

Boulder Condensed Matter Summer School

Theoretical Biophysics

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

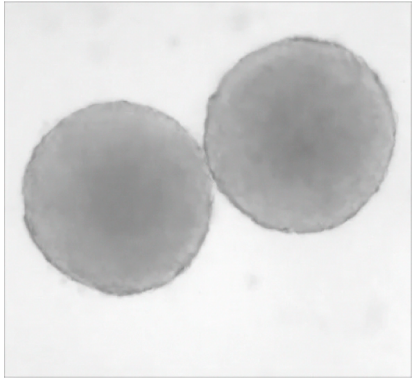
Syracuse University
BioInspired Institute

Lisa Manning
Department of Physics
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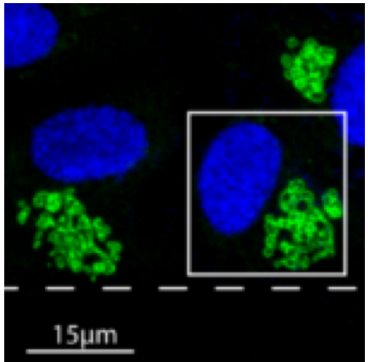


Science in the Manning group

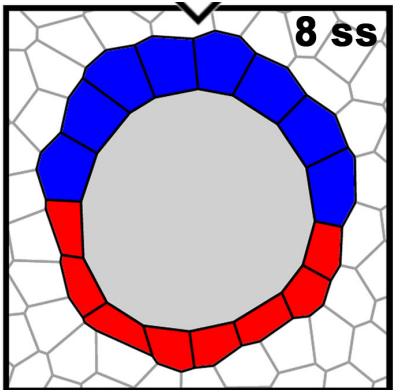
mmanning@syr.edu



mechanics of biological tissues + extracellular matrix

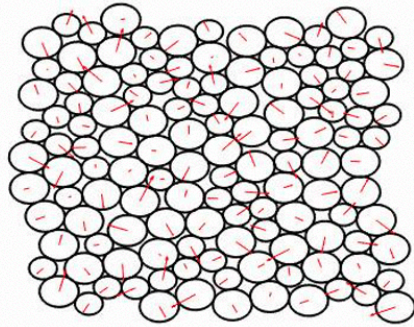


intracellular polarization of motility and superdiffusive cell trajectories

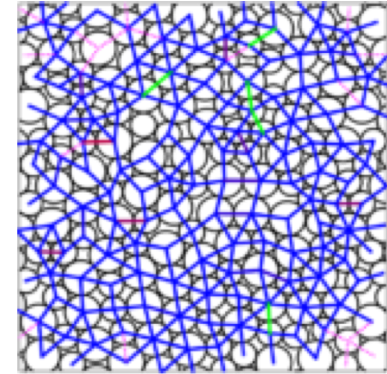


cell shape remodeling in the zebrafish left-right organizer

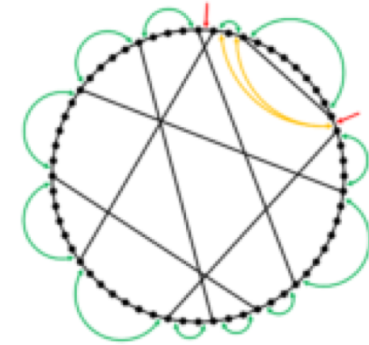
deep connection between shear and active matter



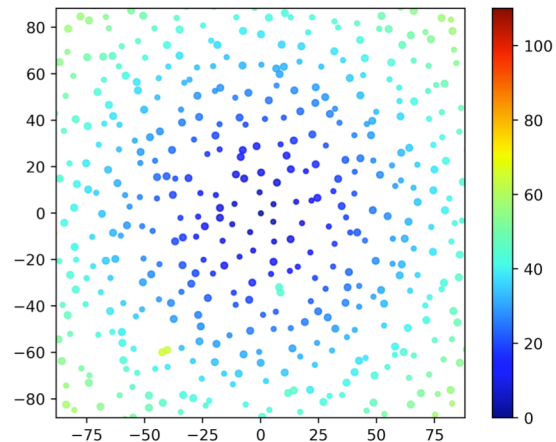
reversibility and potential energy landscape of glasses



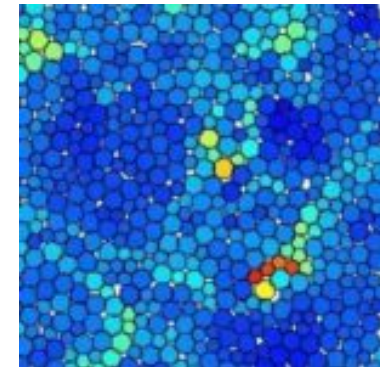
Sparse random matrix models for glasses



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)

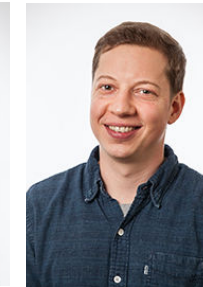
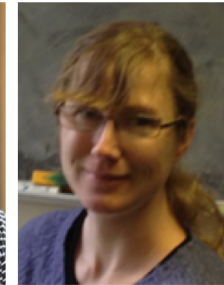
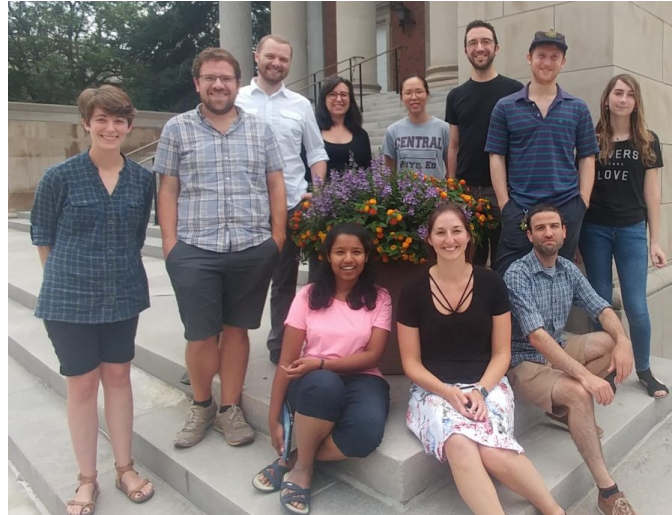
Syracuse:

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

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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

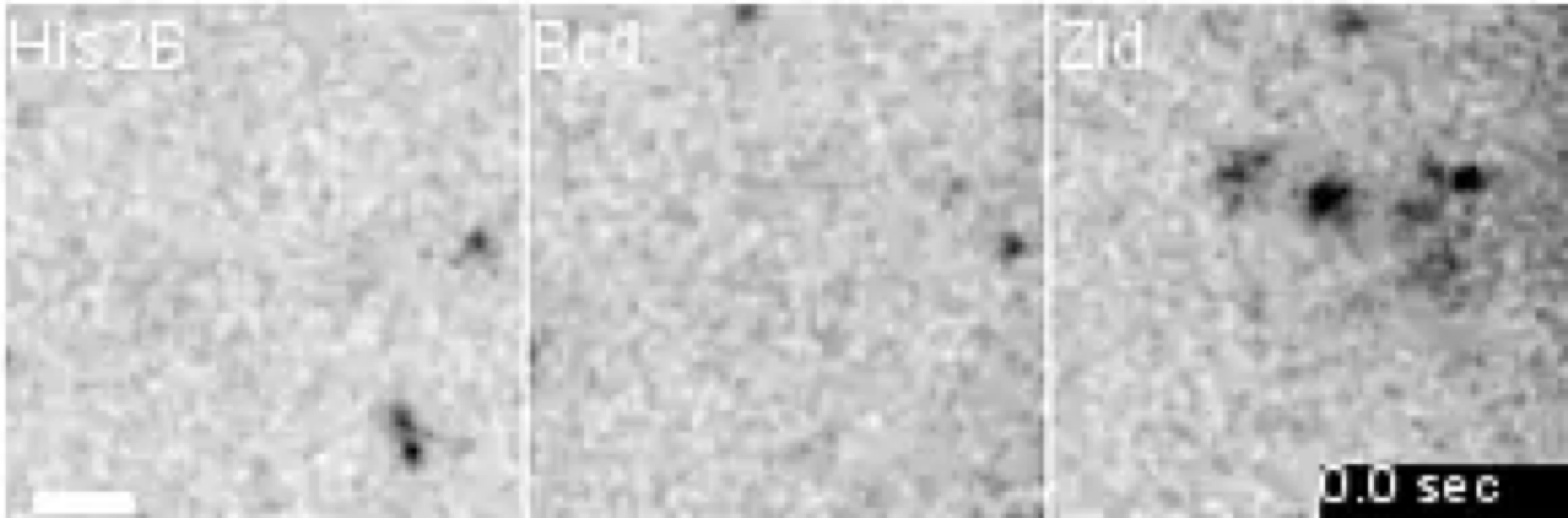
lecture notes:



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 μ m bar

2D Active Nematic
Liquid Crystal

Fluorescence Image

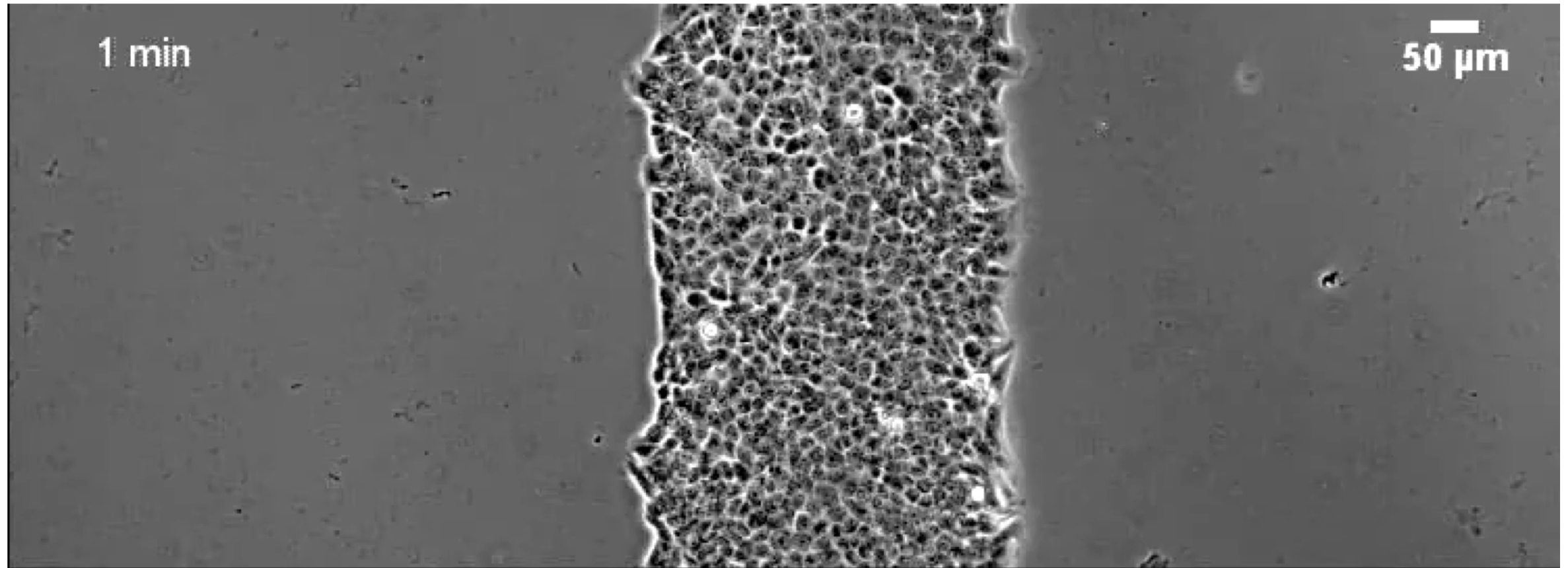
$\Delta = 0.89\text{nm}$

Dogic lab: kinesin + microtubules

Palacci et al. Science 2013

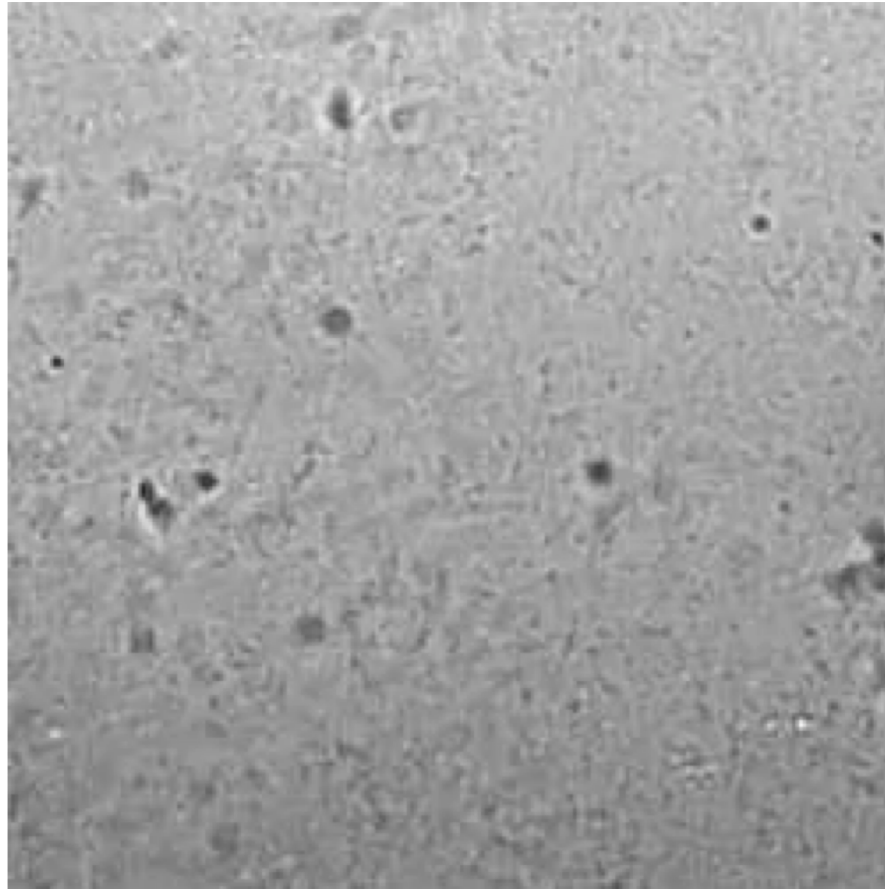


MDCK monolayer on substrate with gradient stiffness

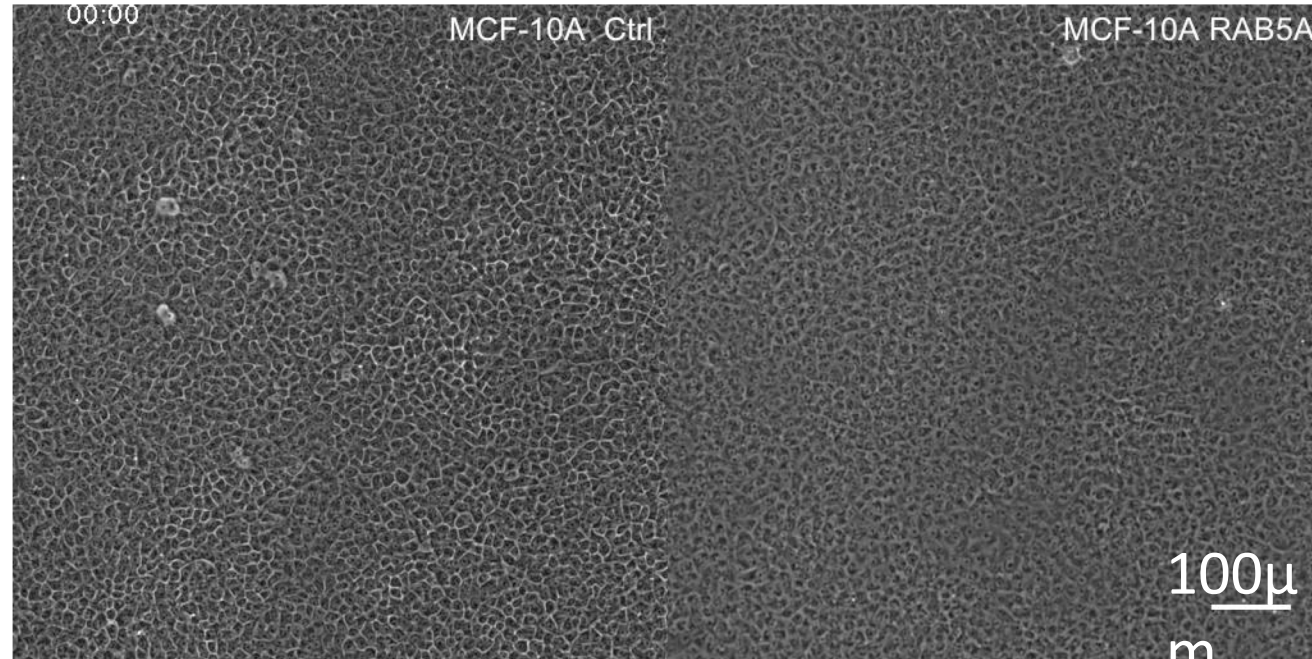


Liu et al, PRL **122** 2019

Myxococcus xanthus bacteria: aggregation of fruiting bodies



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



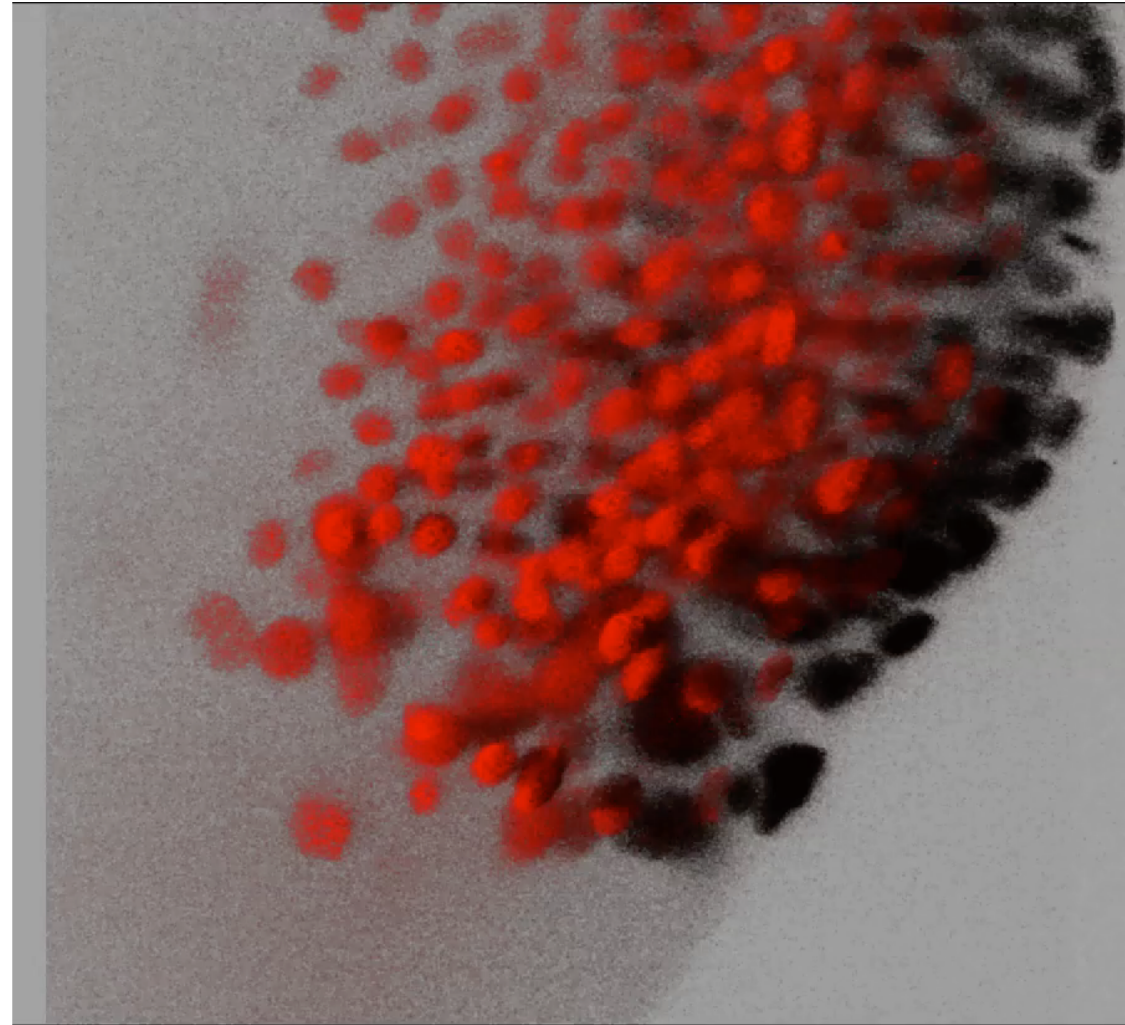
A **jammed** confluent layer of MCF 10A **unjams** upon addition of Rab5a – over 24h

zebrafish development



Karlstrom et al, Development (1996)

EM Schoetz PhD Thesis 2008



National Geographic : flocking starlings



Caters clips: sheep herds

