .mx files were created using the Mathematica Notebooks BirefrObjectForwardProjFeb2025.nb and BirefrObjectForwardProjApril2025.nb

Copied from Notes in the above Mathematica Notebooks:

Using the light field data in folder SMS\_2024\_0611\_1248\_1, I created the retardance stack SMS\_2024\_0611\_1248\_1\_RetStack.tif that was further processed. The resolution along the Z-axis was increased from 6.75µm to 5µm, making the resolution isotropic. Some black Z-slices were added at top and bottom, bringing the overall dimensions {Z, Y, X} to {43, 128,128}. Furthermore, to reduce the measured retardance values to voxels that represent the spicule but not the tissue surrounding the spicule, the retardance data was thresholded by setting all retardance values below 8nm to zero. Finally, the stack of retardance data was converted to 8 bit and the resultant volume data are stored in SMS1248RetStackRectScaledThresh.tif. Further details can be gleaned from NotesOnImageData.docx residing with the original experimental data in /Users/rudolfo/LightFieldMicroscopy/Experiments/2024\_06\_11\_SUSpicule

The TIFF stack SMS1248RetStackRectScaledThresh.tif was used to create the following HDF5 volume files:

**Spicule1248Feb12\_RevZ.h5**

**optical\_info/description:** Spicule1248Feb12\_RevZ.h5, object box {Z,Y,X}={43, 123, 123}, in units of voxPitch 5.2µm; birefringence pixel values are positive between 0.0 and 0.0047, optic axes follow spicule rods; Spicule1248Feb12\_RevZ.h5 data prepared in Section 'Preparing the Spicule object' of BirefrObjectForwardProjFeb2025.nb with the focus stack of retardance light field images in reversed Z-order; the Z-components of the optic axis vectors are all either zero or positive. Original data in SMS\_2024\_0611\_1248\_1 recorded using light field LC-PolScope with 20x/0.5NA objective lens; data prepared by RO

**Spicule1248Feb12\_RevZ.mx** -> same as **Spicule1248Feb12\_RevZ.h5**, but volume arranged for X-axis imaging and optic axis array with order opt\_axis[[Z, Y, X, oA]] and oA[[X, Y, Z]]. Read .mx files into Mathematica Notebook using Get[] or <<.

**Spicule1248Feb17.h5**

Same as **Spicule1248Feb12\_RevZ.h5**, but without reversing the Z-order

**Spicule1248April9.h5** (identical to **Spicule1248Feb17.h5**)

Spicule A data prepared with the light field retardance stack and original Z-order

**Spicule1248April9\_RevX.h5**

Spicule A data prepared with the light field retardance stack and reversed X-order

**SpiculeInitRandom1.h5**

object box {Z,Y,X}={43, 123, 123}, random birefringence pixel values are positive between 0.0 and 0.01, random optic axis values; InitialSpiculeRandom1.h5 data prepared in Section 'Preparing arbitrary object lists' of BirefrObjectForwardProjApril2025.nb; the Z-components of the optic axis vectors are all either zero or positive; data prepared by RO

Random values are in object box {43, 111, 111}, which was padded by {0, 6, 6} on each side, leading to object box {Z,Y,X}={43, 123, 123}.

**July 2025**

Mathematica simulation using BirefrObjectForwardProjJuly2025.nb

Spicule1248April9-h5\_July6LFRet.tif; Spicule1248April9-h5\_July6LFAzim.tif;

optical parameters for high sampling rate: voxNr = 1; nrCamPix = 16; camPixPitch = 6.5; rNA = 7.5 ; 20x/0.4NA objective

To convert retardance values from radian to nm, multiply radian retardance by

lambda/(2\*Pi), with lambda the wavelength of the light used for imaging (typically 546nm)

546/(2\*3.1416) = 86.90;

for 8bit conversion with 150nm retardance ceiling: 255\*546/(2\*3.1416\*150) = 147.23

To convert azimuth values from radian to degree, multiply radian by:

180/Pi, 180/3.1416 = 57.30

BirTomo on Mac simulation using 111x111 microlenses

Spicule1248April9\_RevX-h5\_July6BirTomoMacLRet.tif;

Spicule1248April9\_RevX-h5\_July6BirTomoMacLFAzim.tif;

Using same optical parameters as above