

Effect of Particle Shape on Motion in Microfluidic Channel



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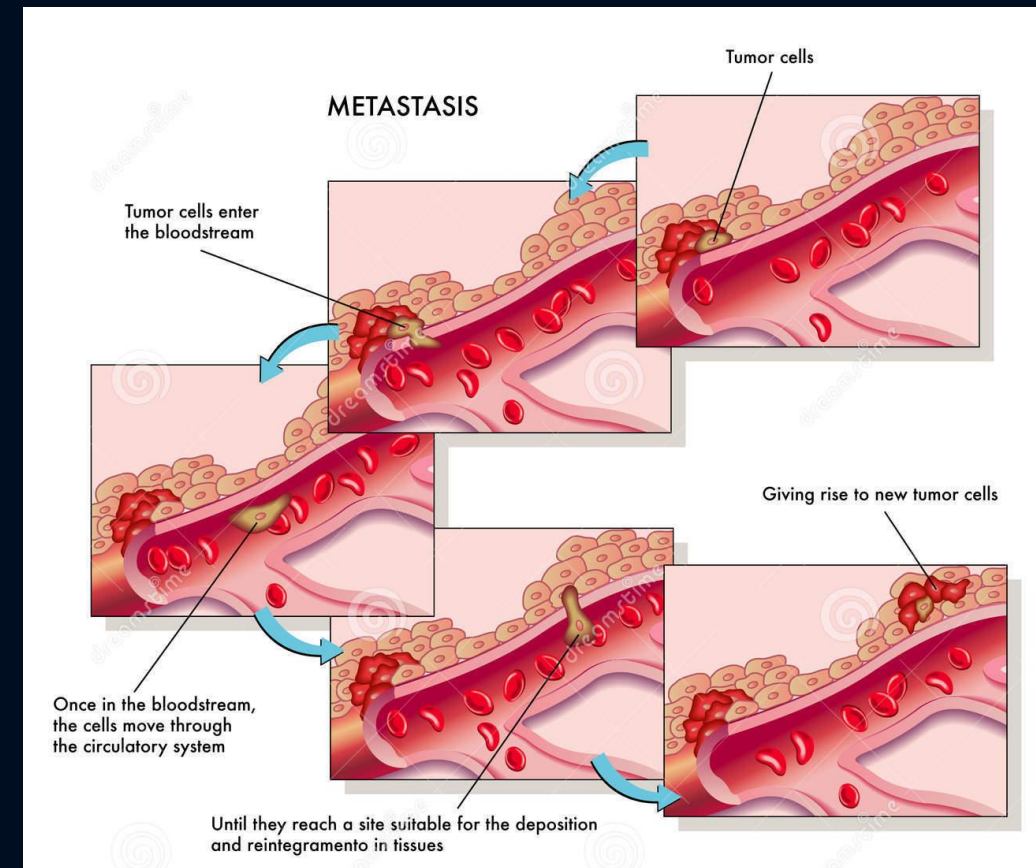
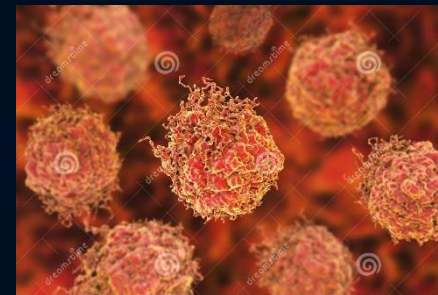
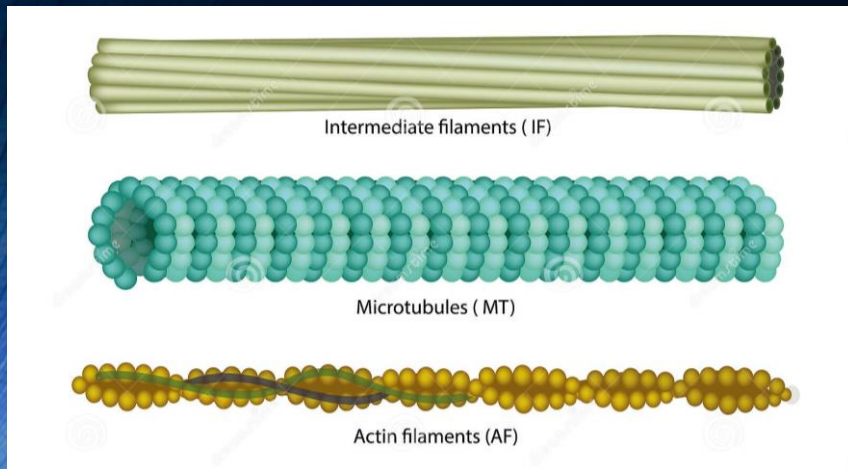
Content

- ❑ Why microchannels?
- ❑ What's the history?
- ❑ A nature communication paper
- ❑ Conformity with experimental results
- ❑ Future works
- ❑ Conclusion

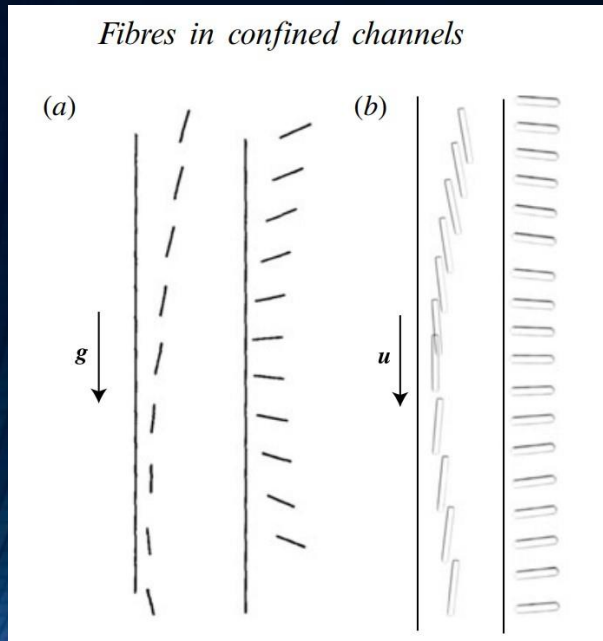
INTRODUCTION

What's the Difference?

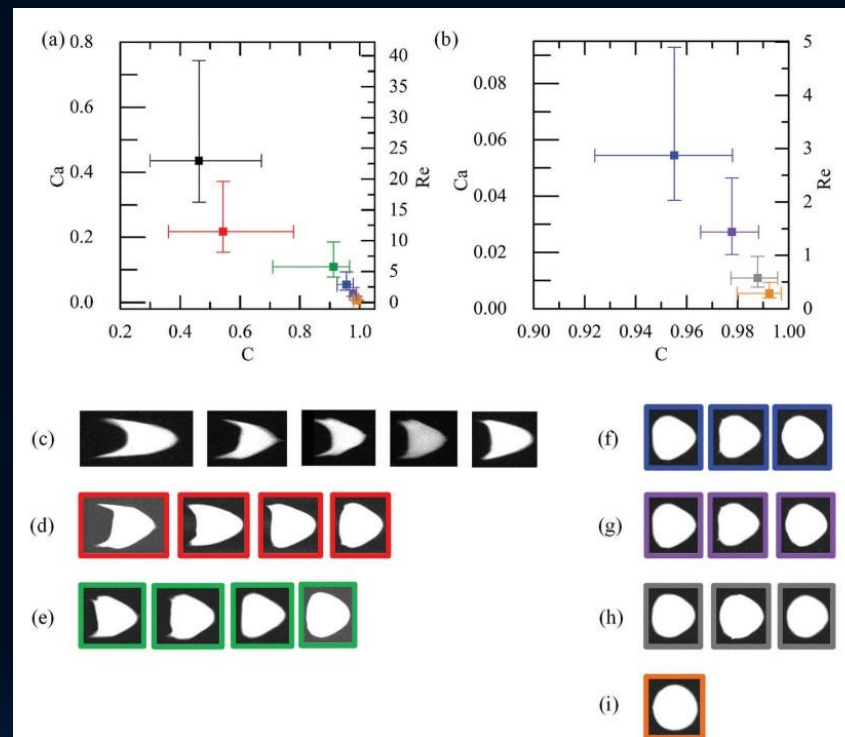
- q2D motion
- Quicker damping
- More noises
- IT'S ABOUT OUR BODY



Other Works



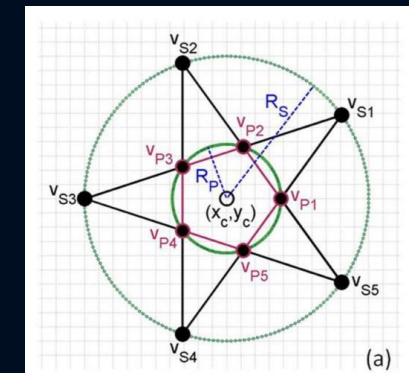
M. Nagel et al., J. Fluid Mech. 835, 444, 2018



M. Y. Hwang et al., Soft Matter 14, 216, 2018



M. Trofa et al., Phys. Fluids 31, 083603, 2019



H. Başağaoğlu et al., Sci. Rep. 8, 1, 2018

So what did W.Uspal, H.Eral & P.Doyle do?



Pictures from Google Scholar



W. E. Uspal et al., Nat. Commun. 4,2666,2013

Channel and Particle Geometry

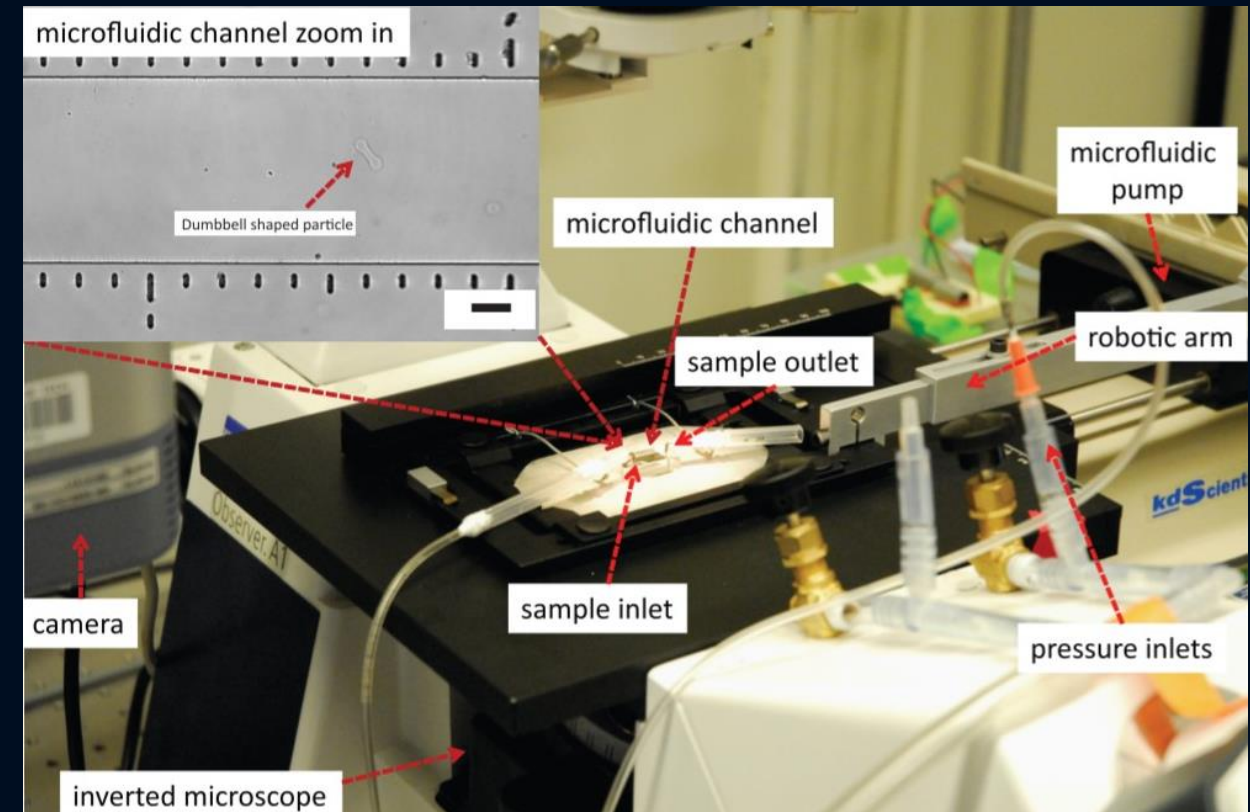
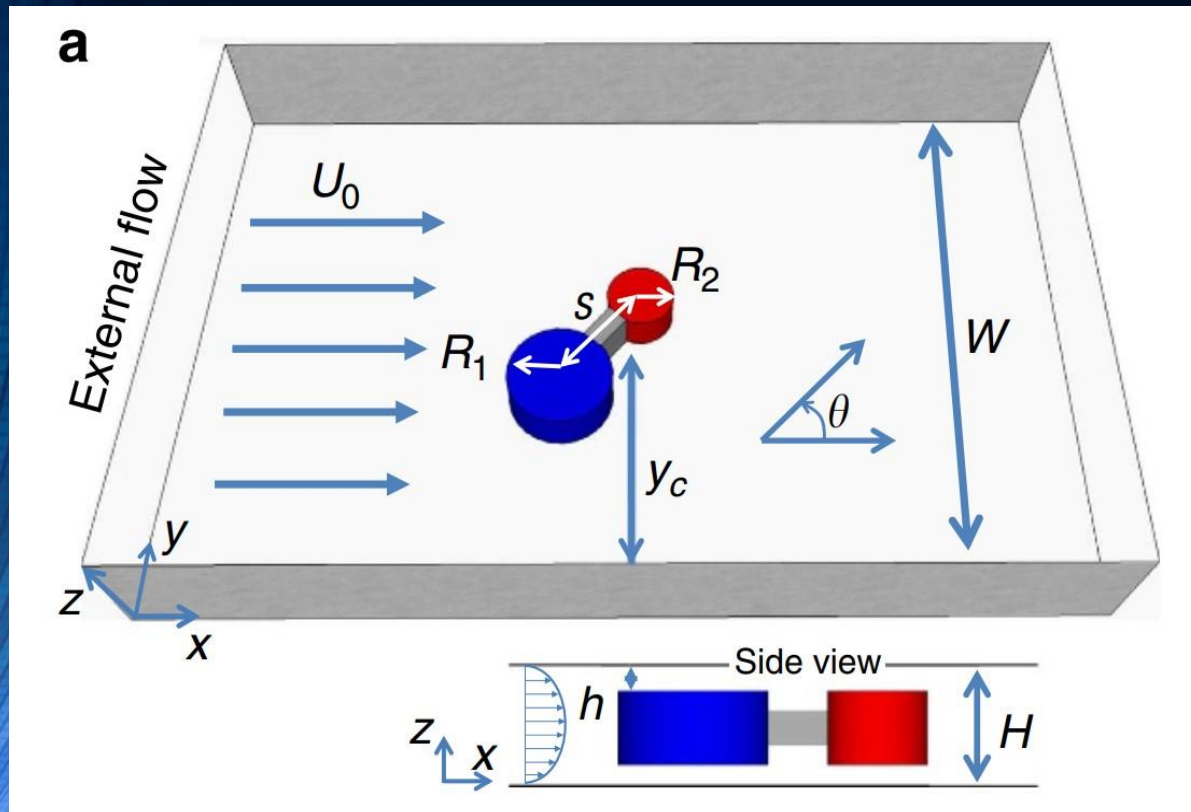


Figure 1

$$\tilde{R} \equiv \frac{R_1}{R_2}$$

- Oscillation
- Damped oscillation
- Over damped oscillation

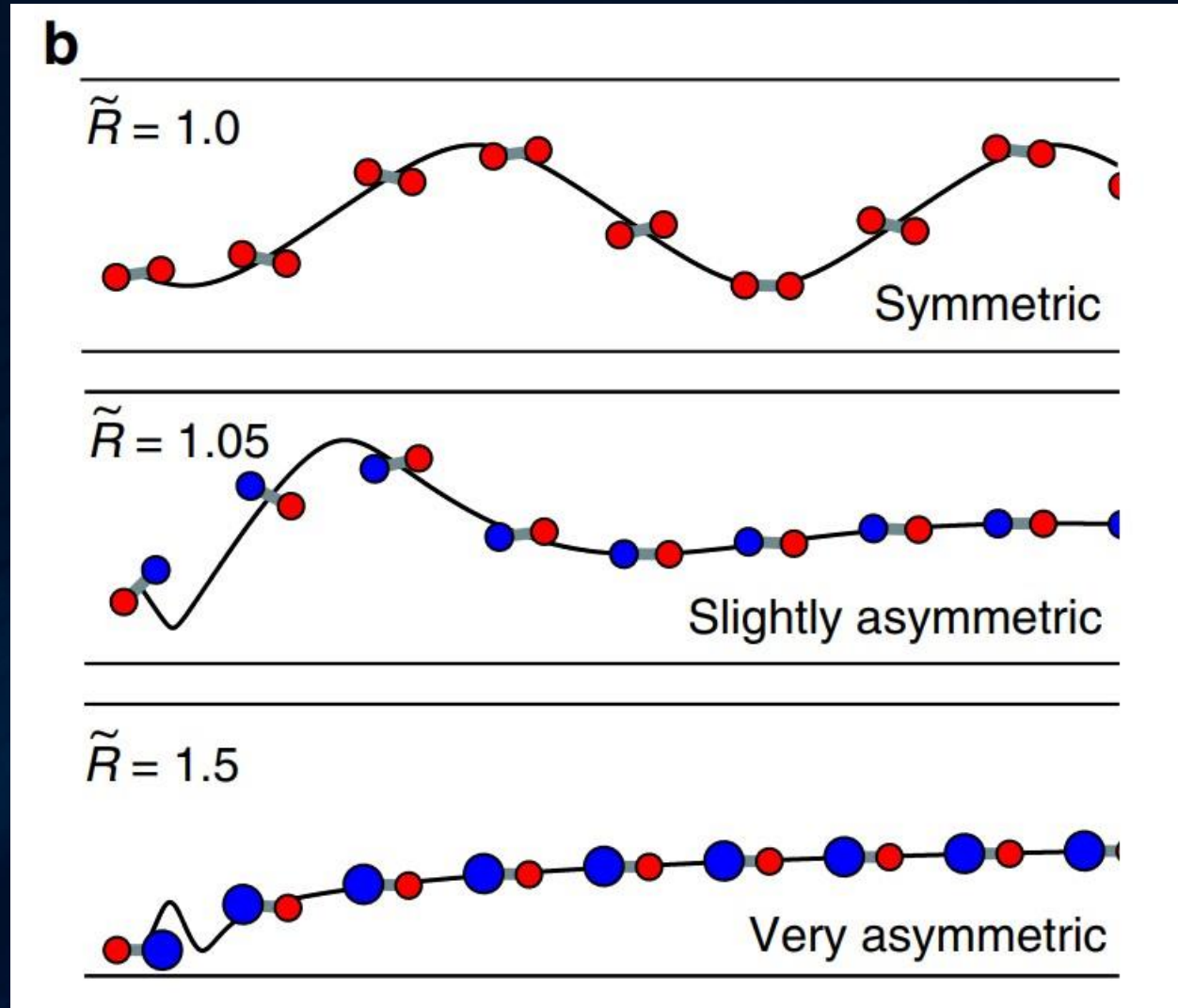
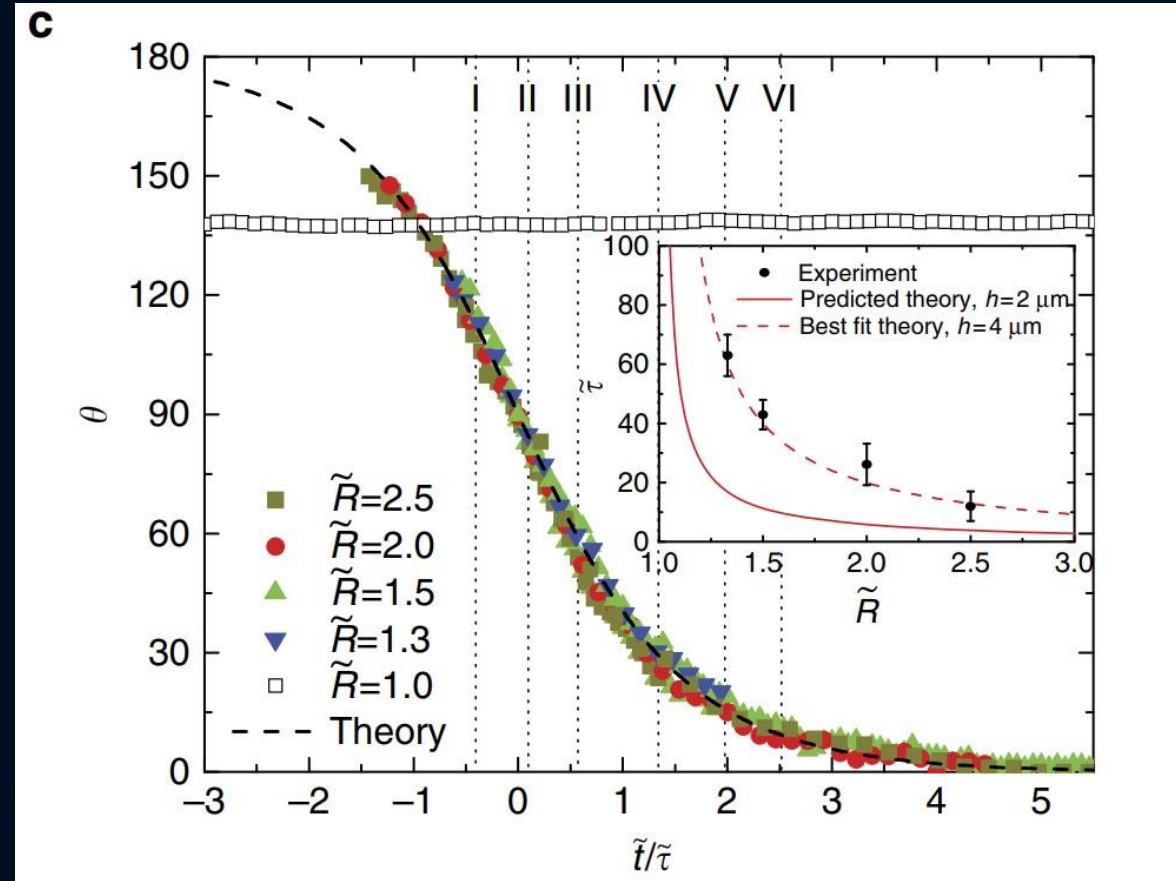
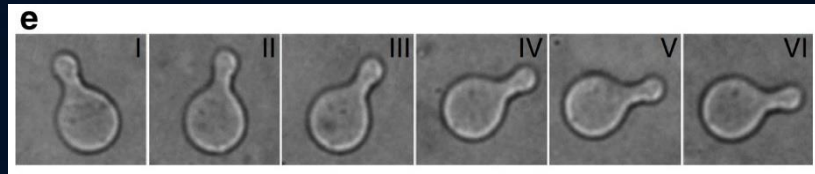
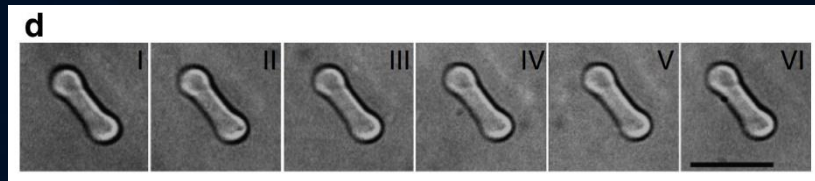
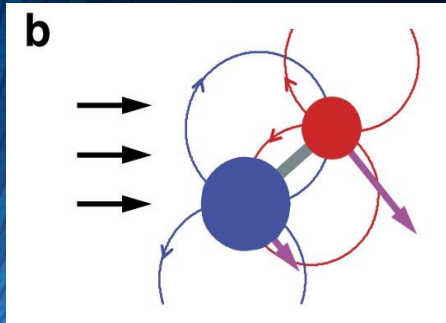
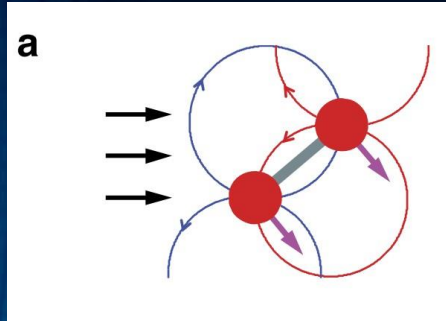


Figure 1

Self-Interaction



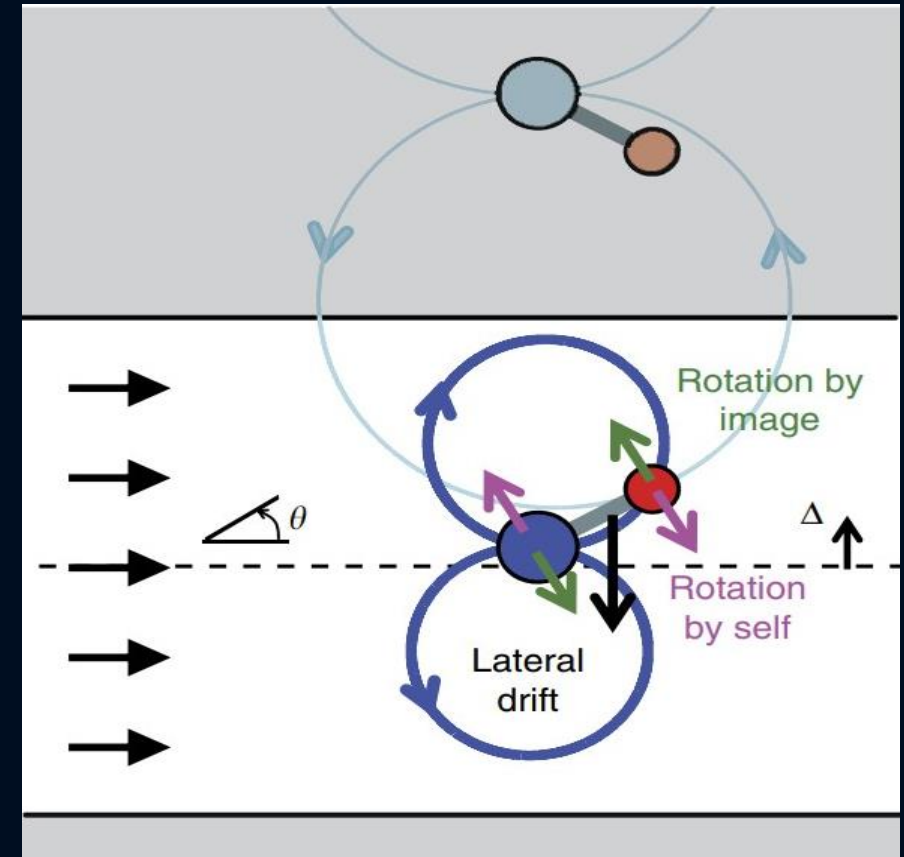
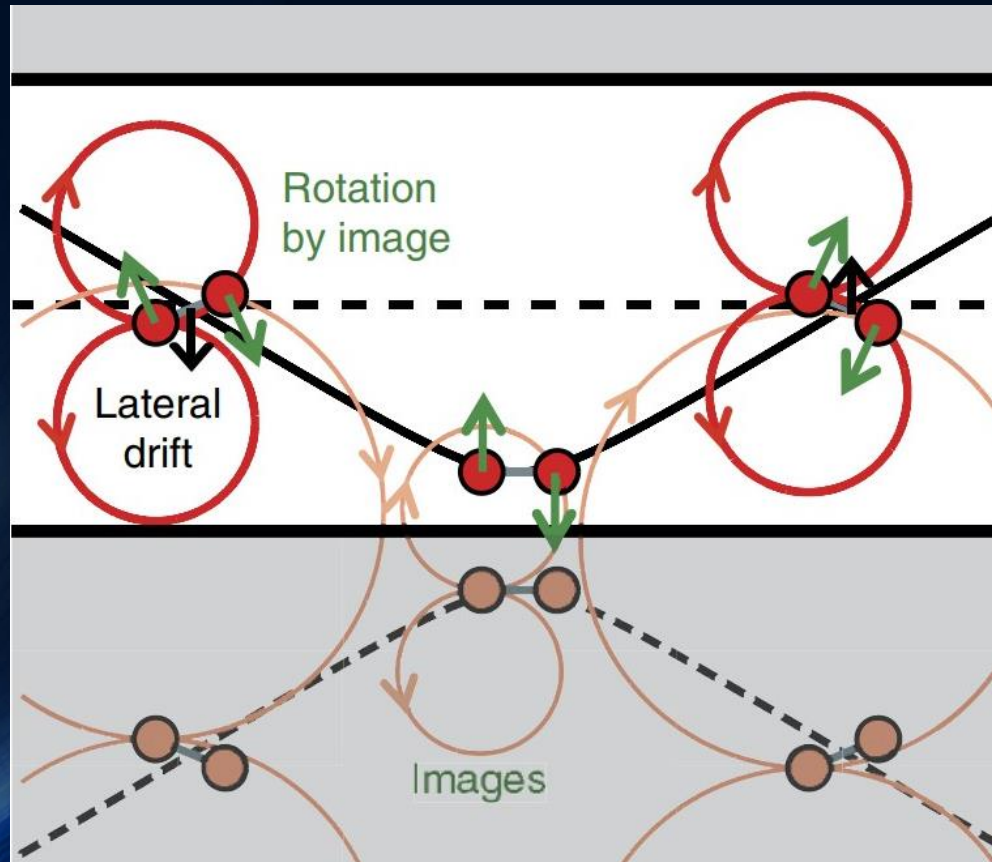
Bipolar hydrodynamic fields

Figure 2

Particle-wall Interaction

A little trick...

A little trick...



$$\dot{\theta} = b\Delta - c\theta$$

Figure 3,4

NUMERICAL RESULTS

Critical Boundary

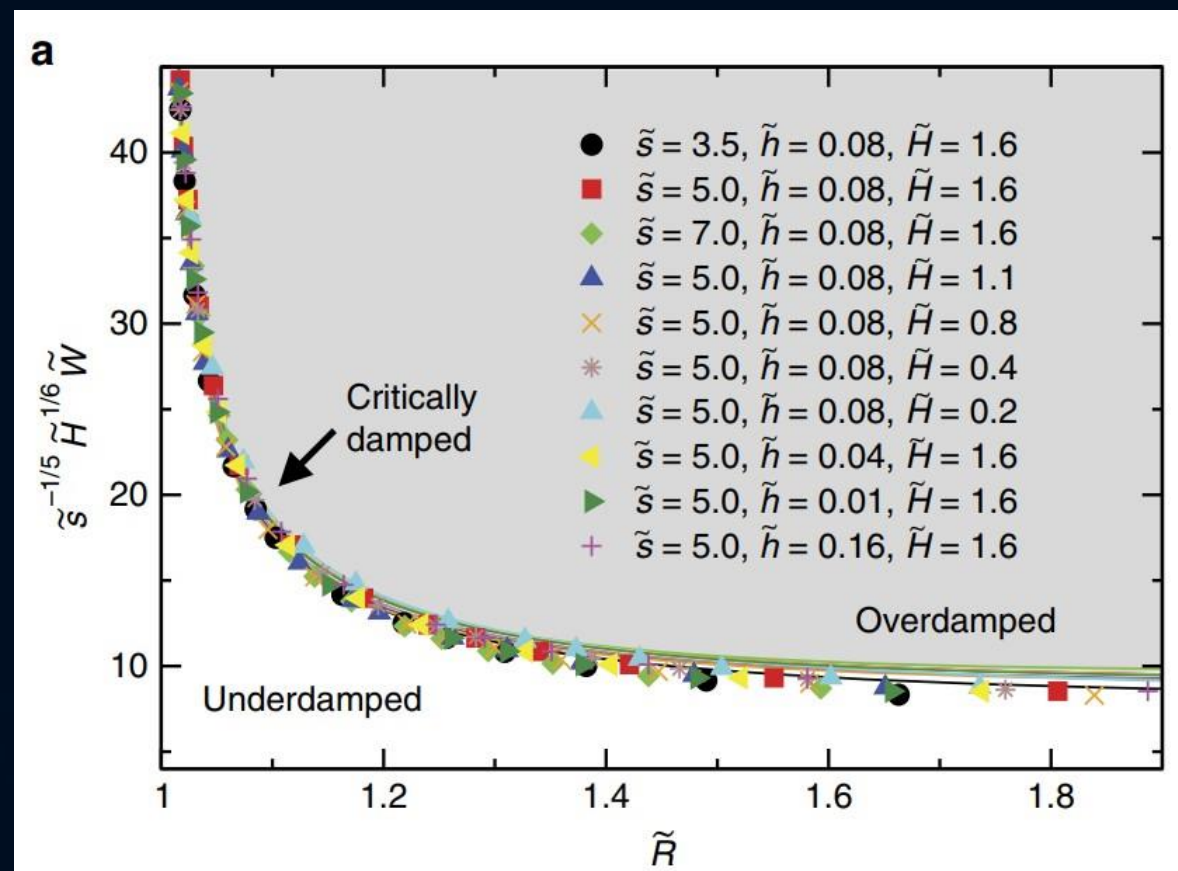
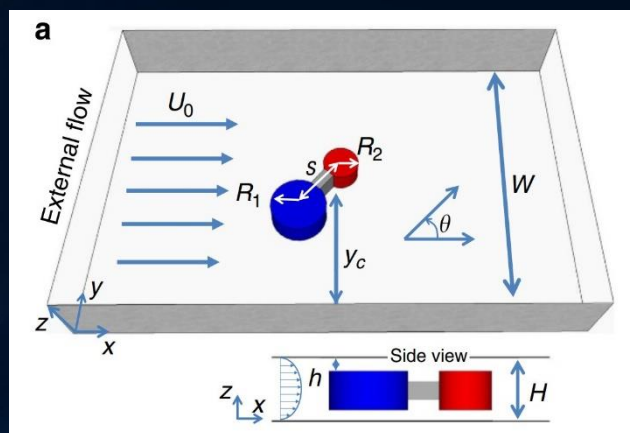
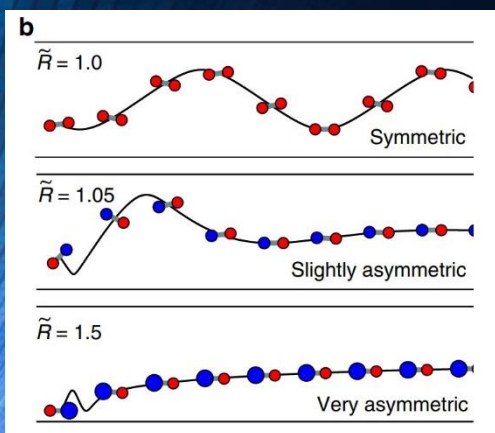
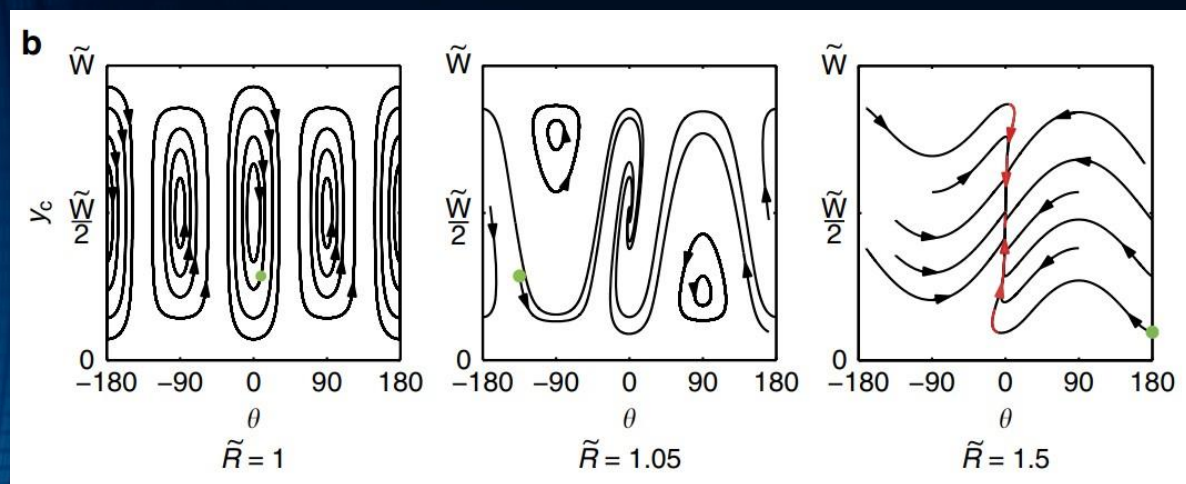


Figure 5,1

EXPERIMENTAL RESULTS

Individual Particle Trajectories

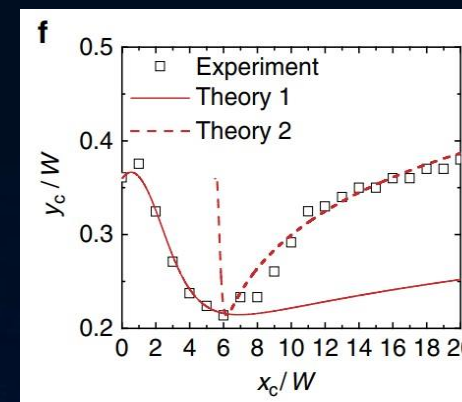
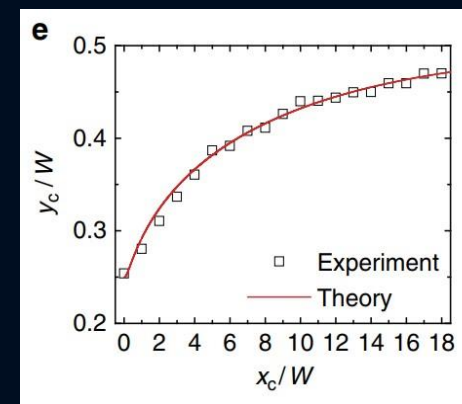
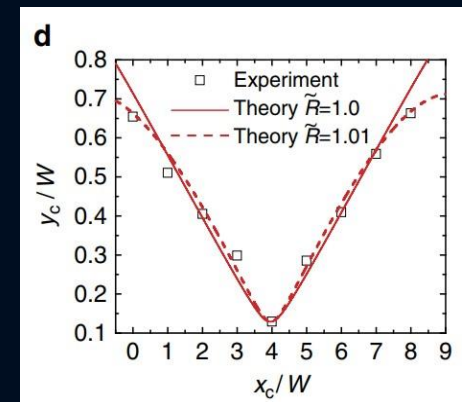
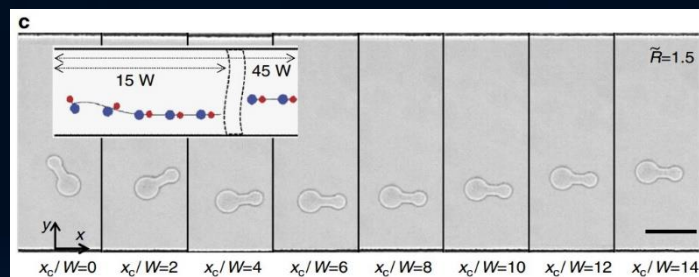
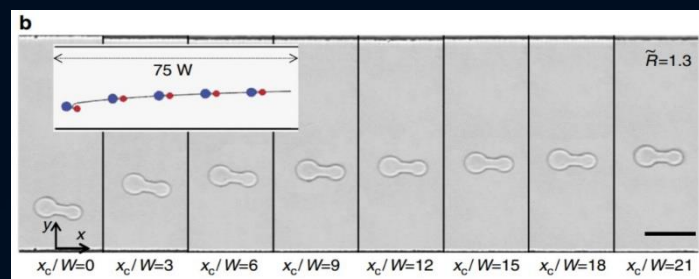
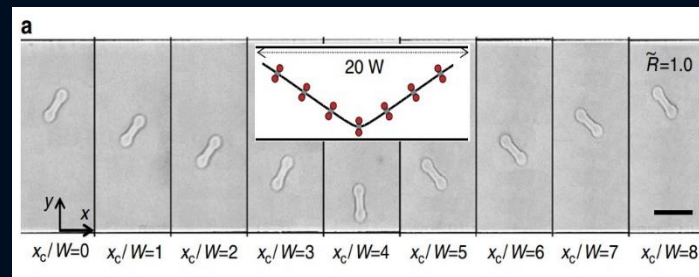
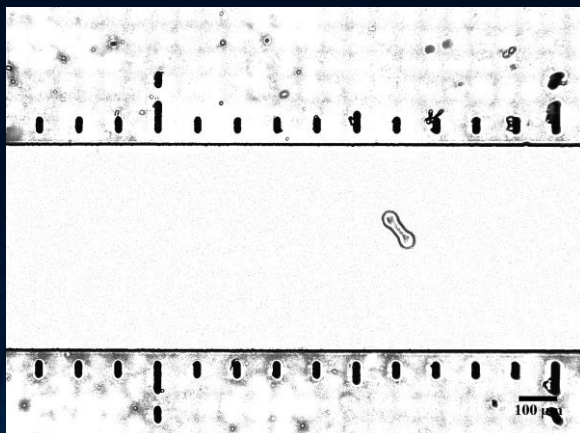


Figure 6

Channel Outlet

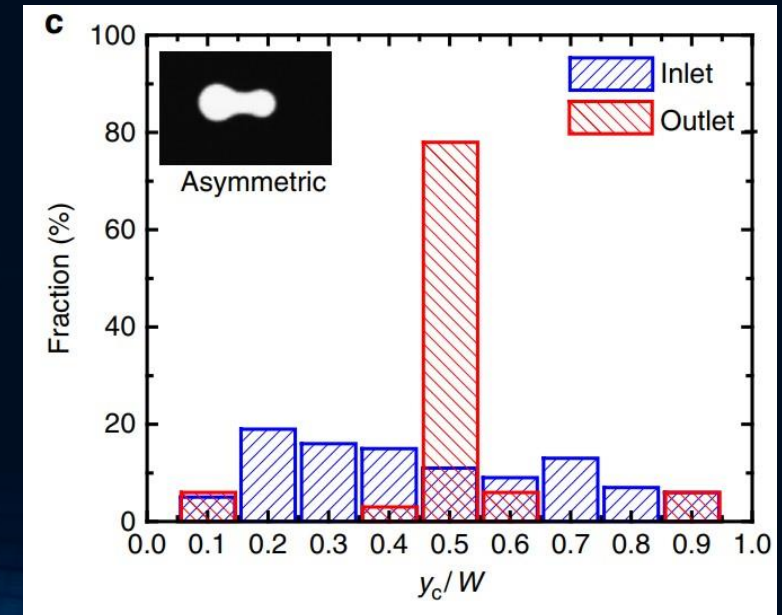
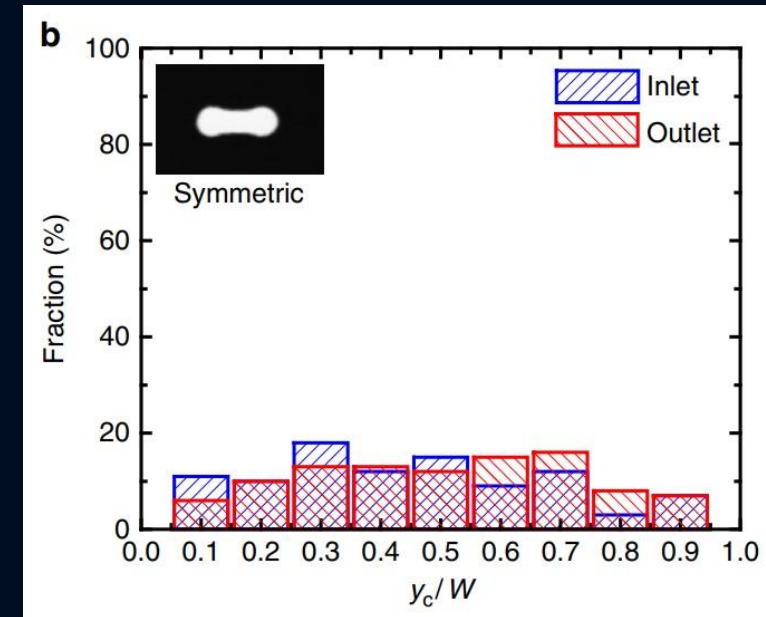
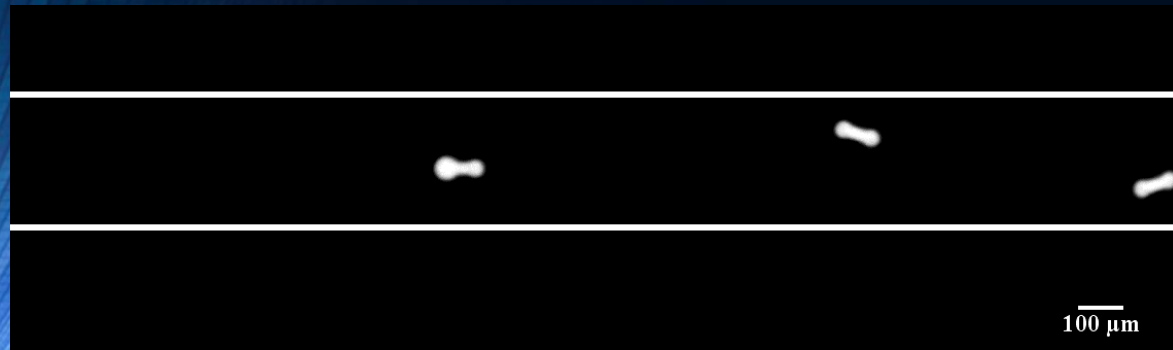
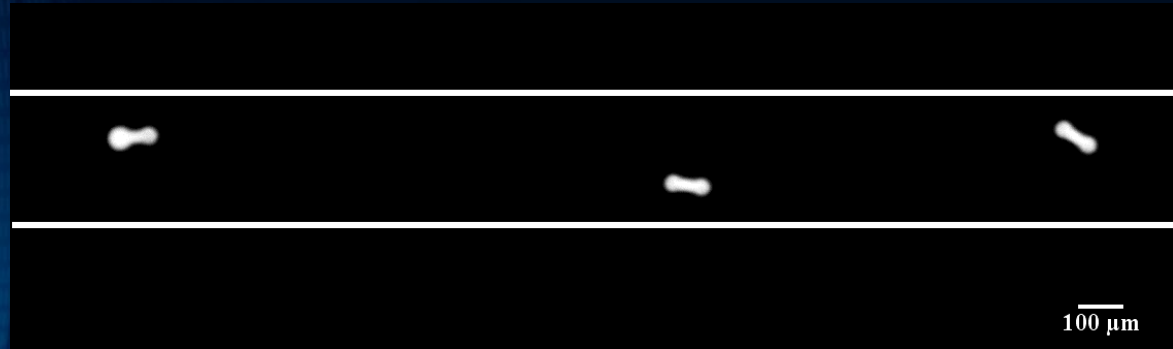
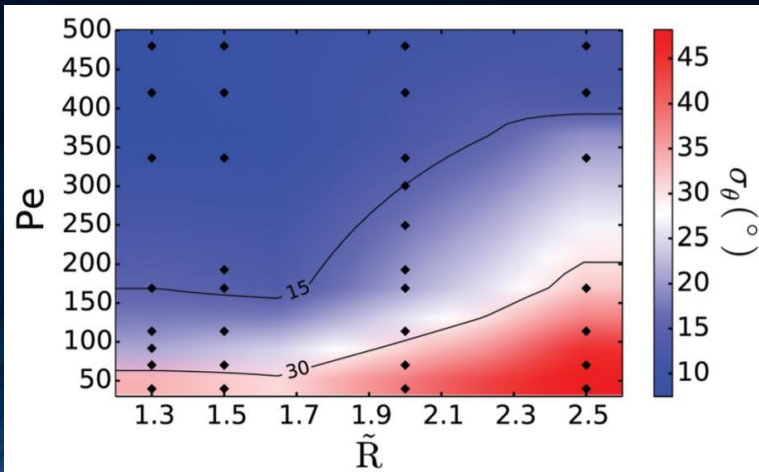


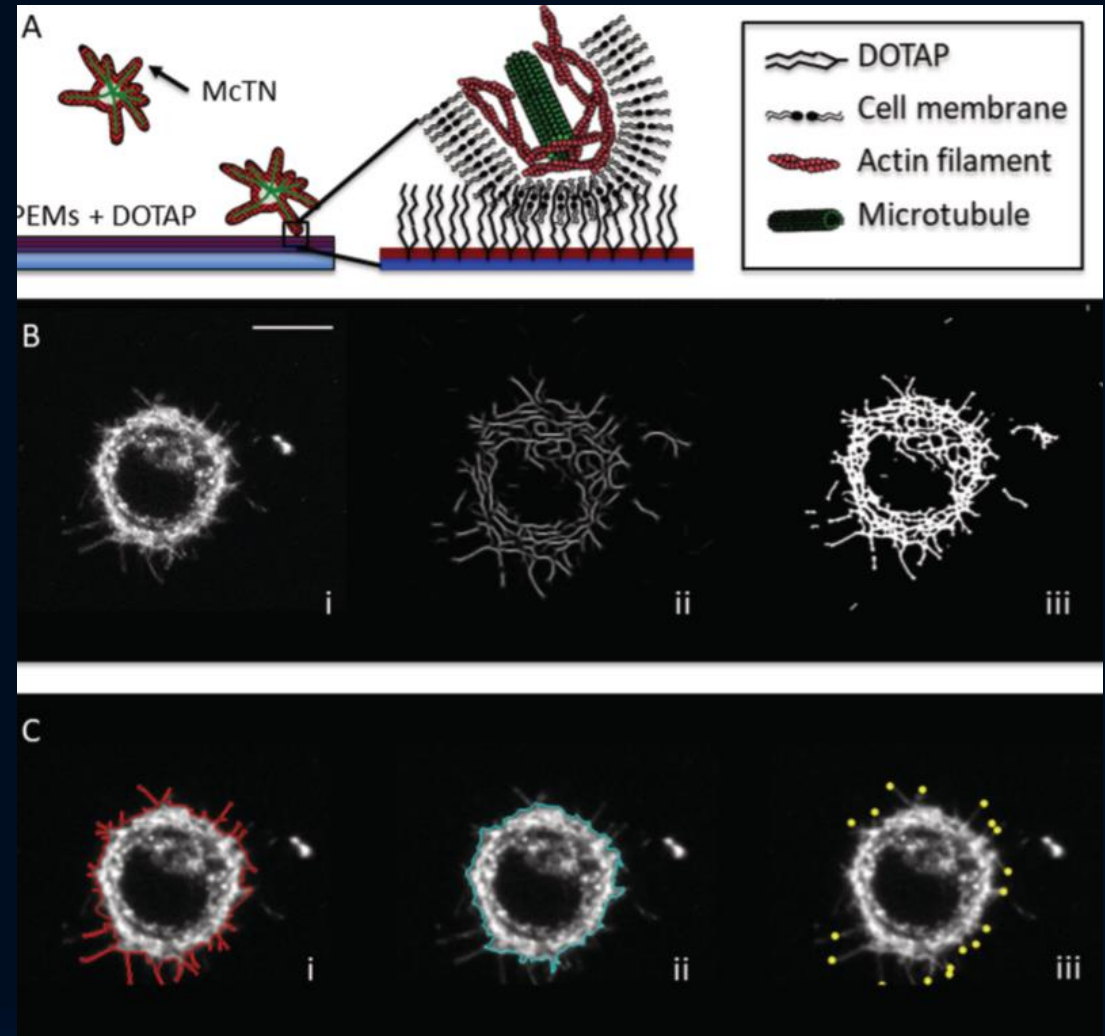
Figure 7

What's Next?



G. Fiorucci et al., *Soft Matter* 15, 321, 2019

E. C. Ory et al., *Oncotarget* 8, 111567, 2017



CONCLUSION

- ✓ Importance
- ✓ Topics
- ✓ Engineering particle trajectories
- ✓ Future works

THANK YOU

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Special thanks to Dr Shaebani and Dr Hamzehpour

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