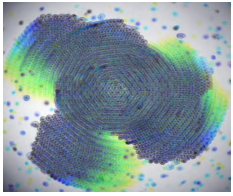
Active matter and collective behaviours

[Carine Douarche, Julien Tailleur, Thursday 9:30-12:30, Room 109 lobby 14-24, Sorbone Université]

Drive at the microscopic level ⟶ *Strongly out of equilibrium* ⟶ *New physics*

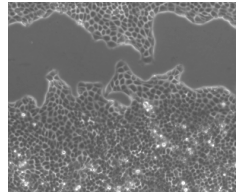


Starfish oocytes

[Fakhri's Lab]

Bird Flocks

[COBBS Lab, Rome]



Crawling cells

[Silberzan's lab]

- Biological relevance
- Explore new dynamical phenomenology

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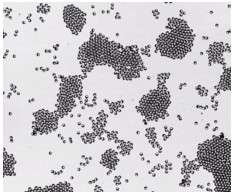
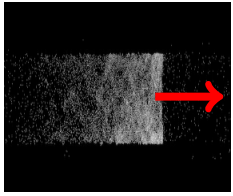


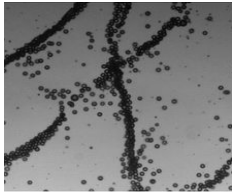
Clusters without attractive interactions

[van der Linden, PRL 2019]



Solitonic waves

[Bricard , Nature 2013]



Filaments

[Thutupalli, PNAS 2018]

- Biological relevance
- Active Soft Materials

- Explore new dynamical phenomenology
- Build generic framework for Active Matter

Outline of the 9 lectures

- 3 first lectures [C. Douarche] oriented towards 'wet' active matter & experimental realizations
- 6 last lectures [J. Tailleur] oriented towards 'dry' active matter & non-equilibrium statistical mechanics

I. Active matter at the microscopic scale

- What is an active particle?
- Non-Boltzmann features
- Active particles in external potentials
- Irreversibility at the microscopic scale

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- Nature of the transition to collective motion?
- From microscopic model to field theory
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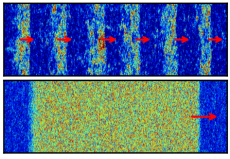

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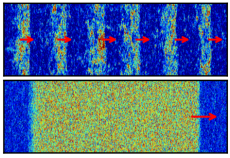

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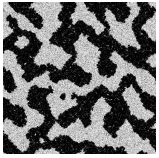
III. Motility-induced phase separation



- Cohesive matter without cohesive forces
- Mapping of simple models onto equilibrium field theory
- MIPS in colloidal & bacterial fluids