

# Fall 2017

## Mathematical Sciences/RTG

### Colloquium

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#### “Time Domain Modeling of Active Materials”

The talk will overview the recent advances and details of time domain modeling of active materials. We focus on the multiphysics modeling of multi-level atomic systems coupled to full-wave time domain Maxwell's solver to include the transitions taking place in gain media. Different atomic systems, 2-level and higher, are reviewed and compared. The details of efficient and universal numerical implementation, as well as experimental characterization and calibration of the model are discussed. Also, we address simulation techniques that handle spontaneous emission and stochastic noise.

The model has been successfully used to design and optimize various active devices and systems such as directional spaser arrays and lasing in hyperbolic metamaterials. A six-level system has also been developed to numerically simulate a lasing system using a more complicated organic laser dye with non-negligible split transitions. To date, even more sophisticated models that account for dye bleaching have been proposed. The review of different systems and modeling techniques will be given.

**Speaker: Ludmila Prokopeva**

**(Purdue University)**

**Monday, November 27, 2017**

**Time: 4:00 – 5:00 PM**

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**Host: Rongjie Lai/Derek Olson**