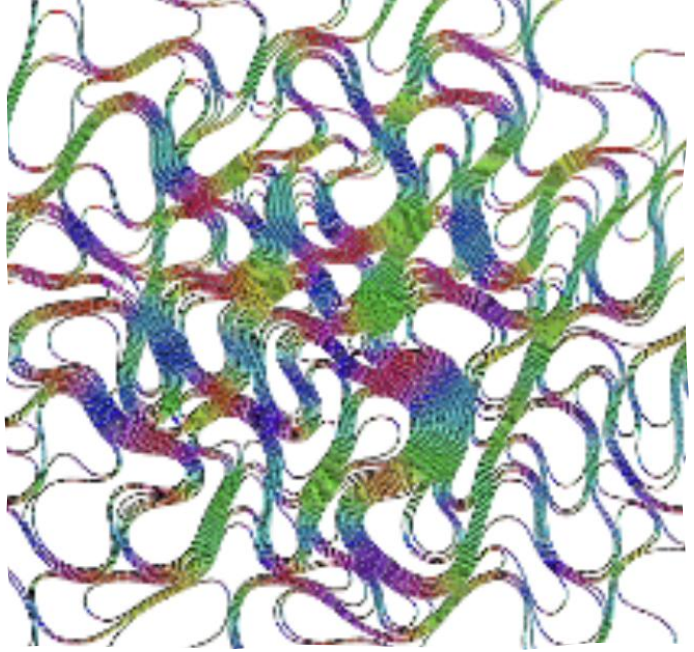
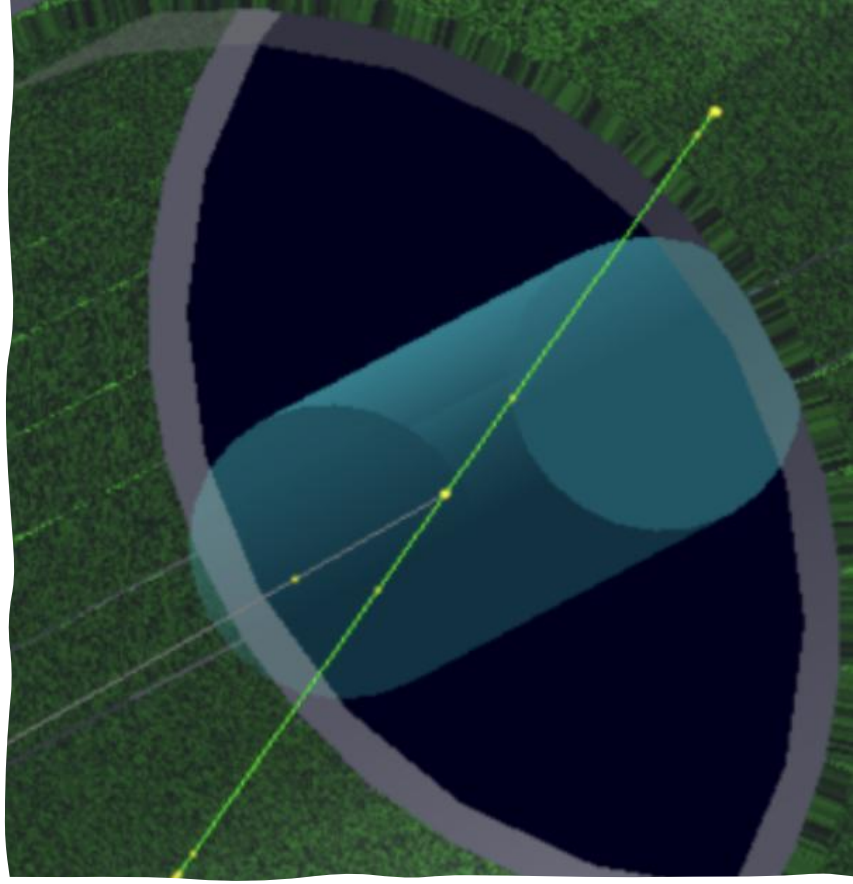
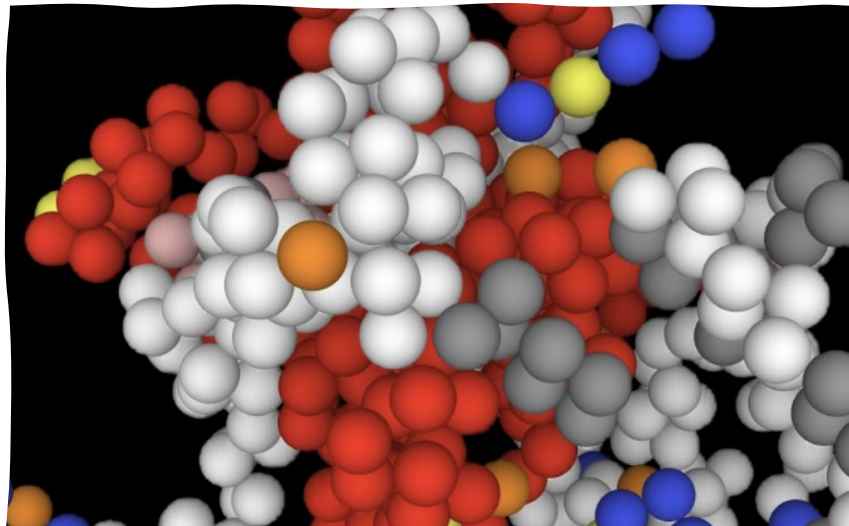
Flash talks session 3

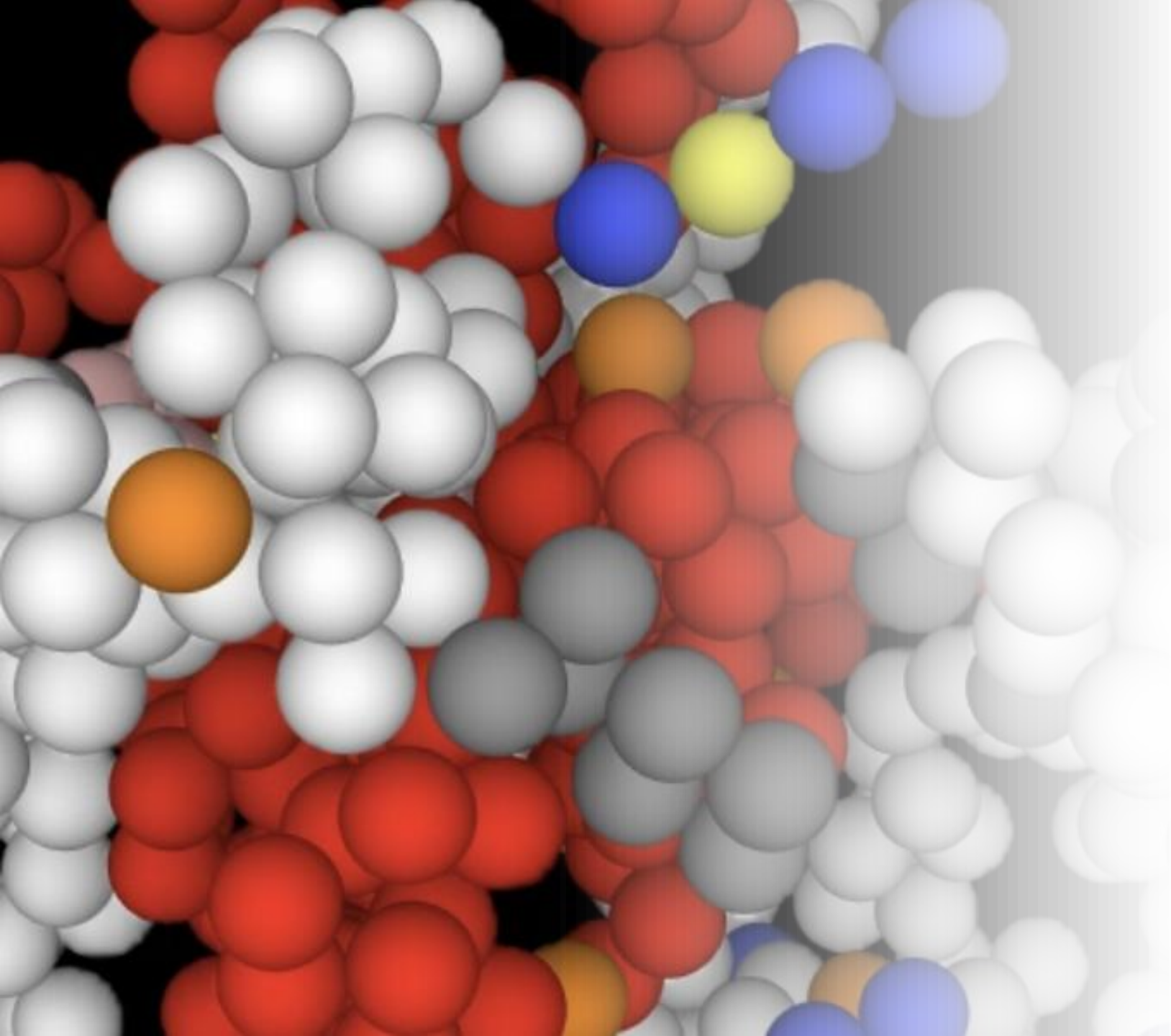




THE UNIVERSITY of EDINBURGH

Edinburgh Centre for Biomedical Physics



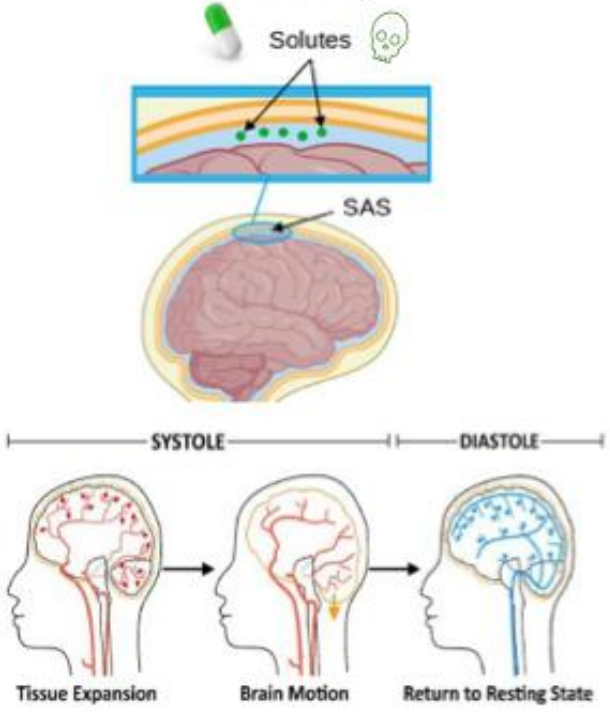


Alannah Neff

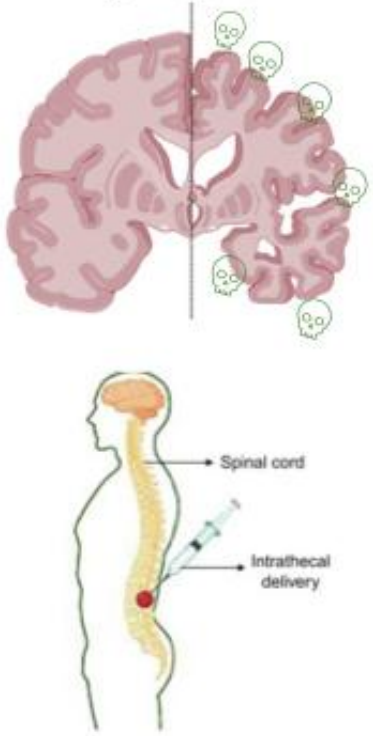
Brain washing:

How CSF transports drugs, nutrients and toxins

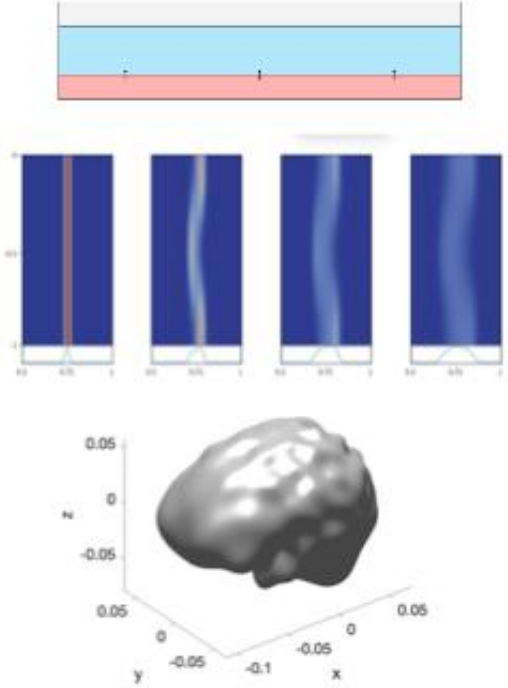
What we study:



Why we care:

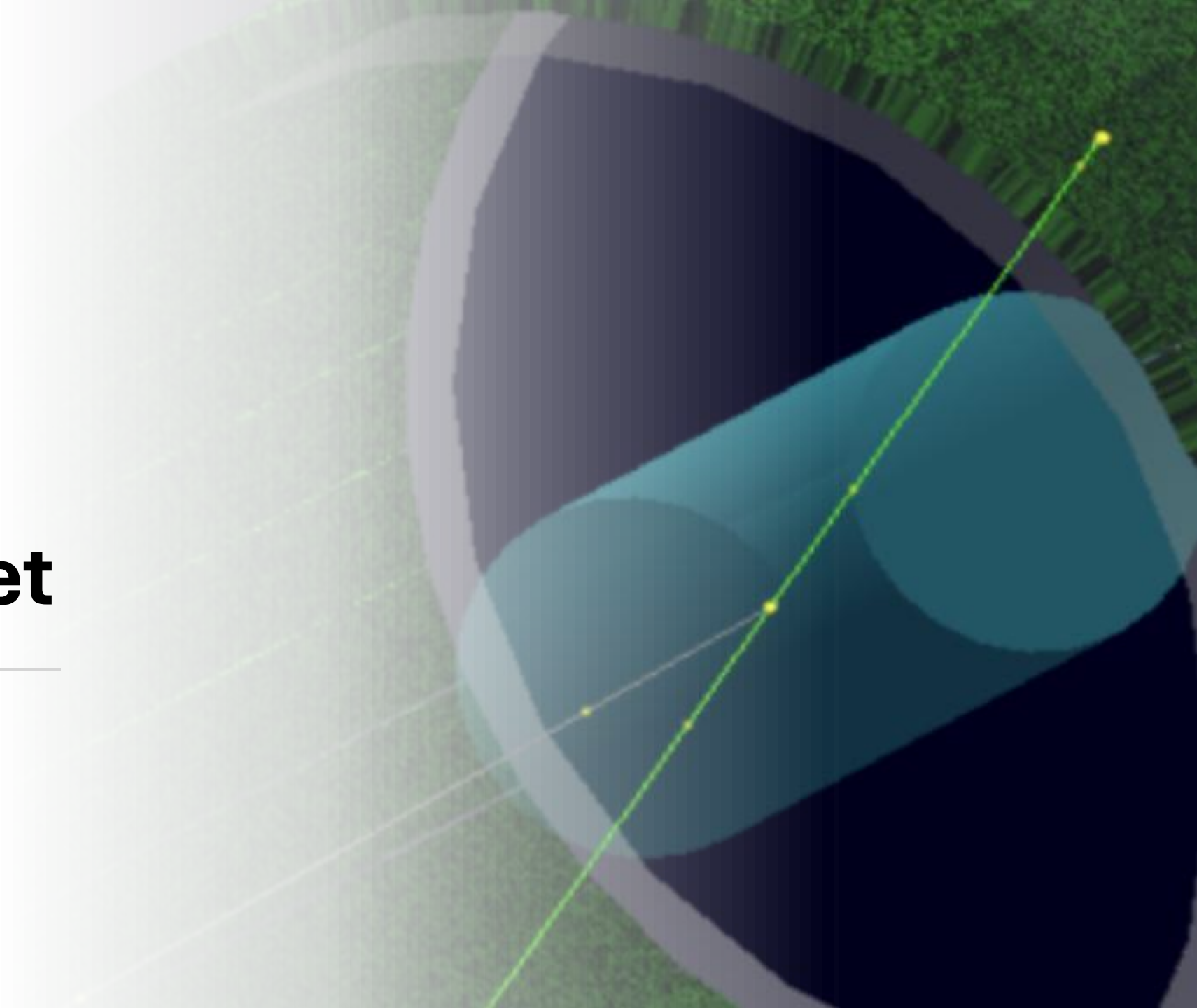


How we investigate:



Alannah Neff, School of Mathematics

Louise Overzet



Louise Overzet
ICMCS
1st year PhD student

Biobased materials for engineered lung tissue

Background
- CRDs affect 545 million people globally[1]
- COPD : 4th leading cause of death worldwide[2]

Goal
- Mimic the Extracellular Matrix of lung tissue
- Find a solution to donor shortage

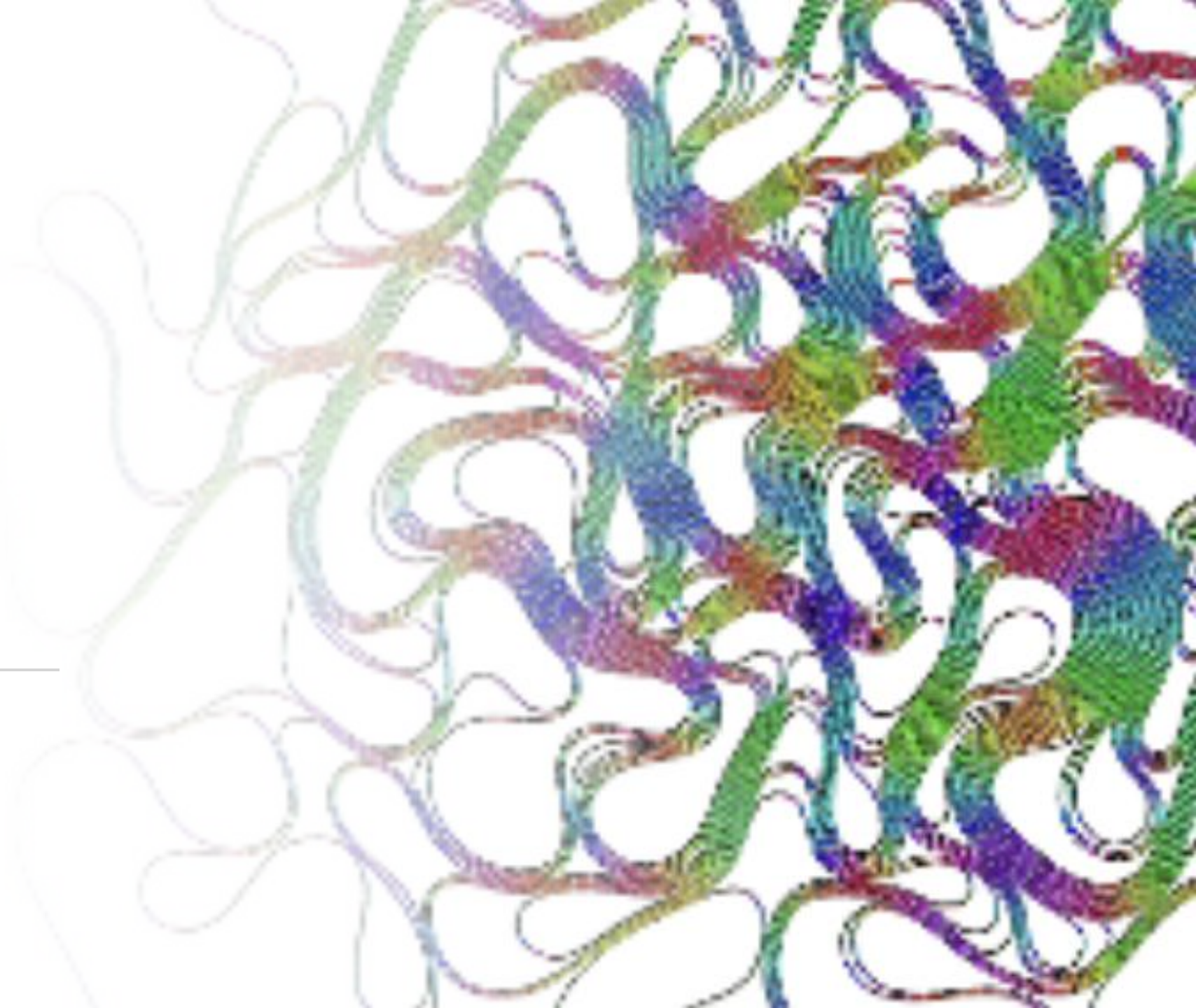
Methods
- Rheology
- Microscopy
- Spectroscopy

Focus so far
- Studying viscoelastic biopolymer (HPMC)
- Literature review

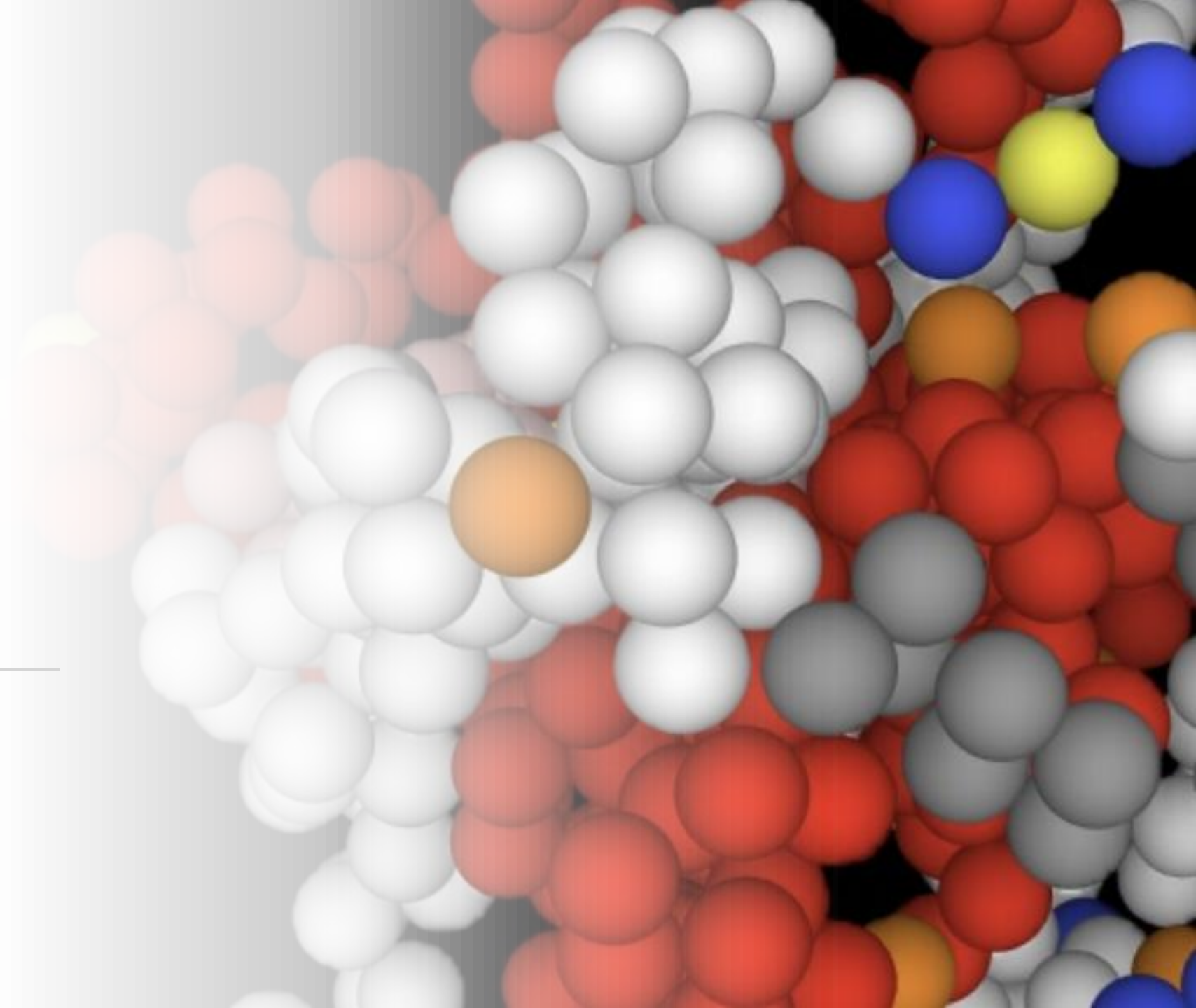
Future steps
- Due to lack of suitable data on lung's mechanical properties → Assess the mechanical properties of animal lungs tissue ourselves, to obtain a dataset and determine the target values needed for designing effective lung scaffolds.

1. (1) Petrella, F.; Spaggiari, L. Artificial Lung. J. Thorac. Dis. **2018**, 10 (S20), S2329–S2332. https://doi.org/10.21037/jtd.2017.12.89.
2. (2) Toyoda, Y.; Bhama, J. K.; Shigemura, N.; Zaldonis, D.; Pilewski, J.; Crespo, M.; Bermudez, C. Efficacy of Extracorporeal Membrane Oxygenation as a Bridge to Lung Transplantation. J. Thorac. Cardiovasc. Surg. **2013**, 145 (4), 1065–1071. https://doi.org/10.1016/j.jtcvs.2012.12.067.

Tyler Shendruck

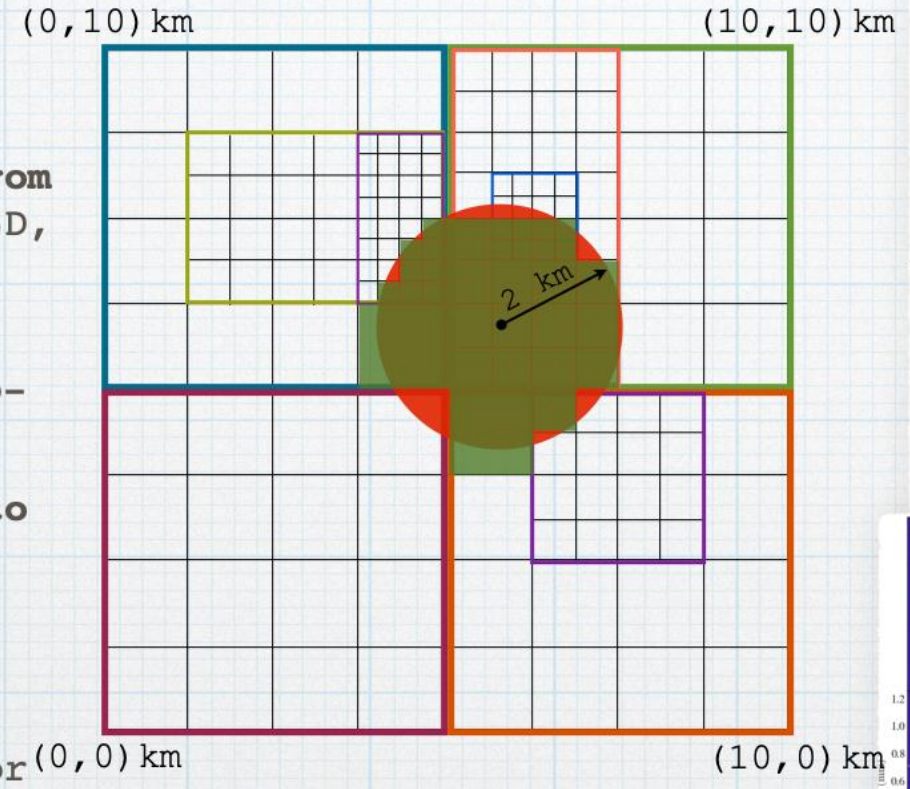


Britton Smith

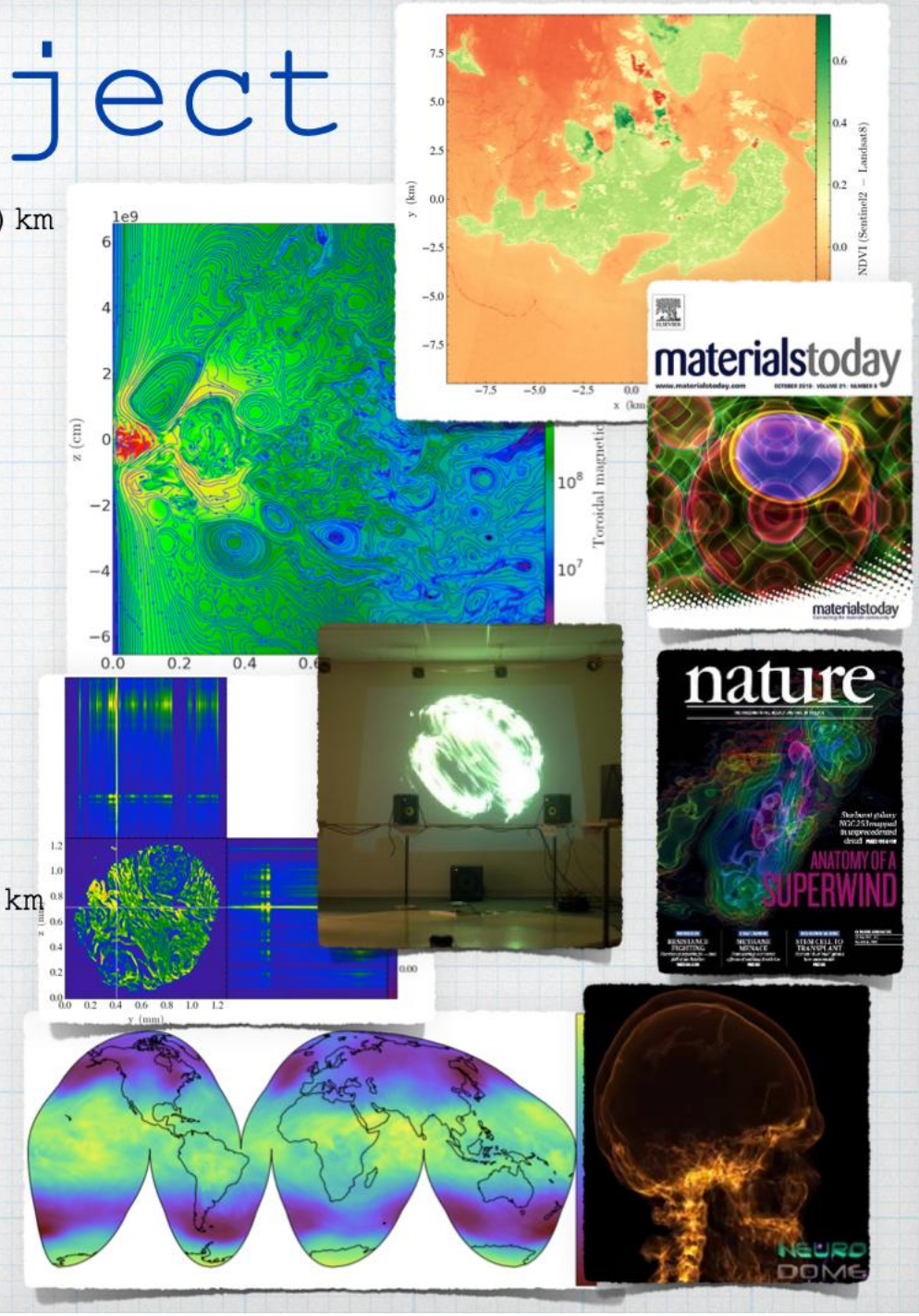


The yt Project

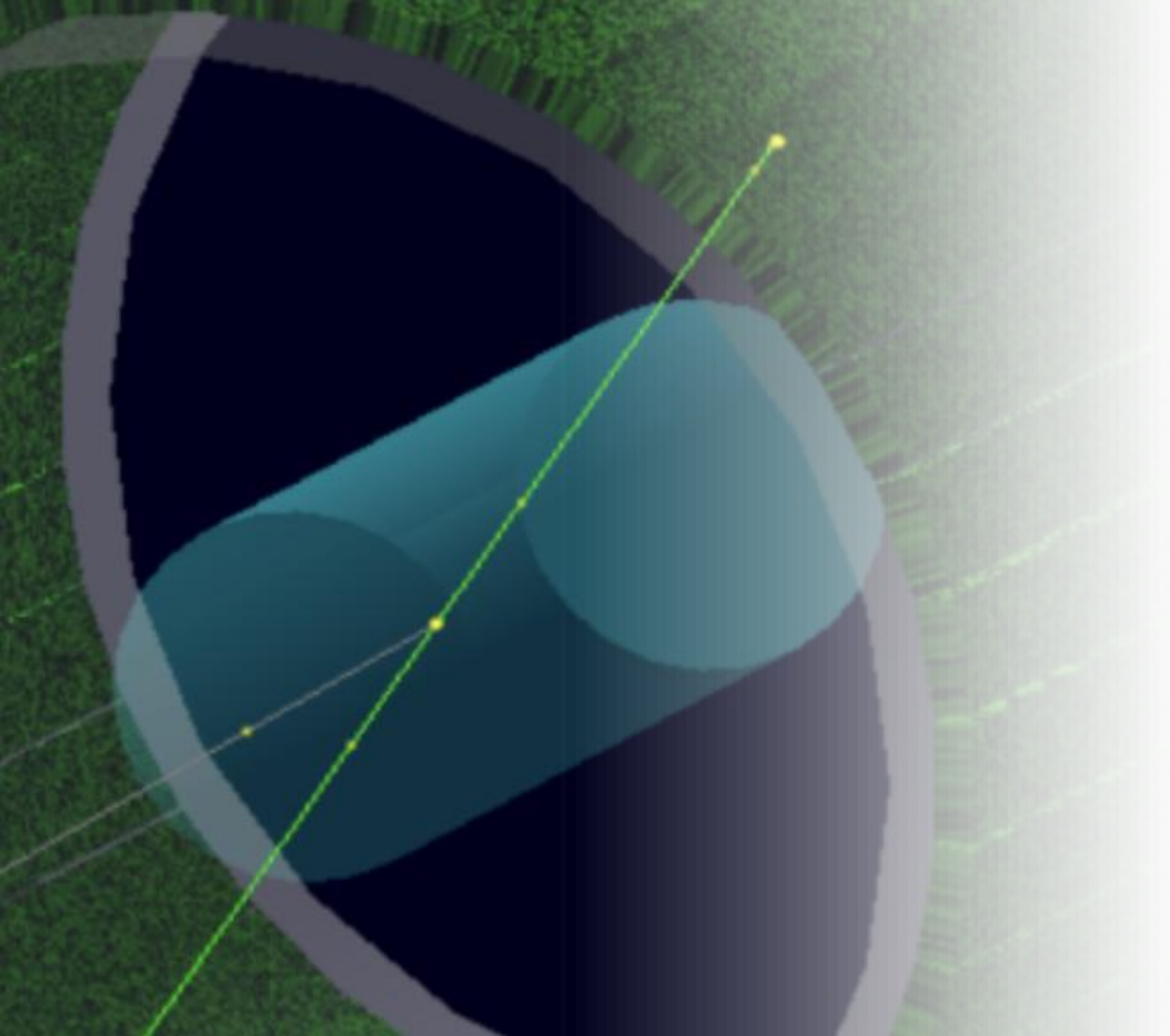
- yt: Python-based spatial analysis
  - **geometric data selection from complex spatial data** (2D, 3D, multi-res, etc)
    - data from simple shapes, logical combinations, iso-contours
  - **glue code to connect data to algorithms**
- yt user/developer workshop
  - 15-18 July, Higgs Centre for Theoretical Physics, JCMB
  - learn from and collaborate with yt team members
  - **Free registration: https://indico.ph.ed.ac.uk/event/346/**



https://yt-project.org/

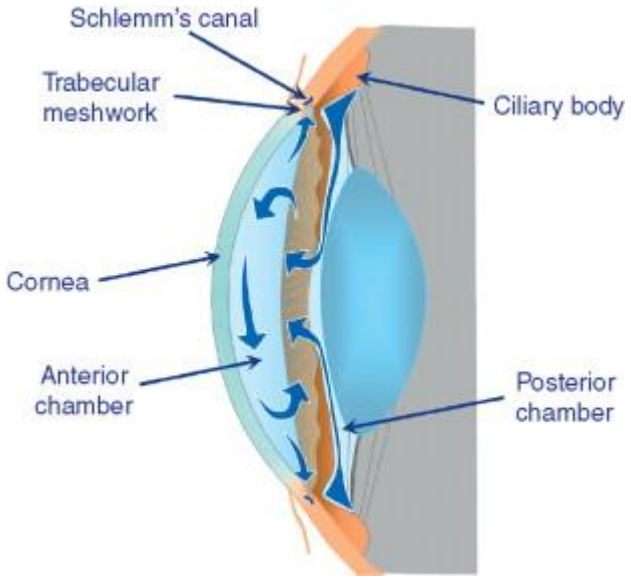


Britton Smith, Institute for Astronomy



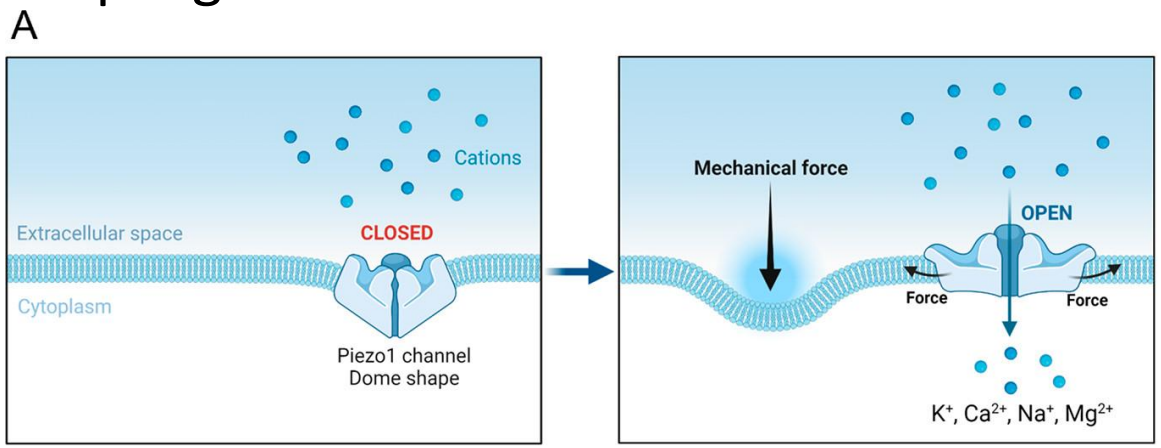
Simon Titmuss

(Mis)Regulation of Intraocular Pressure

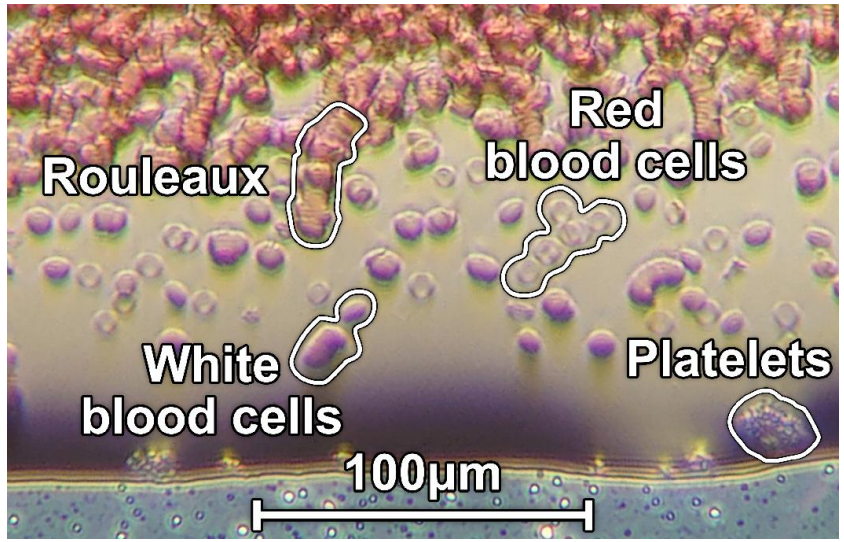


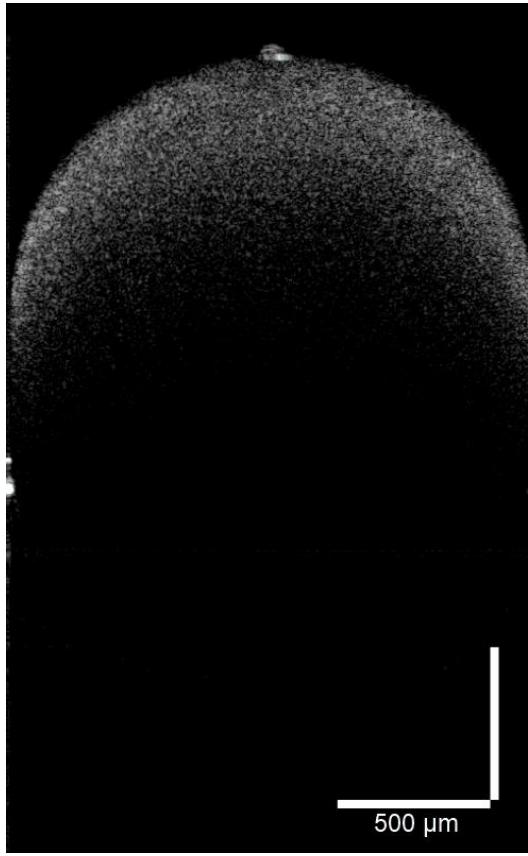
Water transport

Coupling to mechanosensitive ion channels



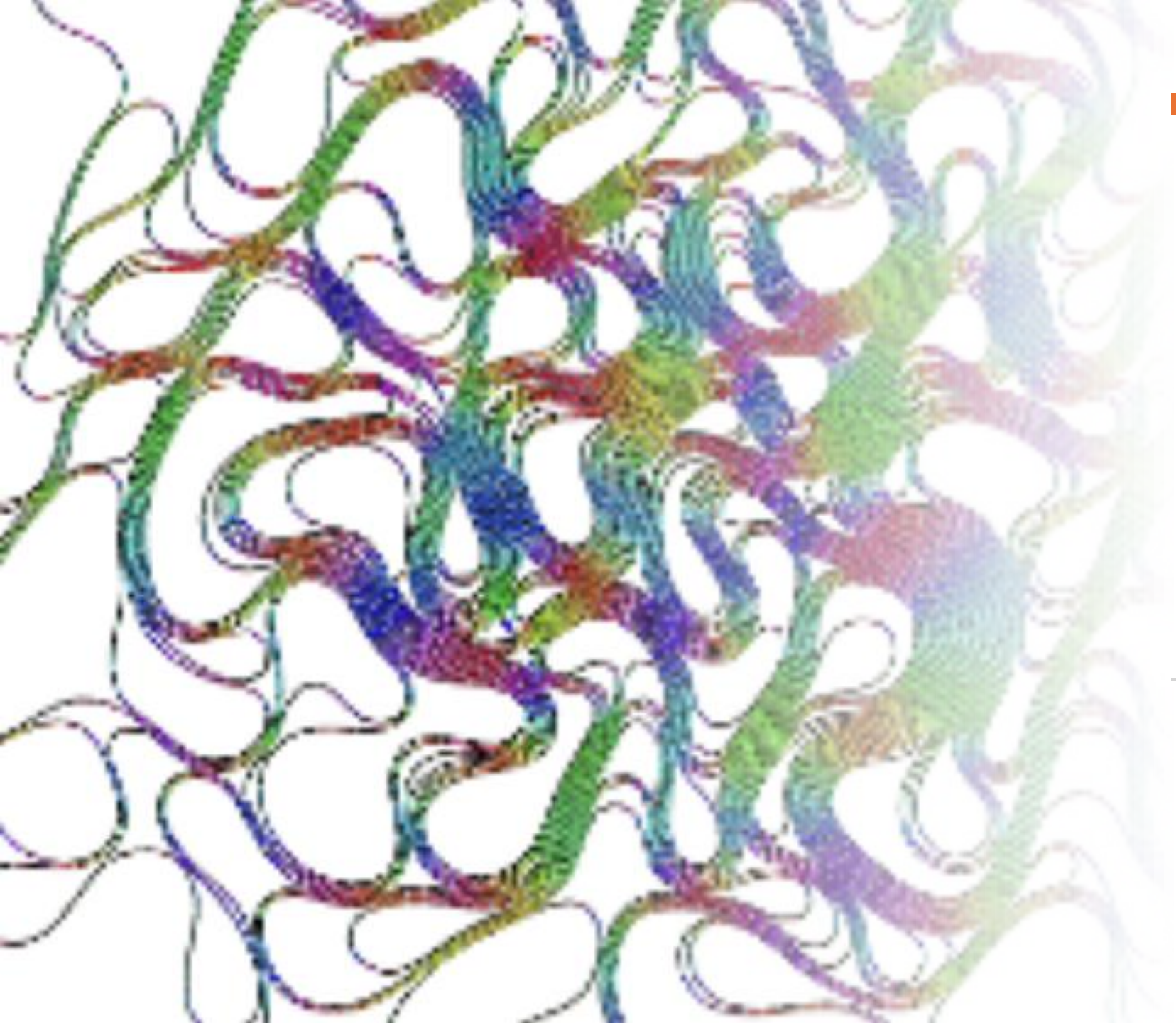
Soft matter physics of blood clotting





Optical coherence tomography of drying blood droplet

Simon Titmuss
simon.titmuss@ed.ac.uk



Richard Wheeler

Parasite flagellum and swimming

Richard Wheeler

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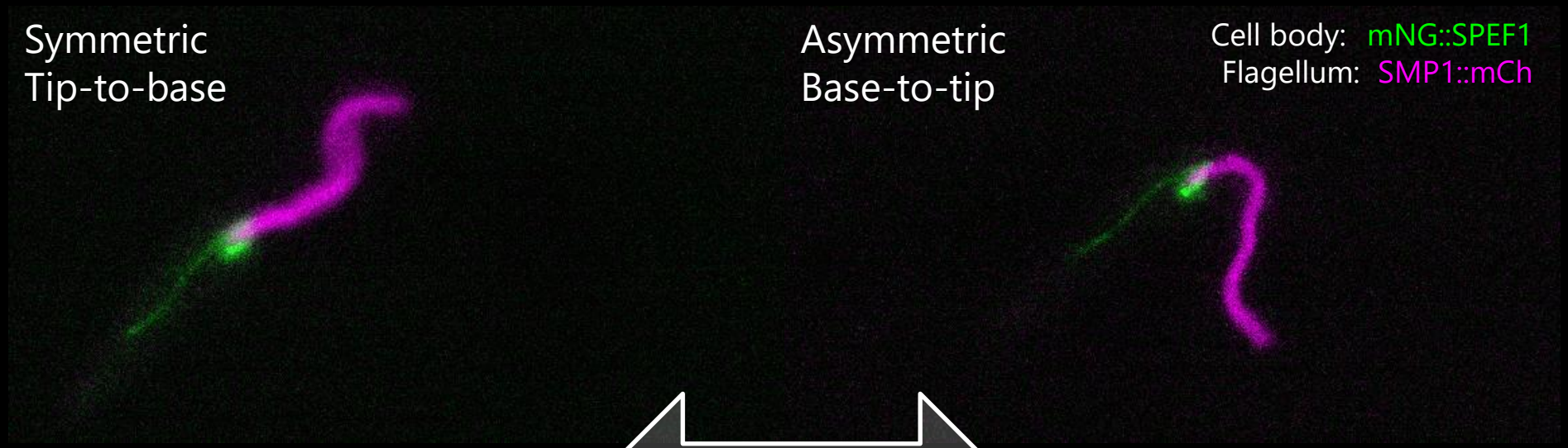
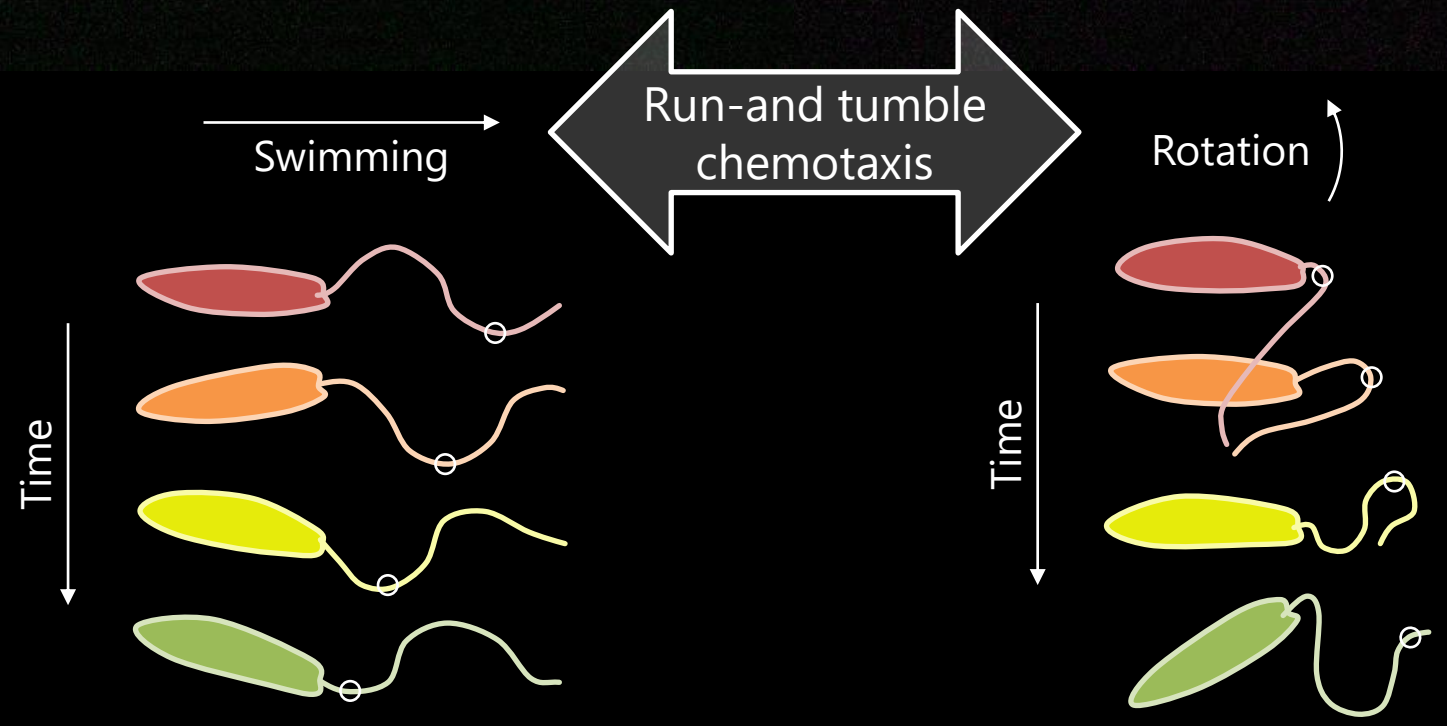
@zephyris @zephyris-science.bsky.social wheelerlab.net

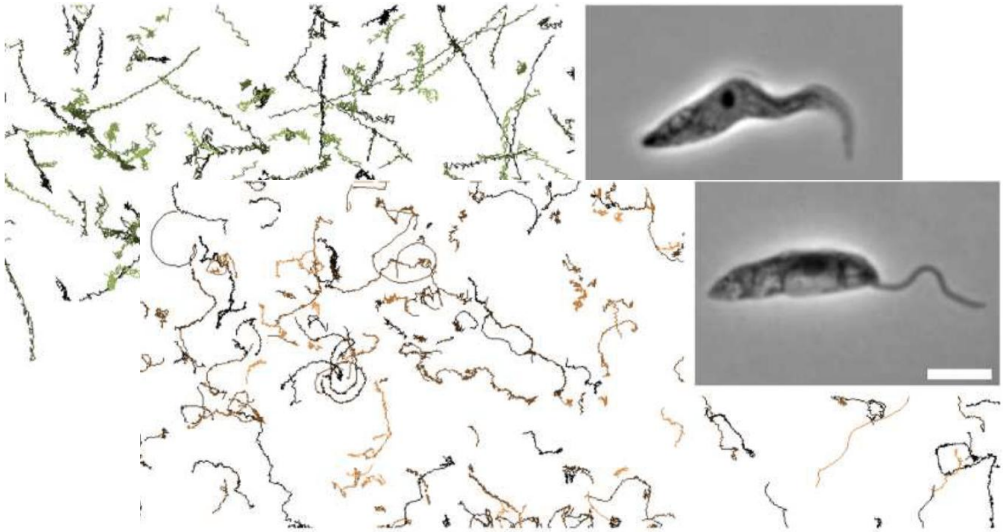
Swimming single-cell *Leishmania* parasites



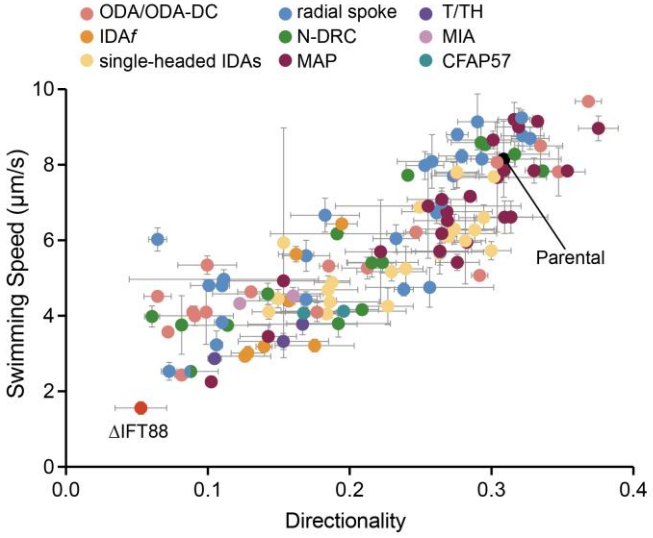


doi:10.1242/jcs.246637

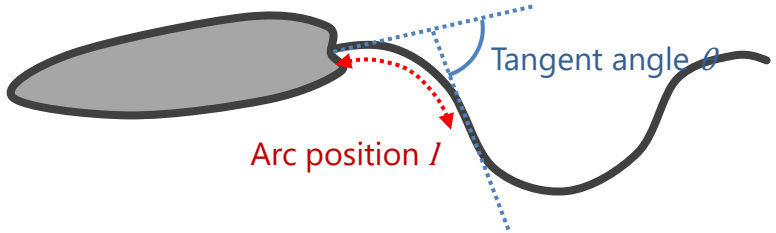
Swimming behaviour

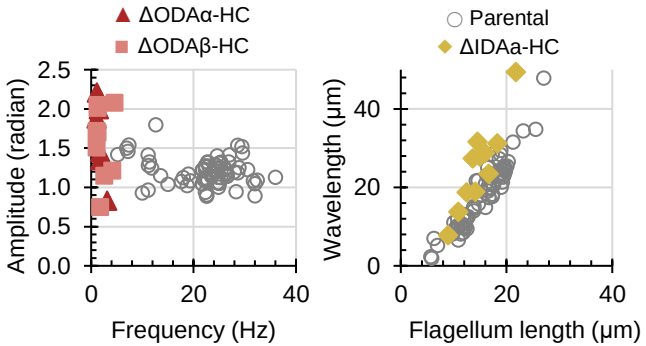


Mutant defects



Beat waveforms

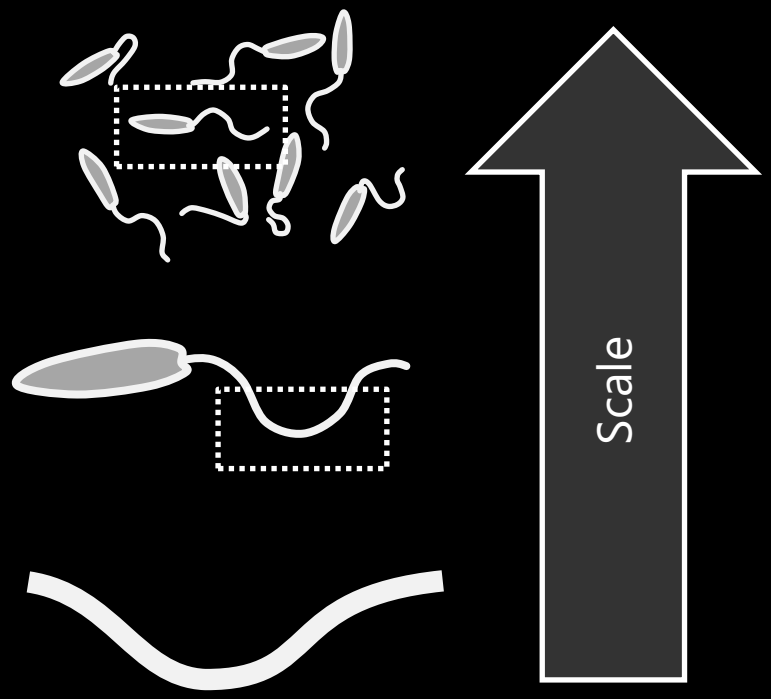




$$\theta_{(t,l)} = A\sin(2\pi tf - 2\pi ln/L)$$

$\vartheta_{(t,l)}$ is the tangent angle at **time** t s and **position** l µm along the flagellum arc.

A is **amplitude** (in tangent angle space, radian),
f is **frequency** (Hz),
L is **flagellum length** (µm)
n is **along-arc wavelength/flagellum length**



How does beating and morphology define swimming behaviour?

How does beat waveform make a cell swim?

How are thousands of dynein motor proteins coordinated in the flagellum?

What apart from swimming? Tissue penetration, parasite-host interaction?