

# Boulder Condensed Matter Summer School

## Theoretical Biophysics

Active Living Matter +  
Tissue Mechanics  
July 15-19, 2019

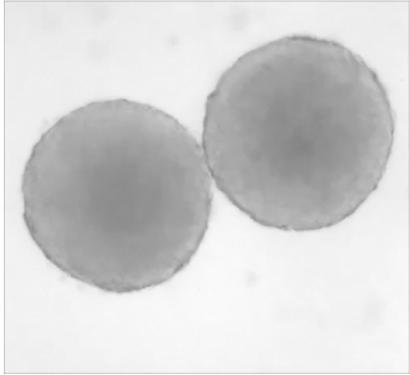
**Syracuse University**  
BioInspired Institute

Lisa Manning  
Department of Physics  
BioInspired Institute  
Syracuse University

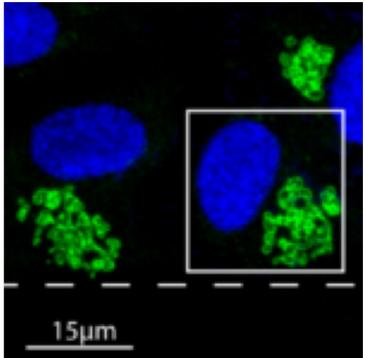


# Science in the Manning group

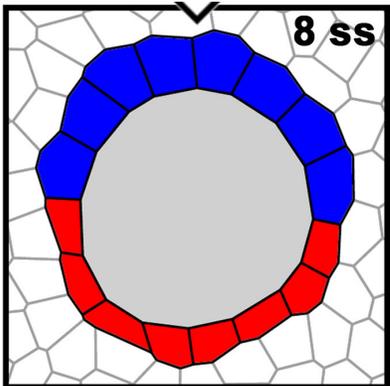
mmanning@syr.edu



mechanics of biological tissues + extracellular matrix

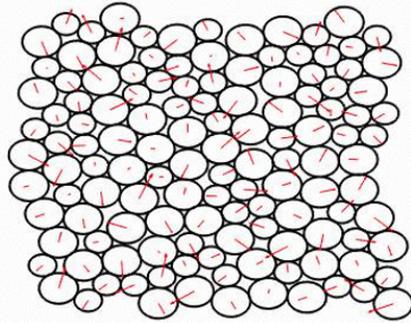


intracellular polarization of motility and superdiffusive cell trajectories

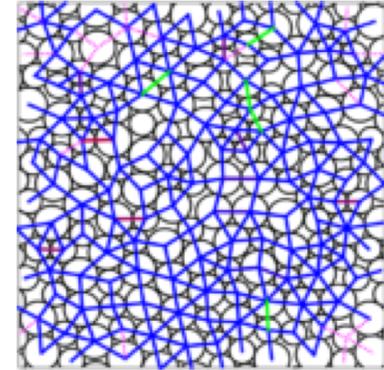


cell shape remodeling in the zebrafish left-right organizer

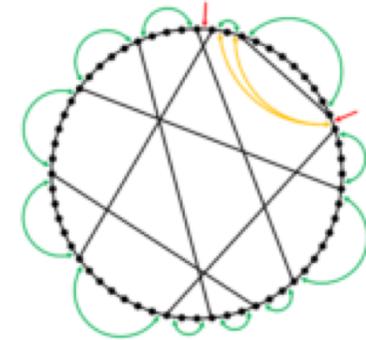
deep connection between shear and active matter



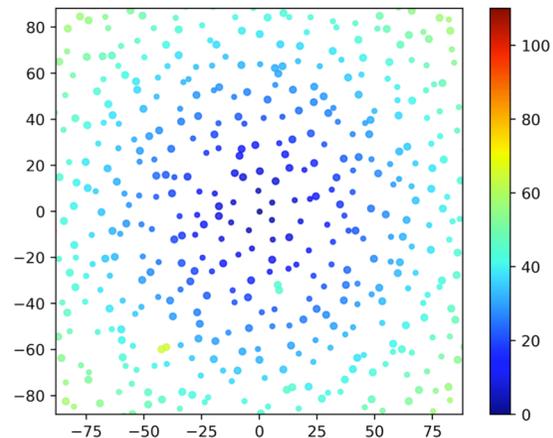
reversibility and potential energy landscape of glasses



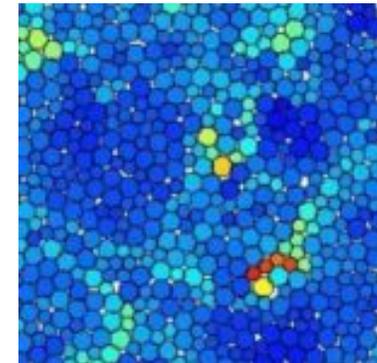
Sparse random matrix models for glasses



behavior of aggregating crowds



rheology of glassy materials



# Manning group and Collaborators

## Manning group:

Gonca Erdemci-Tandogan

Amanda Parker

Sudeshna Roy

Paula Sanematsu

Ethan Stanifer

Preeti Sahu

Liz Lawson-Keister

Julia Giannini

## Alumni:

Daniel Sussman (Emory)

Matthias Merkel (Centuri, Marseille)

Max Dapeng Bi (Northeastern)

Michael Czajkowski (GA Tech)

Peter Morse (Duke)

## Syracuse:

Jen Schwarz

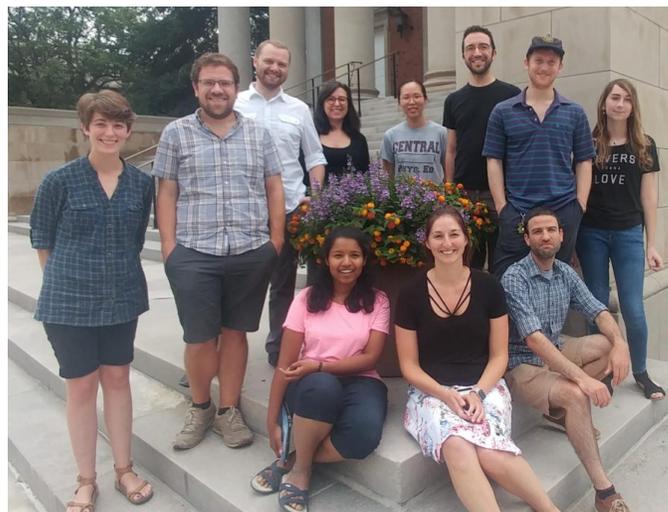
Xingbo Yang

## Käs Group (Leipzig University)

Steffen Grosser

+++

**Brian Tighe**, Karsten Baumgarten (TU Delft)



**Jeff Fredberg** (Harvard School of Public Health)

Jin-Ah Park

+++

**Jeff Amack** (SUNY Upstate)

Guangliang Wang

Agnik Dasgupta

Madeline Clark

Jeff Amack

**Cristina Marchetti** (UCSB)

**Andrea Liu** (UPenn)

Tristan Sharp

**Karen Kasza** (Columbia)

Xun Wang

**Margaret Gardel** (Chicago)

John Devaney

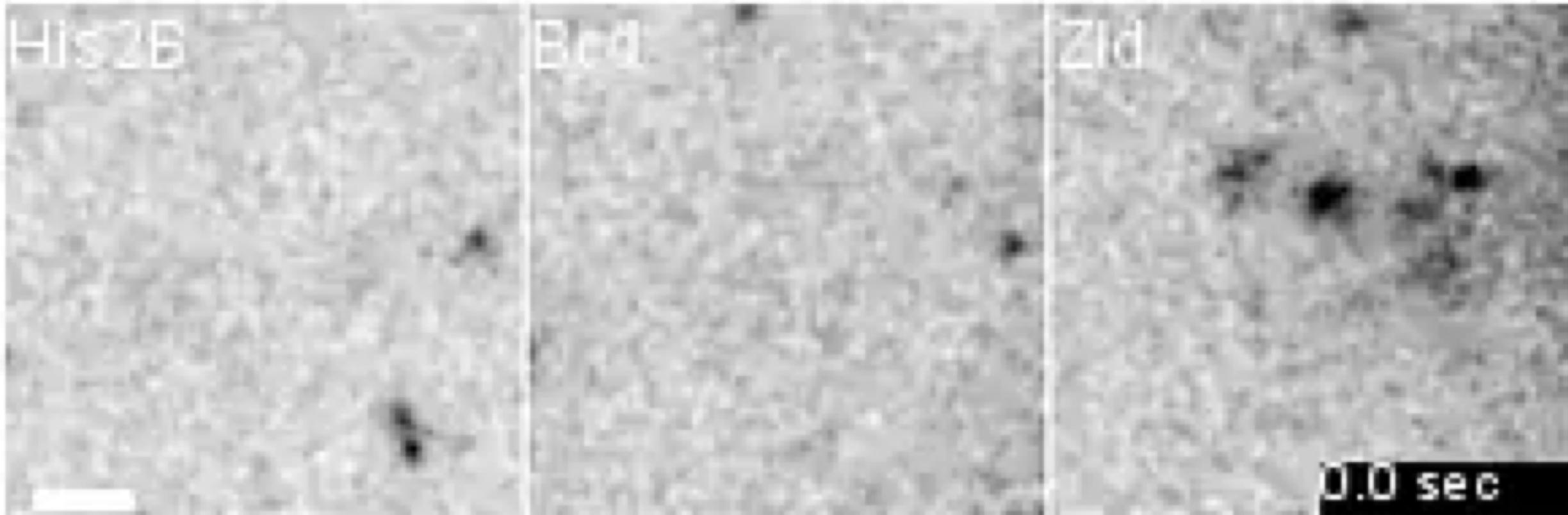
lecture notes:



Examples of living and  
biomimetic active matter

[Mir et al. eLife. 2018; 7: e40497.](#)

Single molecule labeling of histones and other chromatin associated proteins



Onset of active flow coincides  
with microtubule alignment  
and bundle formation

50 $\mu$ m bar

2D Active Nematic  
Liquid Crystal

Fluorescence Image

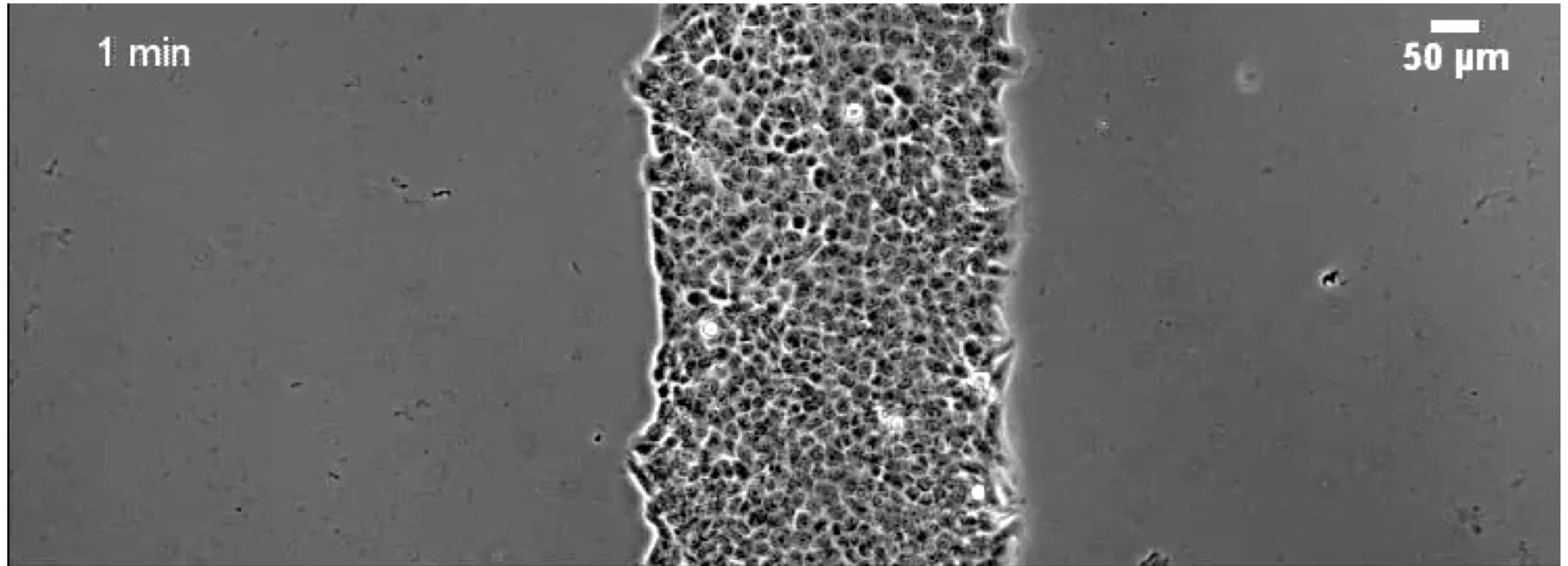
$\Delta = 0.89\text{nm}$

Dogic lab: kinesin + microtubules

Palacci et al. Science 2013

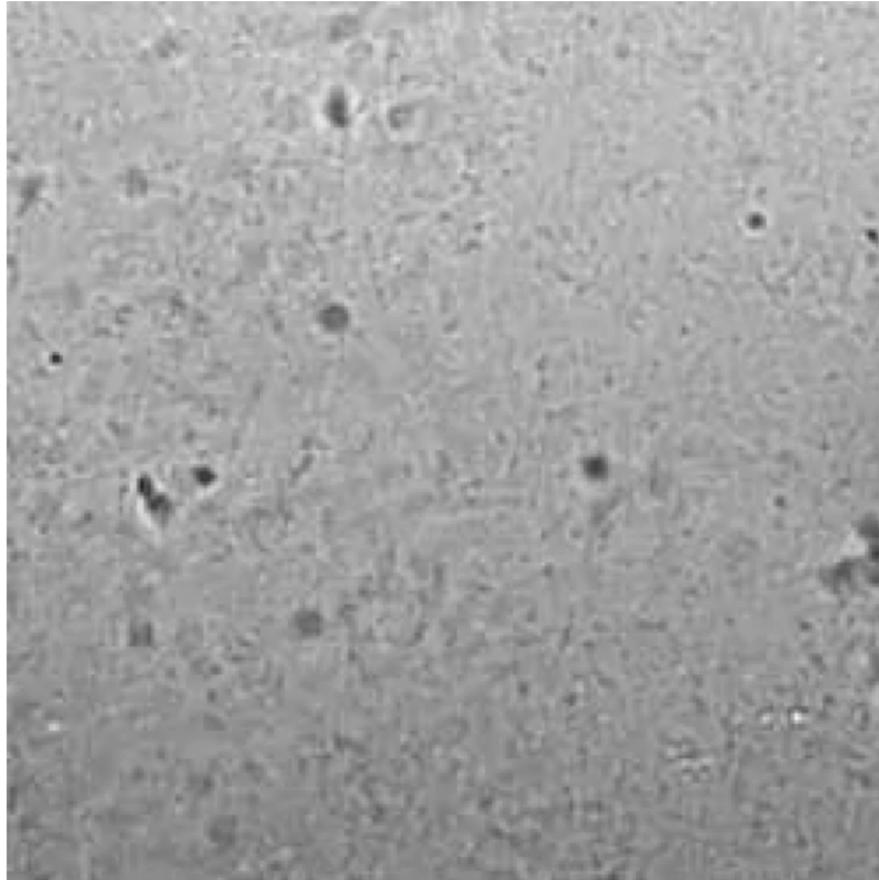


MDCK monolayer on substrate with gradient stiffness

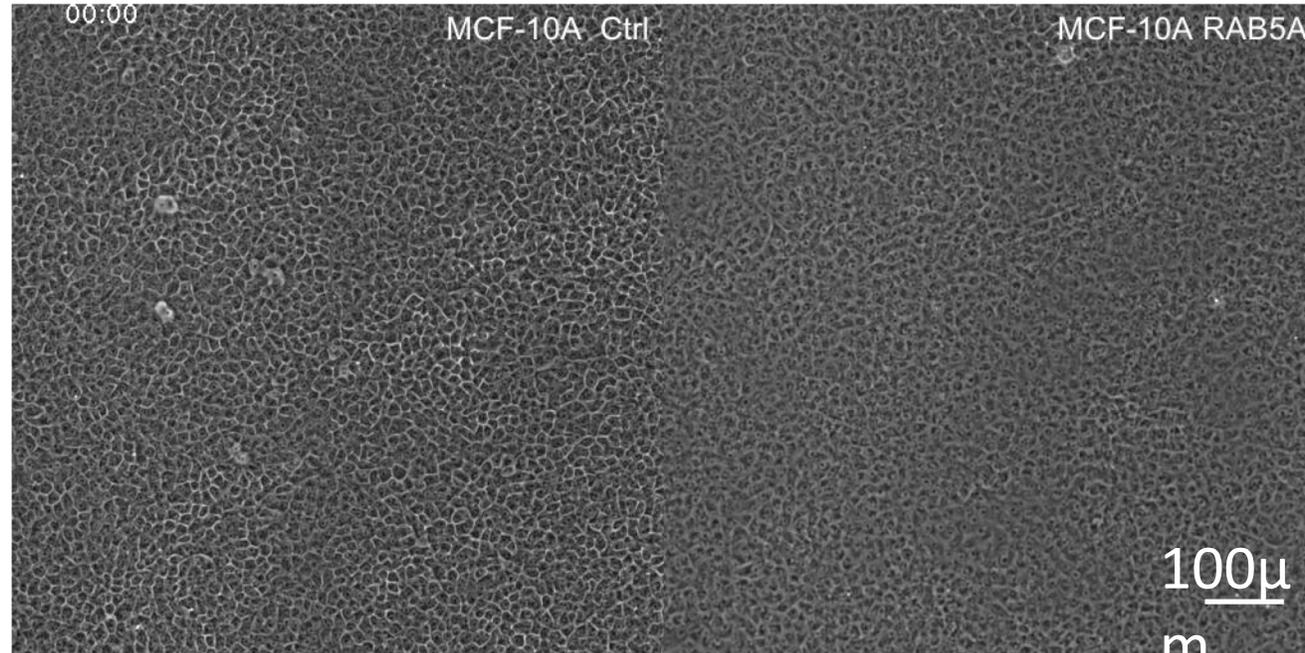


Liu et al, PRL **122** 2019

*Myxococcus xanthus* bacteria: aggregation of fruiting bodies

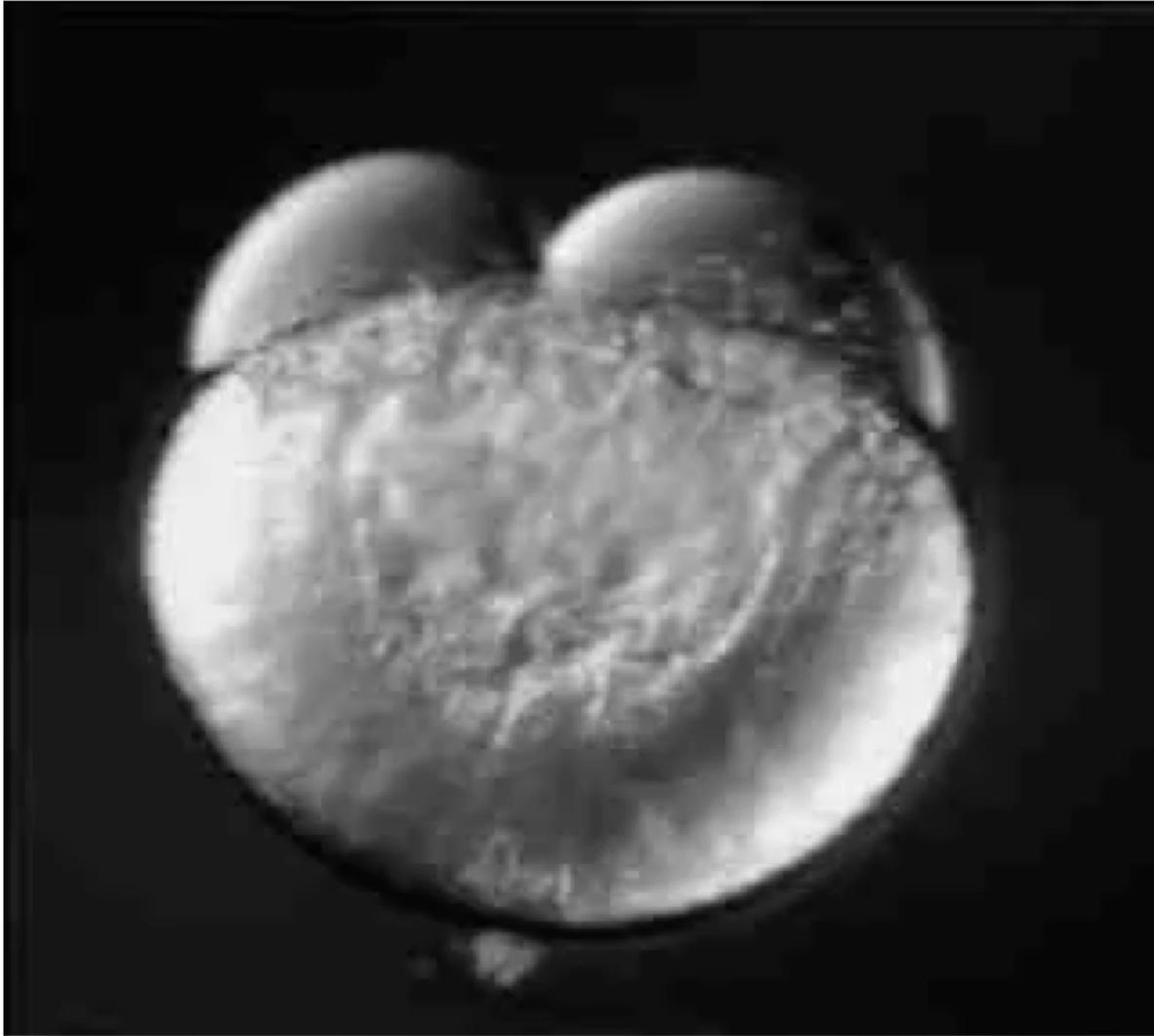


cancer-associated RAB5A induces “flocking” in a jammed tissue



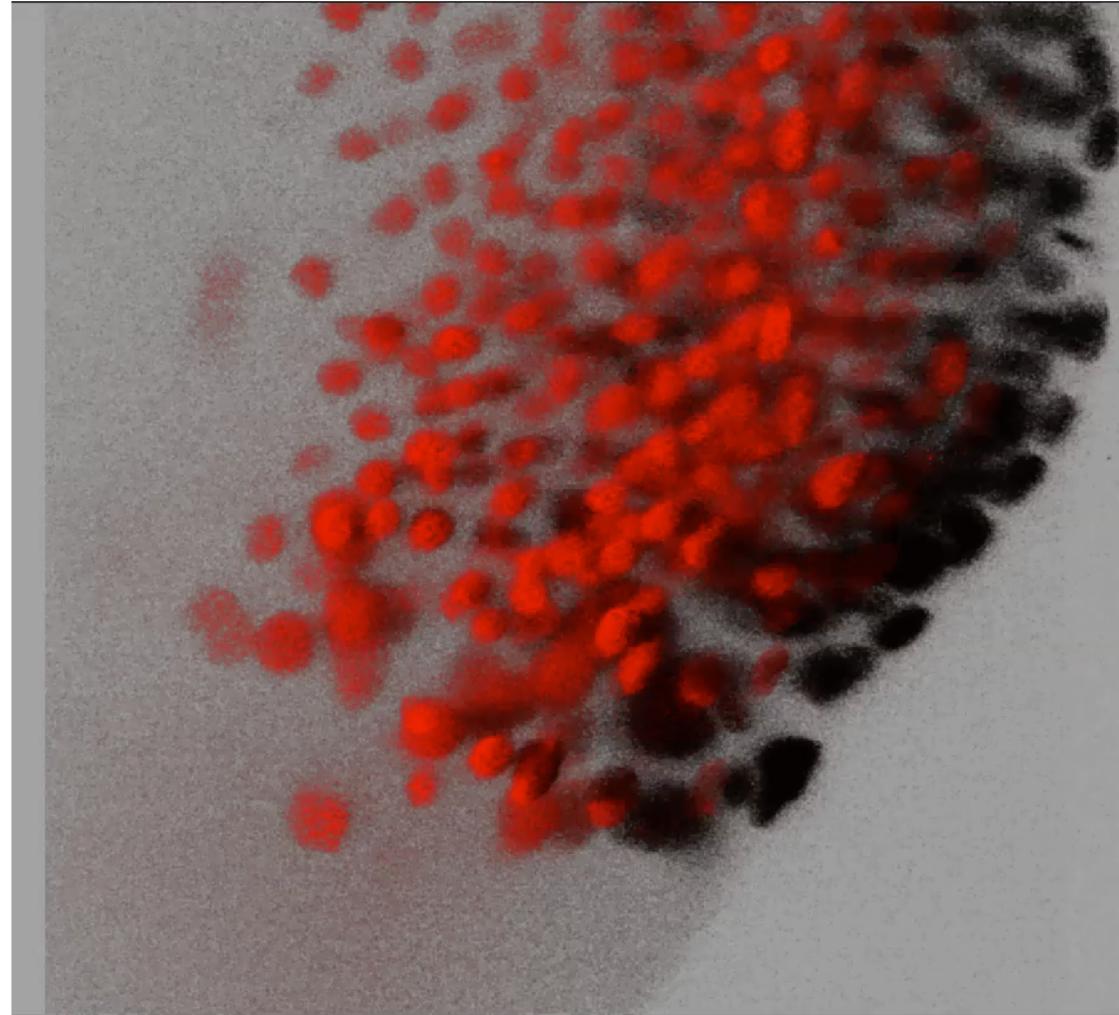
A **jammed** confluent layer of MCF 10A **unjams** upon addition of Rab5a – over 24h

zebrafish development



Karlstrom et al, Development (1996)

EM Schoetz PhD Thesis 2008



National Geographic : flocking starlings



Caters clips: sheep herds

