

# Emergent Collective Dynamics of Skyrmions

## PH40024 Contemporary Physics

Insert image

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# Outline



## ■ Motivation. Why is this interesting!

new dynamic materials.

## ■ Overall overview

- 1** Will discuss what skyrmions are.
- 2** Why they are particle like and can be active matter.
- 3** They're emergent dynamic behaviour — collective movement and clustering.
- 4** Finish with applications

## ■ Physics and arrangement of skyrmion

### ■ pair movement

### ■ large group movement

### ■ Uses of technology

### ■ Repeat overview



Starting with the end results/applications/motivation

ref 33-36

Movie

Active soft matter  
complex dynamics

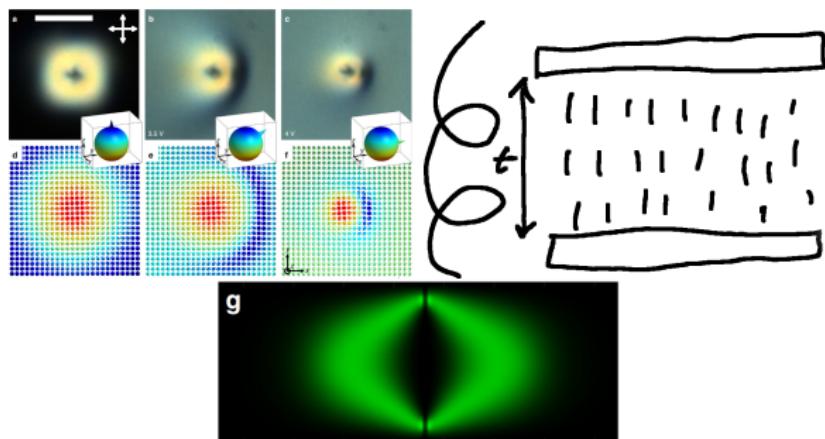
Topological 2D solitons — skyrmions act like particles  
exhibit collective motion — In random directions!

Observe complex clustering behaviour  
Out of equilibrium elastic interactions

# Skrymions



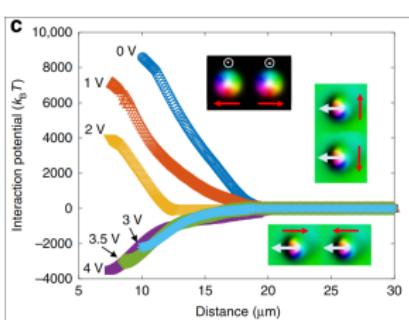
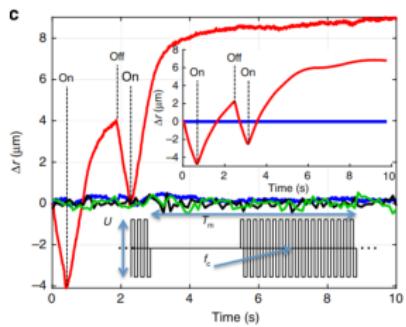
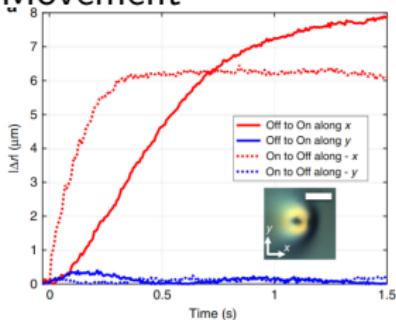
Physical relaxation in chiral LC



# Squirming Skyrmions



## Movement



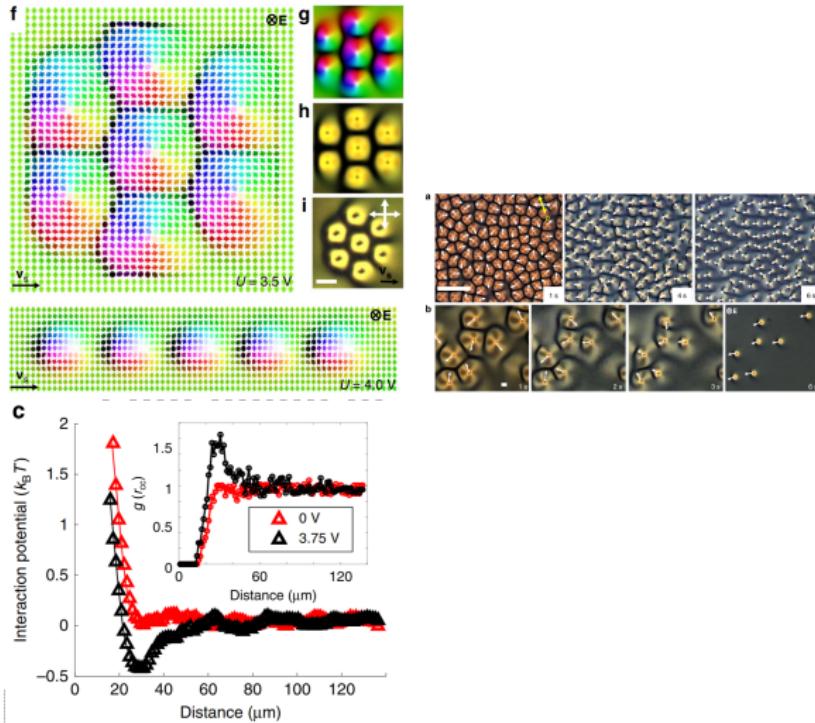
Two particle

interactions

# Skyrmions

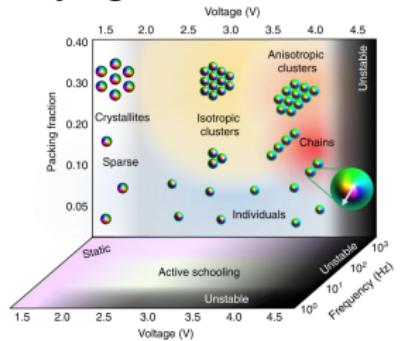
Many particle elastic interactions

Coherent motion



# Skyrmions

## Varying oscillation and field



# Conclusions



## Applications

# Conclusions



Reiteration  
(and references)

# References



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