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Simulation of Second Harmonic Generation from Heterogeneous Microtubule Structures NOAH LANGOWITZ, CHEHANG YU, DANIEL NEEDLEMAN, Harvard University — Second harmonic generation imaging is a coherent nonlinear microscopy with contrast arising from certain asymmetric endogenous structures in cells, including spindle microtubules. As a second-order nonlinear optical process, SHG requires a noncentrosymmetric macromolecular organization to generate signal, so it can be used as a measure of microtubule polarity within spindles or other microtubule structures. We developed a simulation of SHG microscopy accounting for 3-dimensional orientation and circularly polarized excitation in order to quantify the dependence of SHG signal on microtubule density, spacing, polarity, and rotational order. SHG can be used to assess spindle polarity in living cells using simultaneous ratio imaging with two-photon excited fluorescence from labeled tubulin. The results from simulation are used to quantify microtubule polarity from SHG and TPEF images of spindles in the one-cell C. elegans embryo and Xenopus oocyte extract.

[X] Prefer Oral Session
[ ] Prefer Poster Session

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