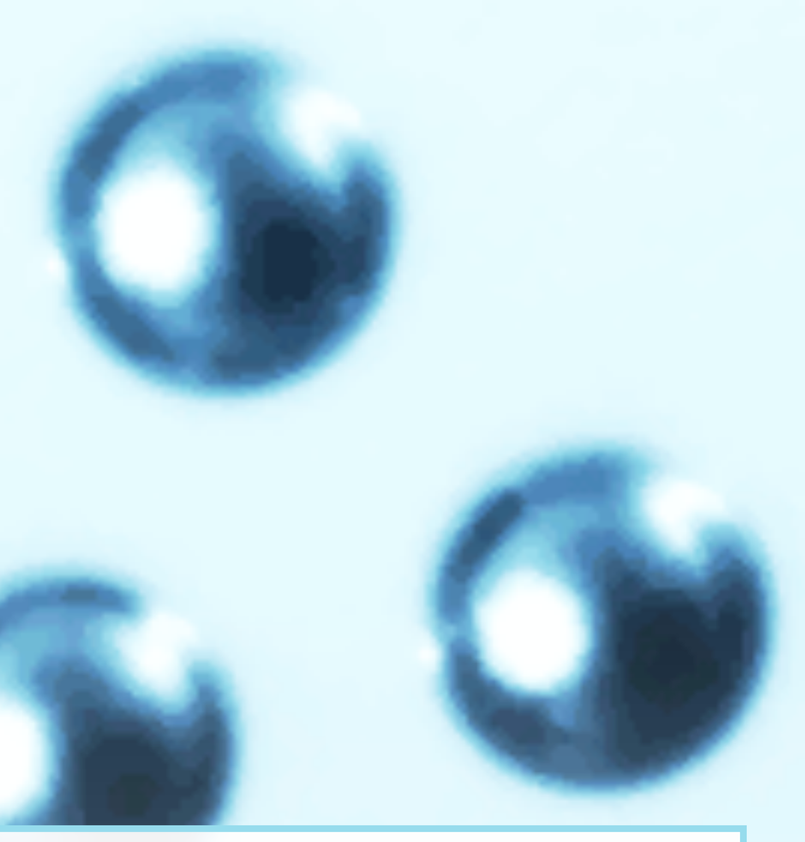
Remote control of self-assembled magnetocapillary microswimmers



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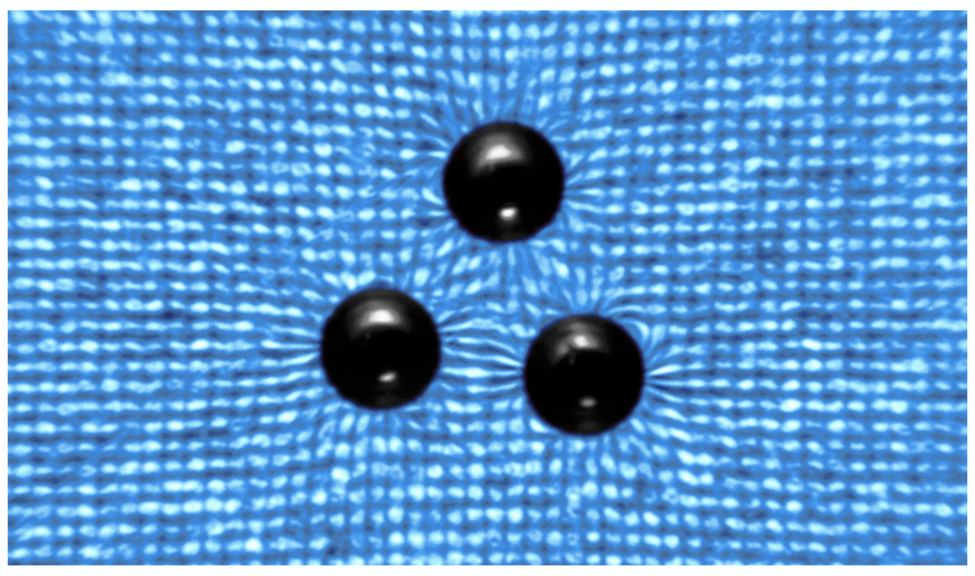
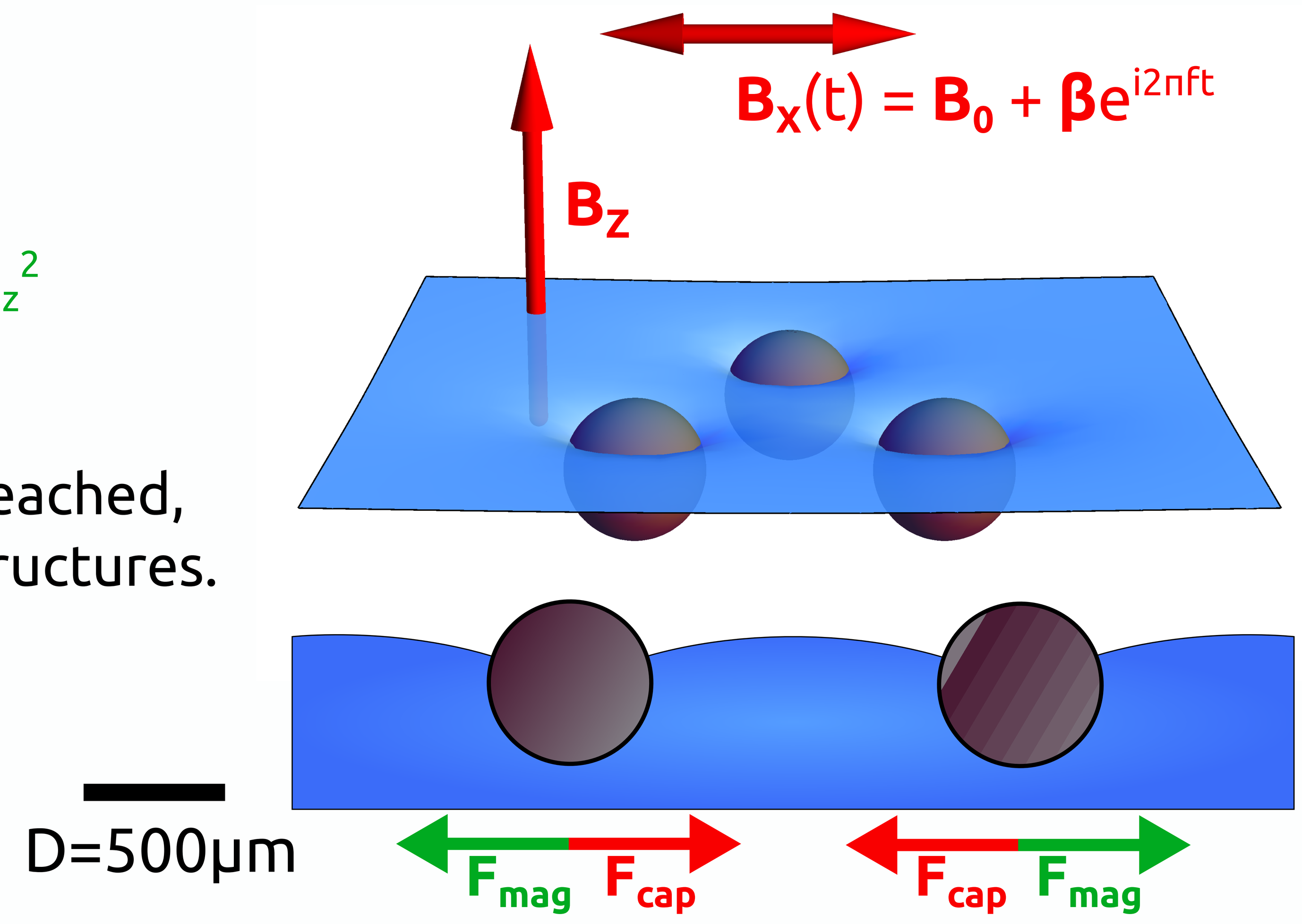
3 floating magnetic beads on a water surface.



Vertical field B_z generates assemblies of tunable size.

Competition between :
- capillary attraction F_{cap},
- magnetic repulsion $F_{mag} \sim B_z^2$ (soft-ferromagnetic beads).

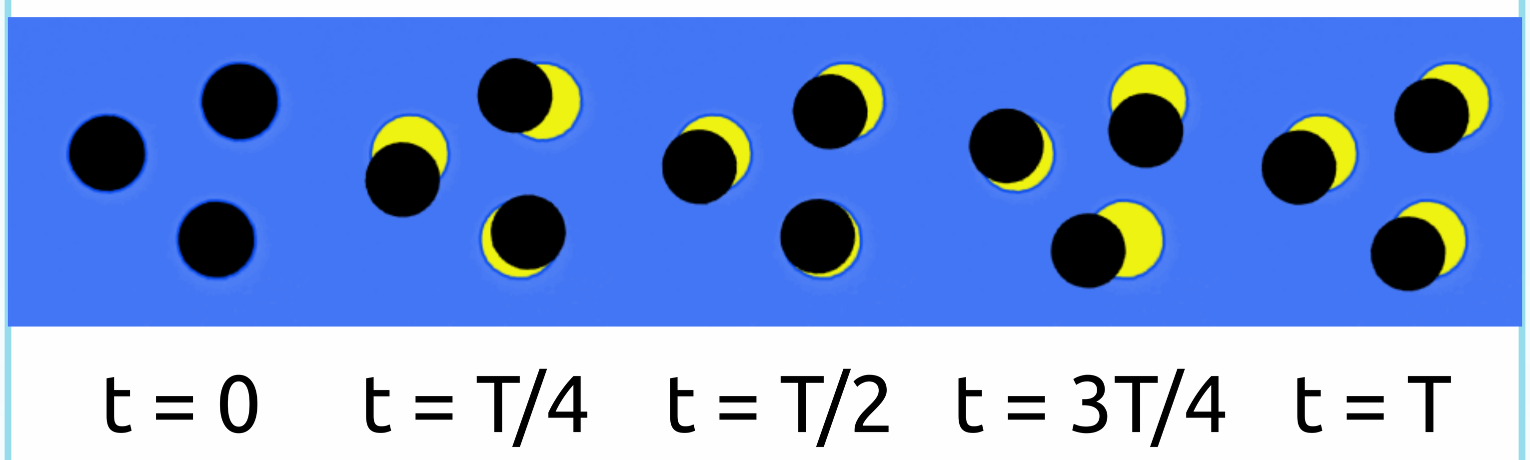
An equilibrium distance is reached, which leads to organized structures.



Horizontal field $B_x(t) = B_0 + \beta e^{i2\pi ft}$ produces low Reynolds motion.

Deformations must be non-reciprocal.

Simple 1D locomotion is possible. Here, T=2s.



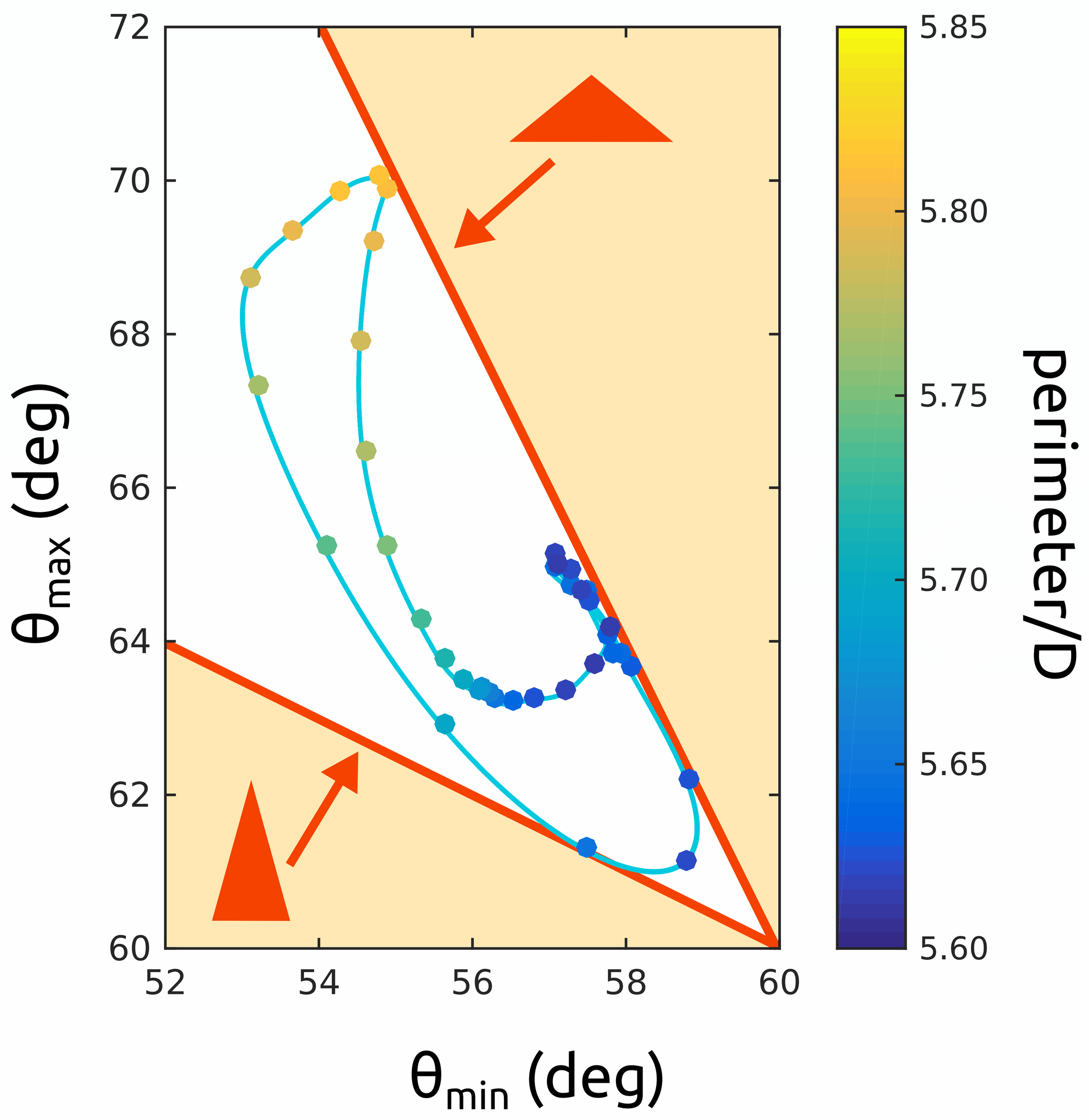
Evidence of non-reciprocal motion.

Loops in configuration space
⇔
Non-reciprocities.

Shape changes between 2 isosceles configurations :

"lepto"

"platy"

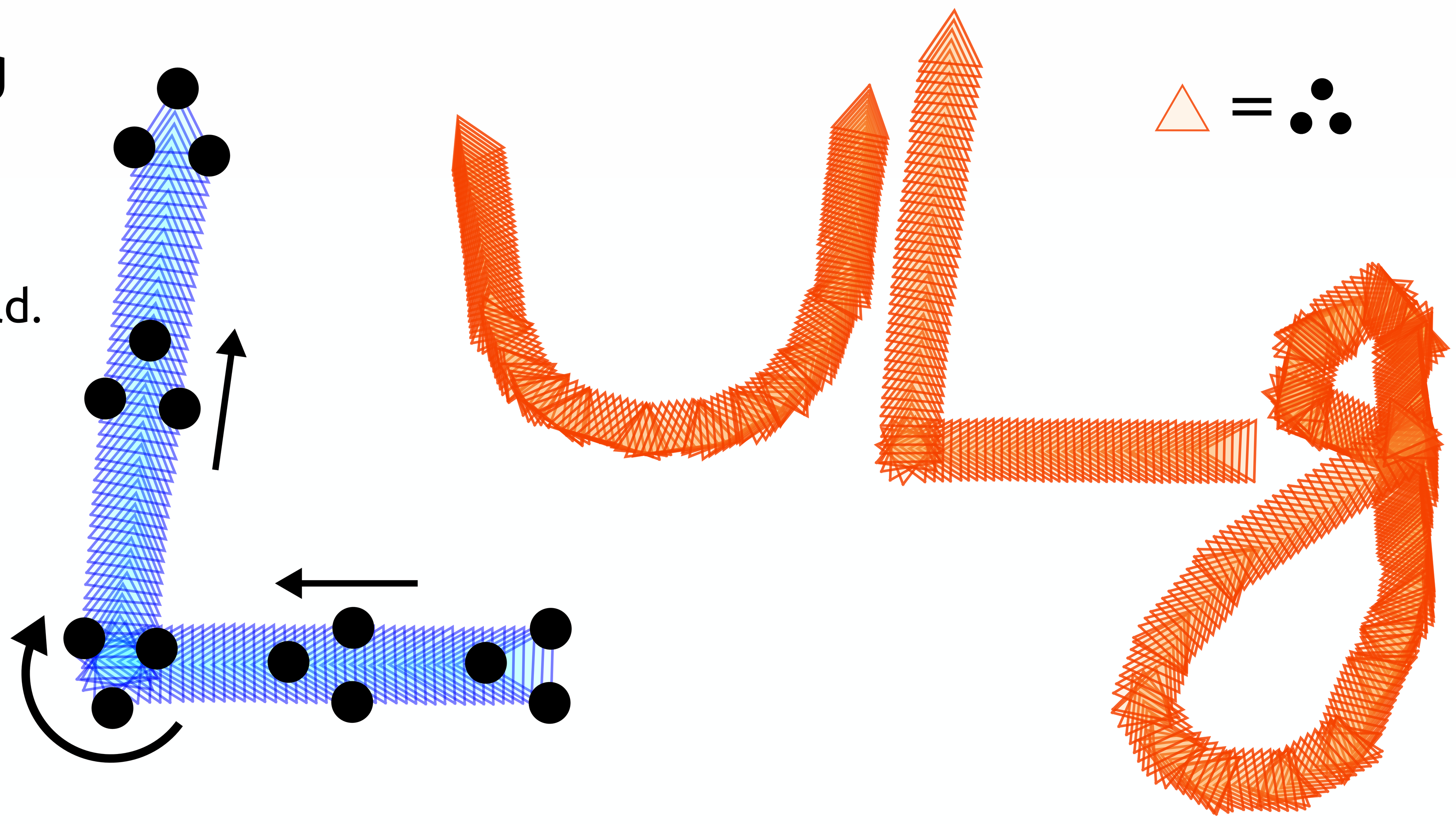


Remote control is possible by changing the orientation of $B_x(t)$.

We can change swimming direction by rotating the field.

Directed trajectories are possible, including smooth curves, straight angles or closed loops.

Swimming is determined by the amplitude and frequency of $\mathbf{B_x(t)}$.



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