



FALL 2018

RENSSELAER POLYTECHNIC INSTITUTE

DEPARTMENT OF MATHEMATICAL SCIENCES COLLOQUIUM

“Mathematical modeling of positioning and size scaling of nuclei in multi-nucleated muscle cells”

Abstract: The nucleus is the organizing center of a cell. We use multi-scale modeling to understand how dozens of nuclei in multi-nucleated muscle cells position themselves and adapt their size.

Positioning mechanisms involve cytoskeletal fibers, called microtubules, that interact with molecular motors to create forces. We perform large scale computational force screens with hundreds of coarse models to predict nuclear positions. Then we compare these to imaging data from *Drosophila* (fruit fly) muscle cells. To identify the most adequate model, we combine statistical with analytical methods, such as bifurcation analysis. Next we use a detailed agent-based mechanical implementation of the "winning model" for further validation.

Finally we predict nuclear sizes by suggesting a space-sensing model based on reaction-diffusion equations. It correctly predicts scaling relationships between nuclei, the amount of space around them and the overall cell size.

Angelika Manhart (Courant Institute, NYU)

September 17, 2018

4:00-5:00pm

Amos Eaton 214

Host: Peter Kramer

Refreshments served 3:30-4pm Amos Eaton 4th Floor Lounge

