

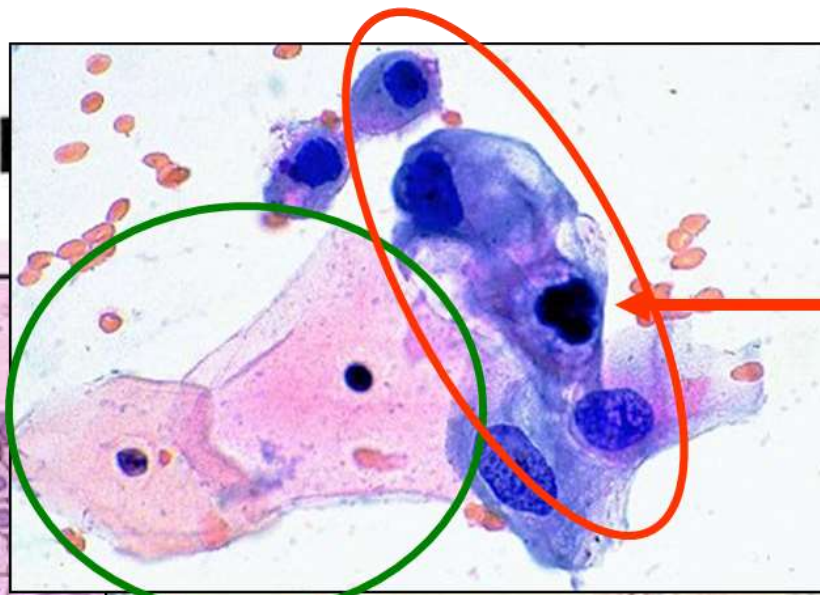
Inertial Focusing of *Xenopus* nuclei

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Undergrad Research Day
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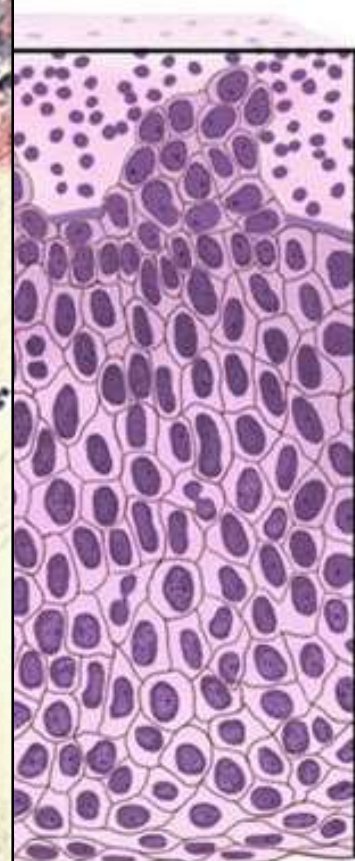
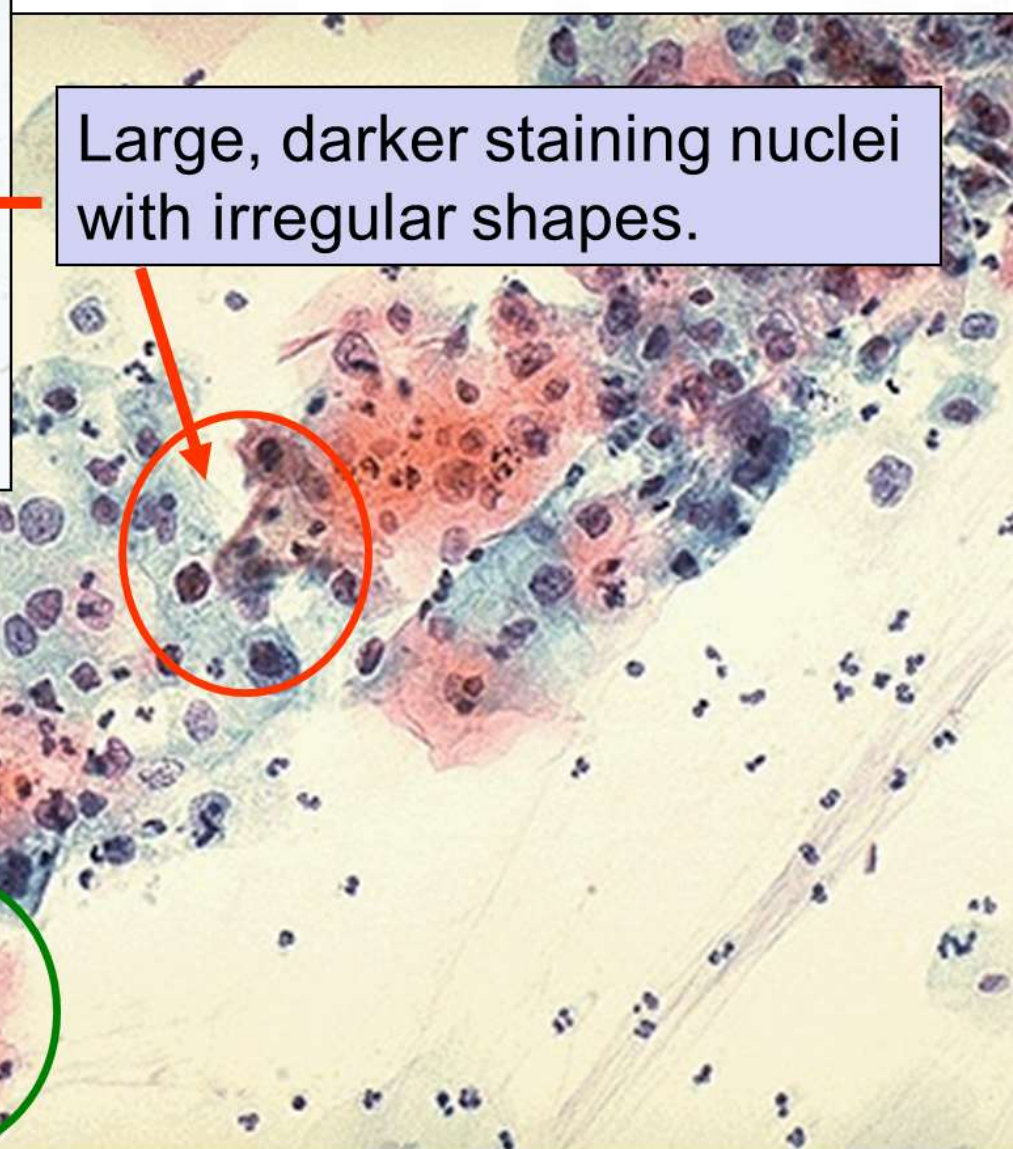
Normal

Cancer



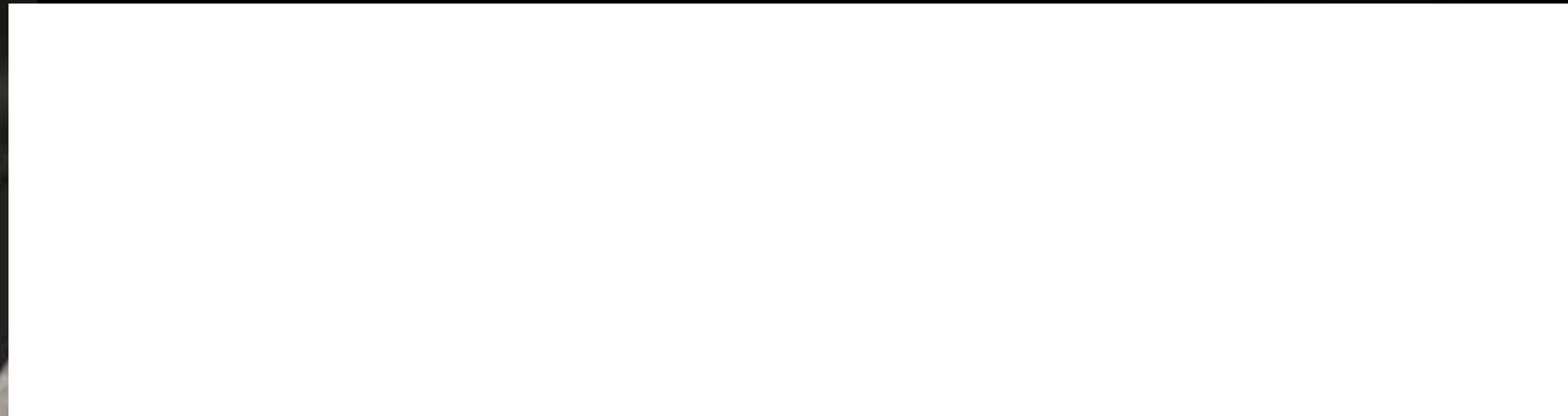
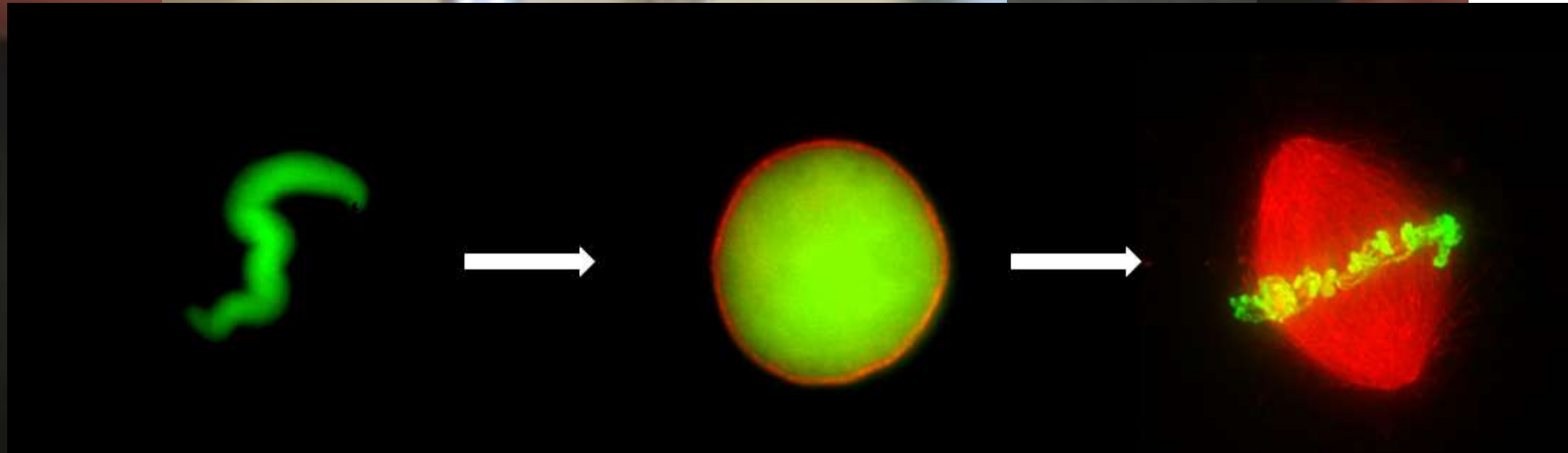
Large, darker staining nuclei with irregular shapes.

Normal cells with small, regular nuclei.



ese Winslow LLC has certain rights

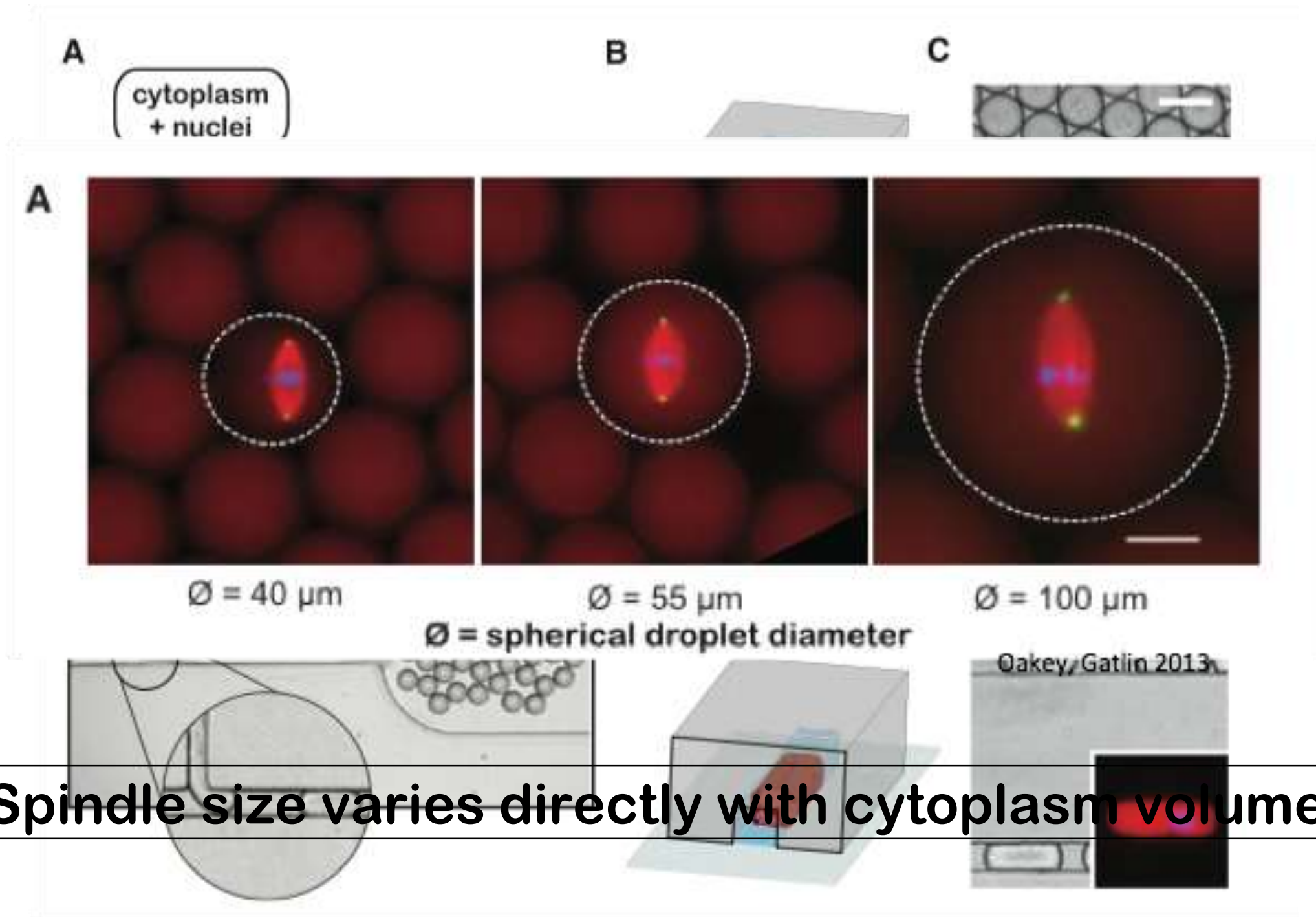
Spindle Formation



Crushed Eggs



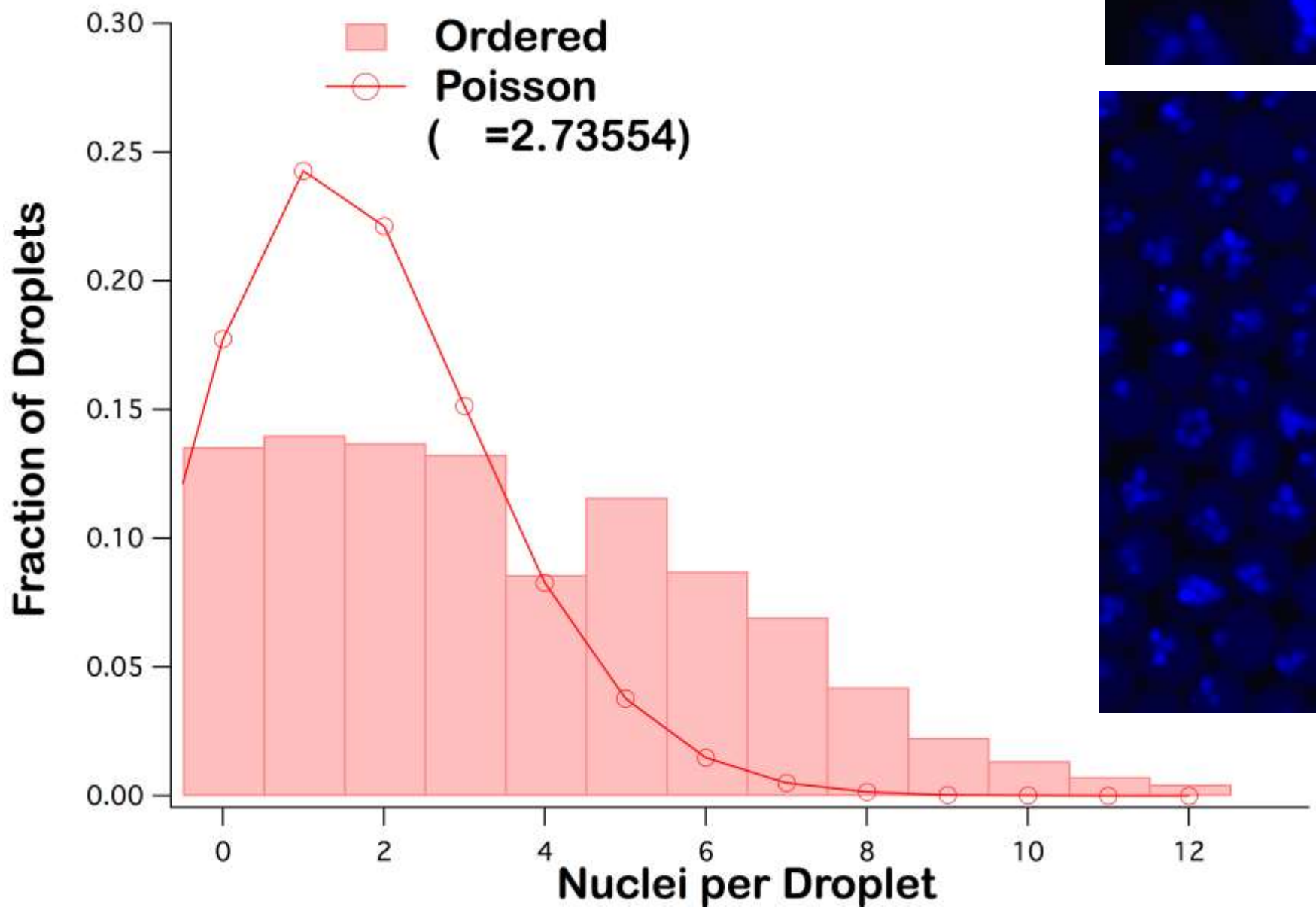
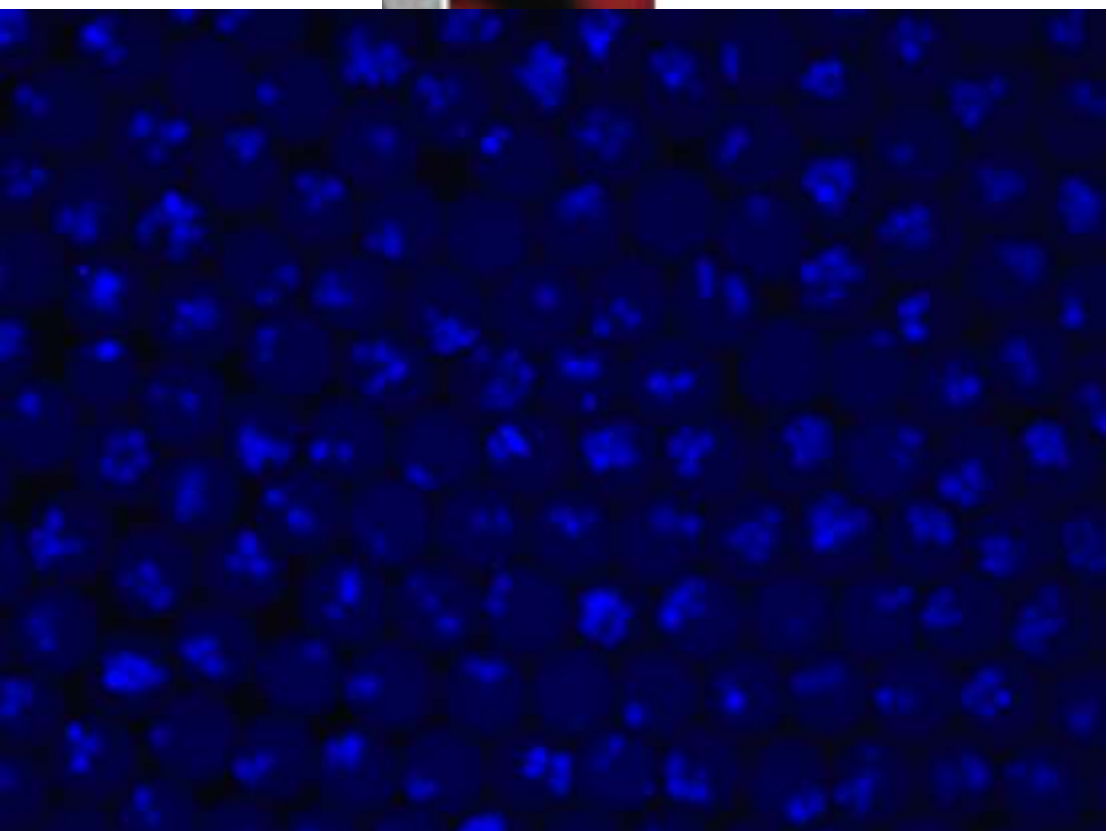
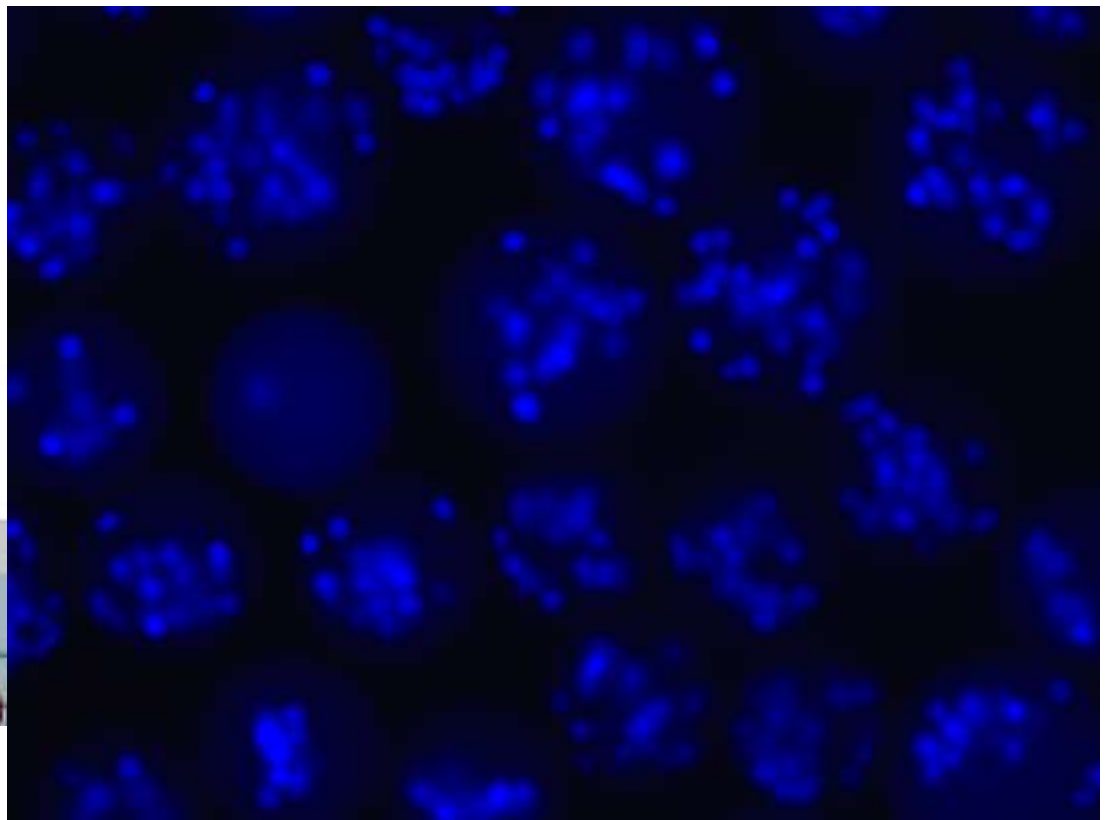
Spindle Formation



Spindle size varies directly with cytoplasm volume.

Nuclei Encapsulation





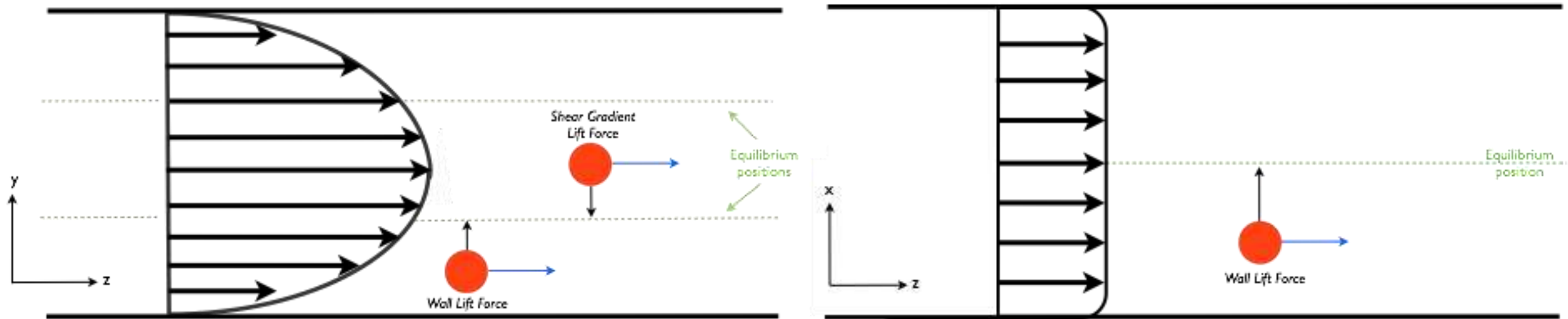
Inertial focusing

- Flow is generally viscosity-dominated and operates at low to zero Reynolds numbers-inertia is negligible.
- As Reynolds numbers approach and exceed 1, inertial forces can no longer be ignored.

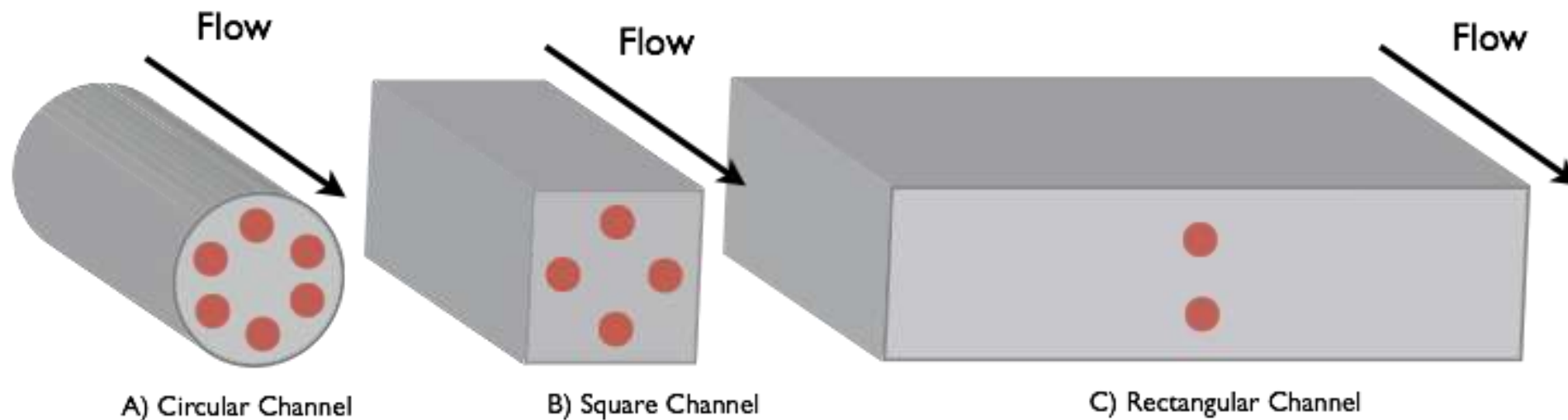
$$Re = \frac{\rho V l}{\mu} = \frac{\text{inertial forces}}{\text{viscous forces}}$$

$$R_p = R_c \frac{a^2}{D_h^2}$$

Inertial Focusing Behavior

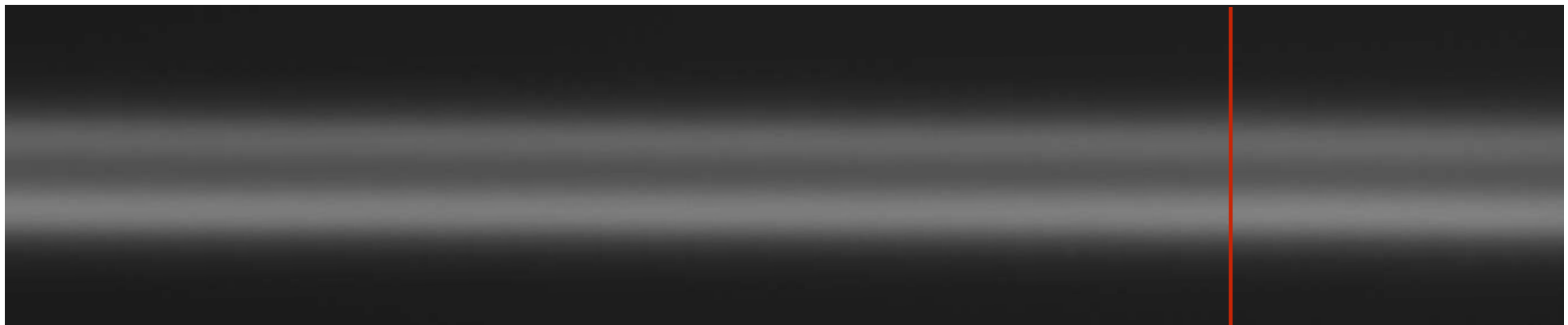
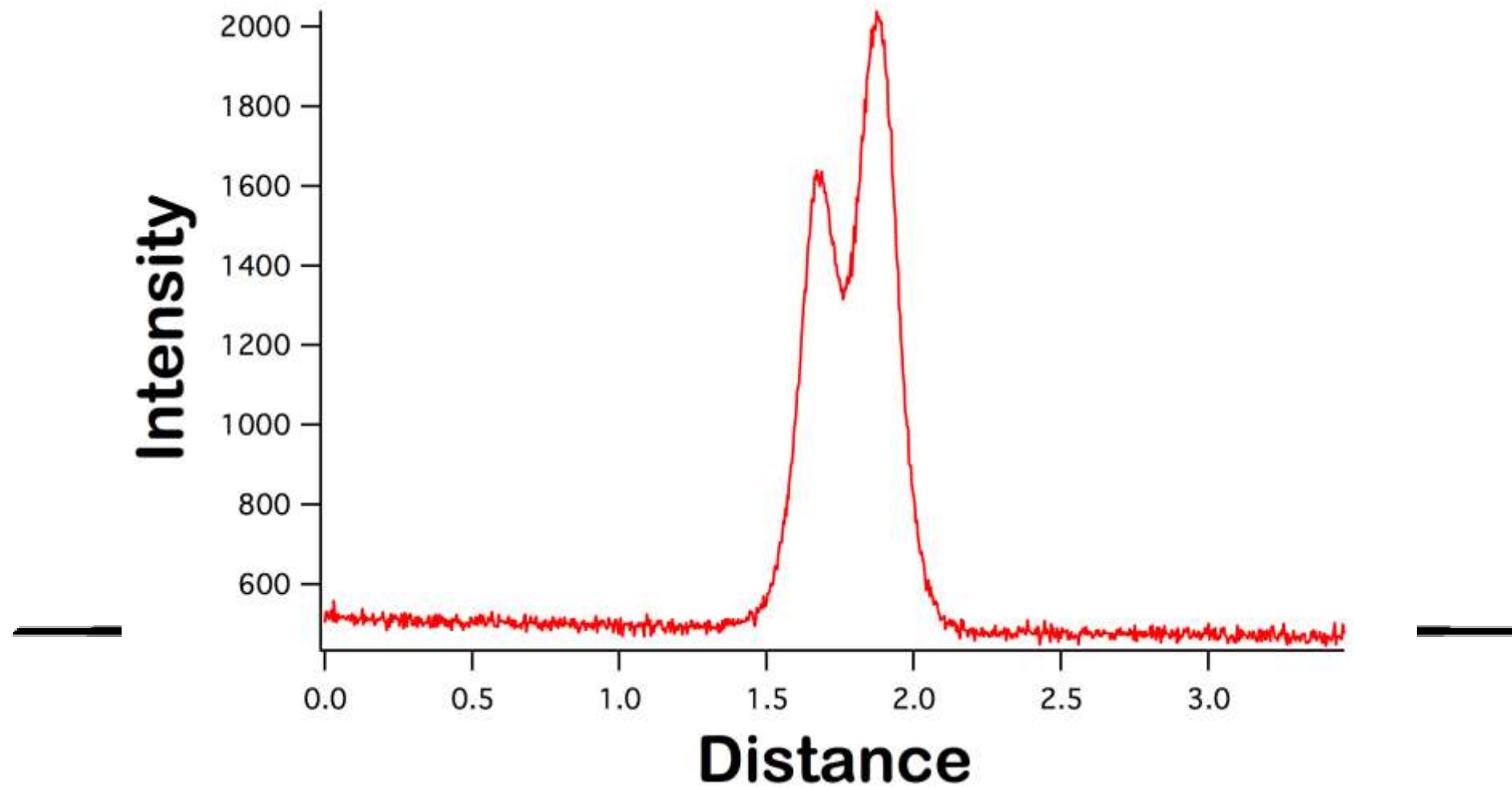


Focusing behavior in a straight channel. Opposing inertial lift forces acting on particles induce equilibrium focusing positions within microchannels.

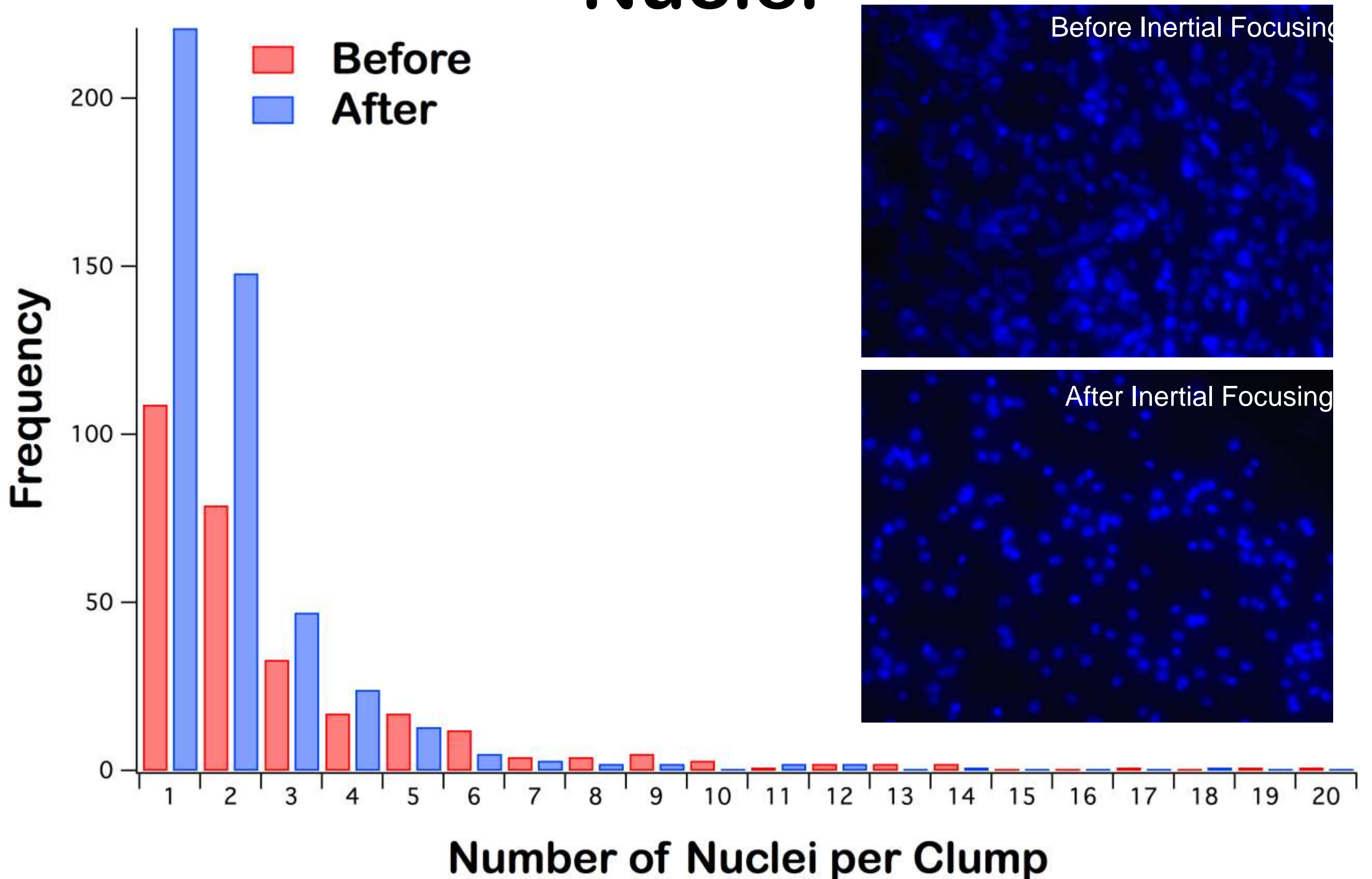


The number of equilibrium focusing positions derived from inertial forces vary by channel geometry.

Inertial Focusing

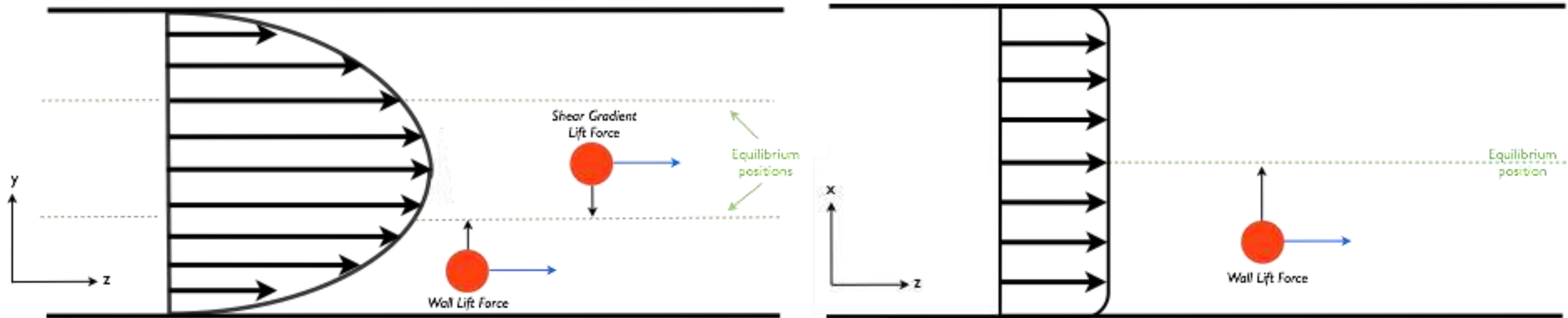


Inertial Focusing to Deaggregate Nuclei

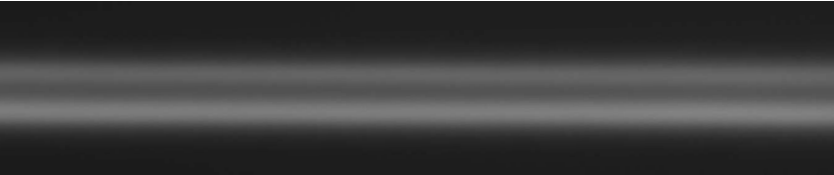


Hypotheses

1. Viscosity of the extract pushes the nuclei out of position into new equilibria positions
2. Nuclei deformability causes a shift in the focusing positions due to the Fahraeus effect

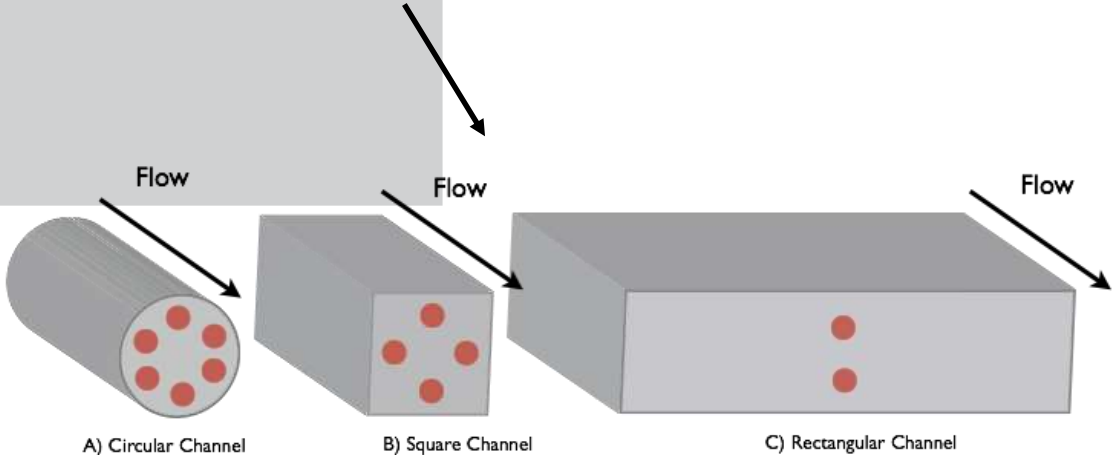
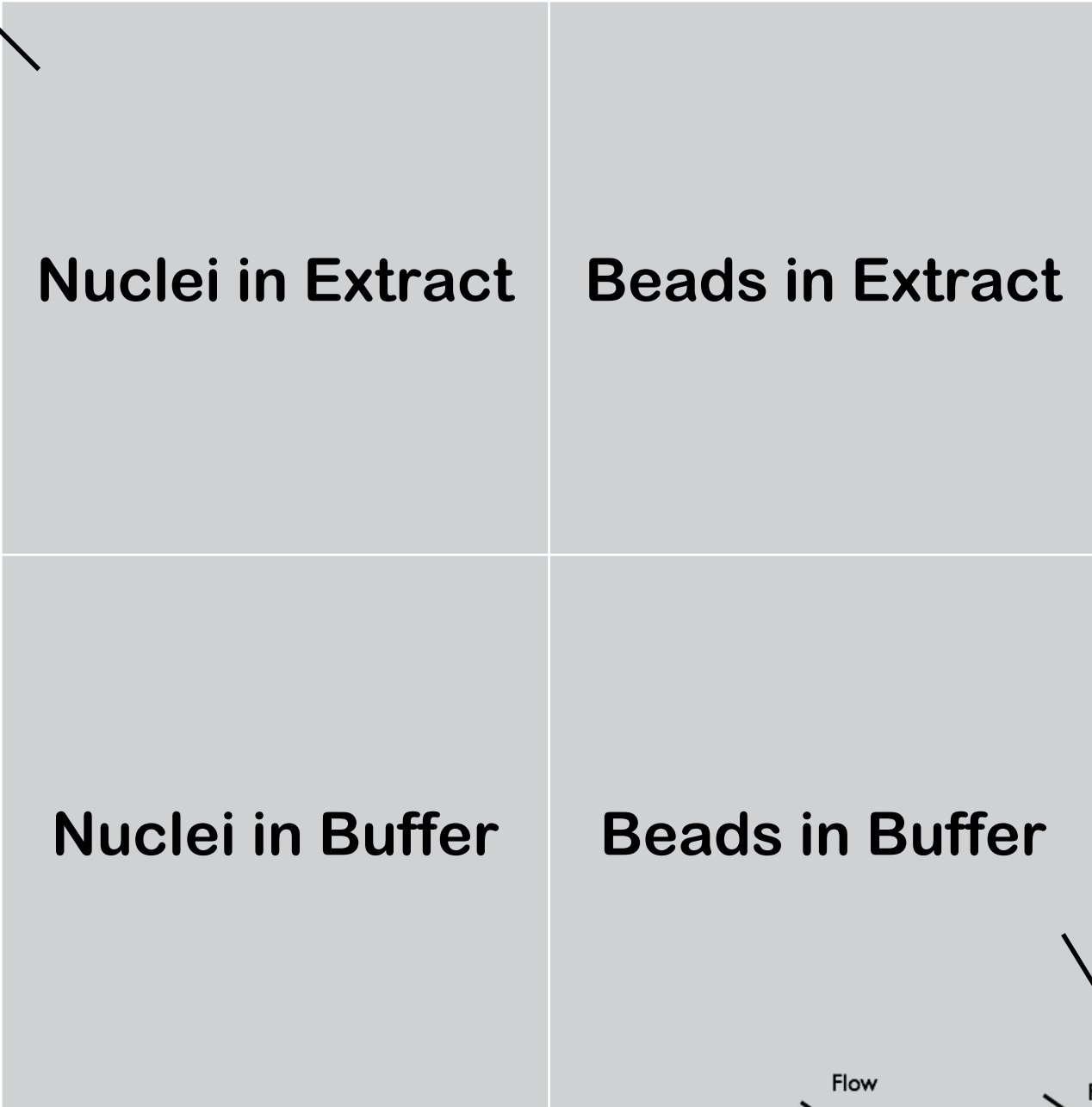


What's Next



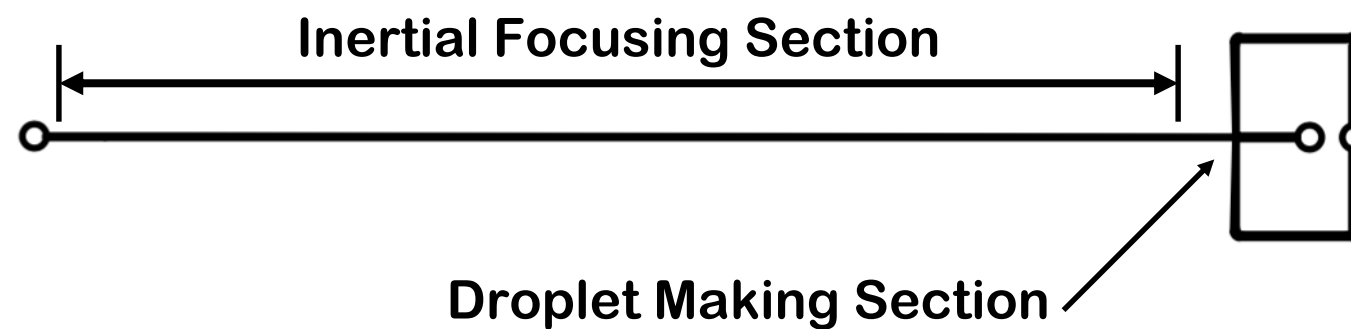
Particle

Medium

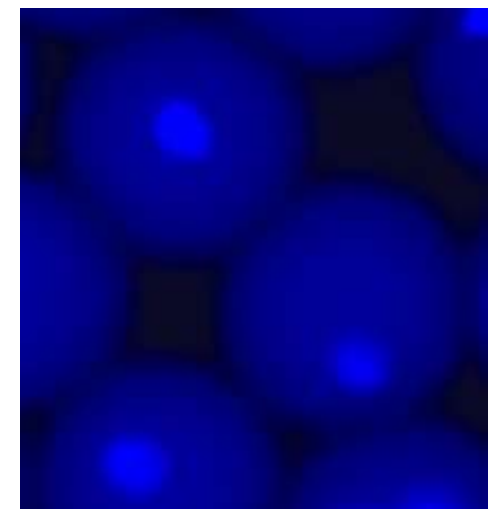


Next

- Use device that has inertial focusing and droplet making sections



- Encapsulate one nuclei per droplet



- Run sizing experiments to determine how nuclei scale

Thanks!

